Agricultural Mechanization in Nepal: Status & Issues

Presented by,

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Nepal

Nepal in Brief

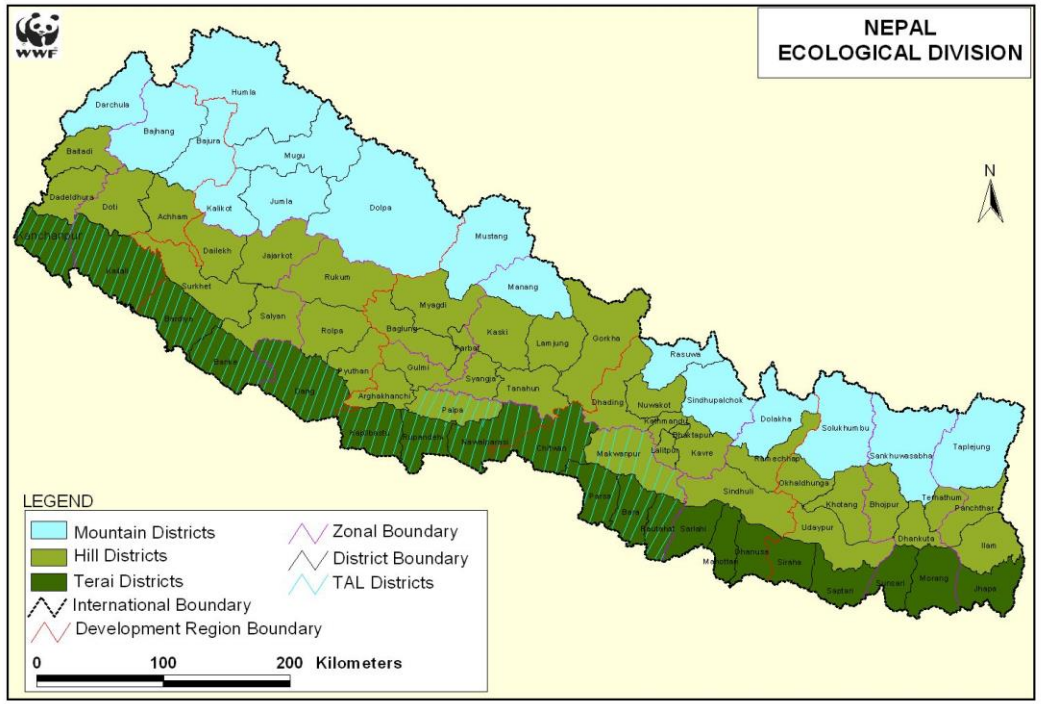
Total Area: 147,181 km^2
Average Length: 885 Km. (East to West)
Average Width: 193 Km. (North to South)

Federal Democratic Republic of Nepal from 2007

- 3 tiers of Government
- Federal Government
- State Government – 7
- Local Government - 753

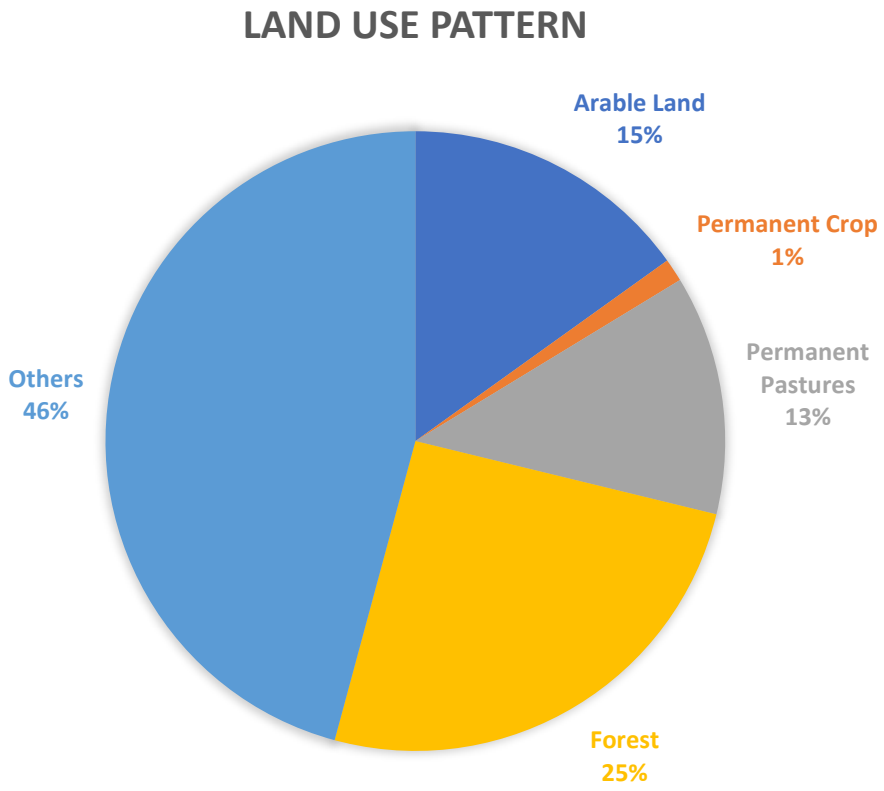
Population		
Description	2011	2017^p
Total	26,494,504	28,825,710
Male	12,849,041	13,975,678
Female	13,645,463	14,850,032

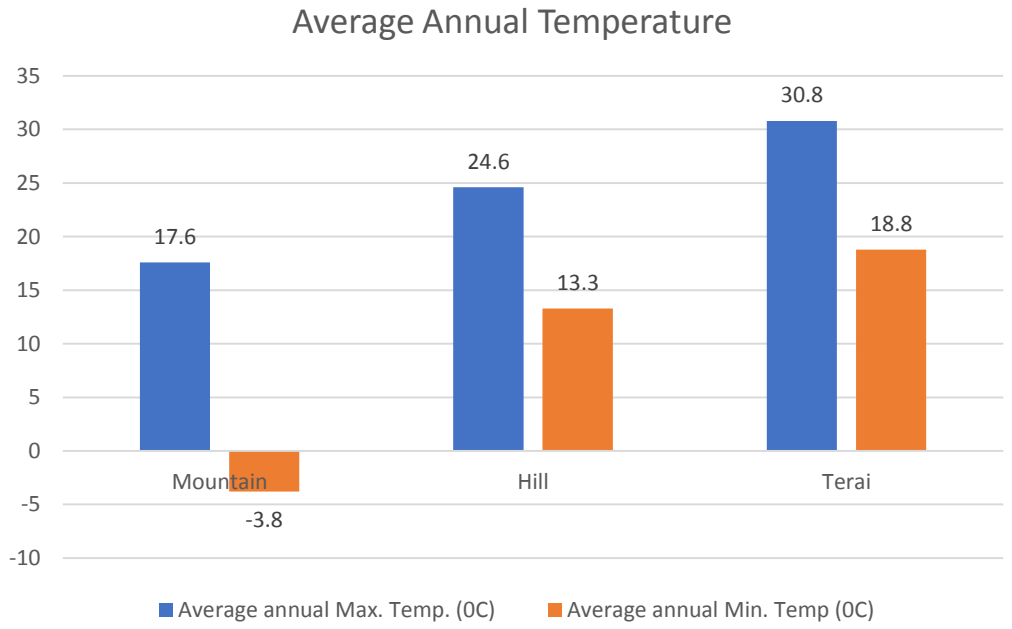
Nepal in Brief



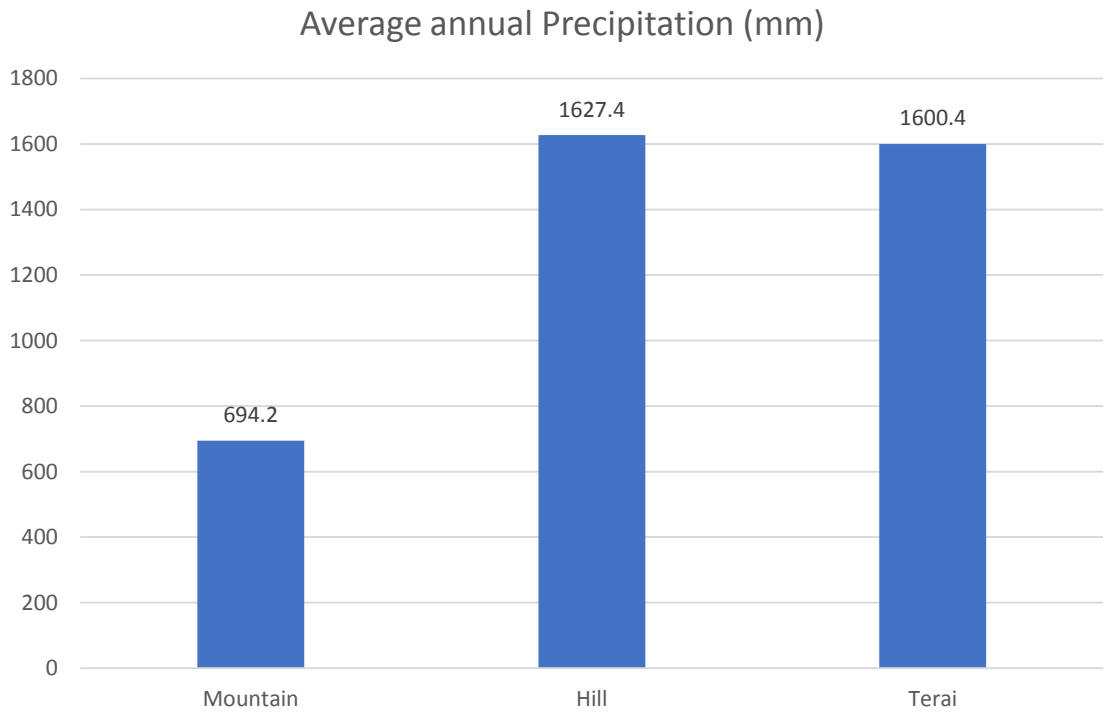
Description	Area Coverage(%)	Population Density (%)	Altitude (m)
Mountain	35	7	3500 - 8848
Hill	42	43	600 - 3500
Terai	23	50	70 - 600

Nepal in Brief





Nepal in Brief



Literacy Rate by 2017
Male: 76.2%
Female: 60.5%

Poverty Index by 2011
25% population below absolute poverty line ($225)

Economy by 2018

- Annual GDP growth rate by 7.05%
- Contribution to GDP by Agriculture, Forestry and Fishing 27.59%
- Contribution to GDP by other sector 74.41%
- GDP per capita - $728.4

Agriculture in Nepal

- 65% population engaged in agriculture
- Dominated by subsistence and small holder agriculture
- GDP contribution of agriculture 27.59%
- Trade deficit in agriculture $1.2 billion
- Total agricultural land 28.8%
- Arable land 15.1%
- Irrigated area 65%
- Year round 30-35%
- Rice, wheat and maize based cropping pattern in dominant in hill and terai
- Diversity in agriculture commodity as of diverse ecological climate

Agriculture in Nepal

- Pulses: lentil, gram, pigeon pea, blackgram, horsegram and soyben
- Fruits and Vegetables: Apple, peach, pear, plum, walnut, orange, lime, lemon, mango, lichi, banana, pineapple, papaya, cucumber, lady's finger, brinjal, pumpkin and several leafy vegetables
- Spices: large cardamom, turmeric and zinger
- Tea

Agriculture in Nepal

Area, Production and Yield by Major Cereal Crops by 2017			
Crop	**Area (ha)**	**Production(MT)**	**Yield (MT/ha)**
Paddy	1,552,469	5,230,327	3.4
Maize	900,288	2,300,121	2.6
Millet	263,596	306,704	1.2
Buckwheat	11,090	12,039	1.1
Wheat	735,850	1,879,191	2.6
Barley	27,370	30,510	1.1
Potato	185,879	2,591,686	14.0
Sugarcane	70,807	3,219,560	45.5
Oilseeds	207,978	214,451	1.0

Agriculture in Nepal

Land Holdings					
	No of holding	Area of holding, ha	Average area of holding, ha/holding	Average no of parcel/holding,	Average size of parcel, ha
Mountain	298,223	218,707	0.73	4.03	0.18
Hill	1,586,406	1,038,615	0.65	3.18	0.21
Terai	1,479,510	1,396,716	0.94	3.20	0.29
Nepal	3,364,139	2,654,037	0.79	3.27	0.24

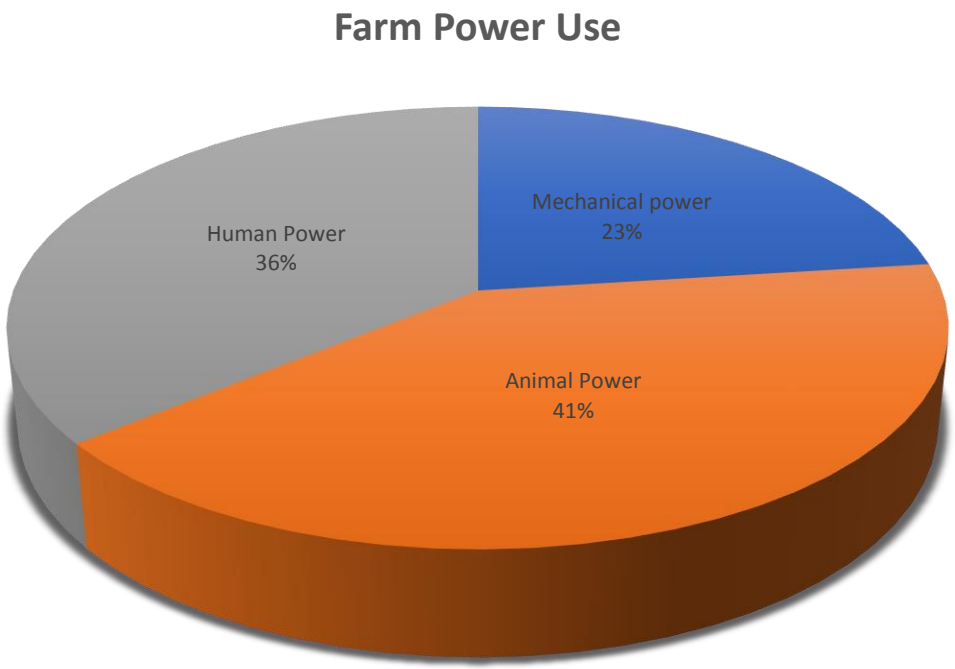
Agriculture in Nepal

Food Balance Sheet base on Cereal by 2017			
	Availability (MT)	Required (MT)	Balance (MT)
Mountain	265,428	351,845	-86,417
Hill	2,357,108	2,445,752	-88,644
Terai	2,732,696	2,629,034	103,662
Nepal	5,355,232	5,426,631	-71,399

National Demographic and Health Survey 2016

- 23 food deficit districts
- 8.1% Undernourished
- 38.4% Food secure HH in mountain
- 51% Food secure HH in Terai
- 13.8% Severely Food insecurity HH in mountain
- 9.2% severely food insecurity HH in Terai

Agricultural Mechanization in Nepal



- Power tillers and tractors – source of mechanical power
- 92.28% mechanical power concentrated in Terai

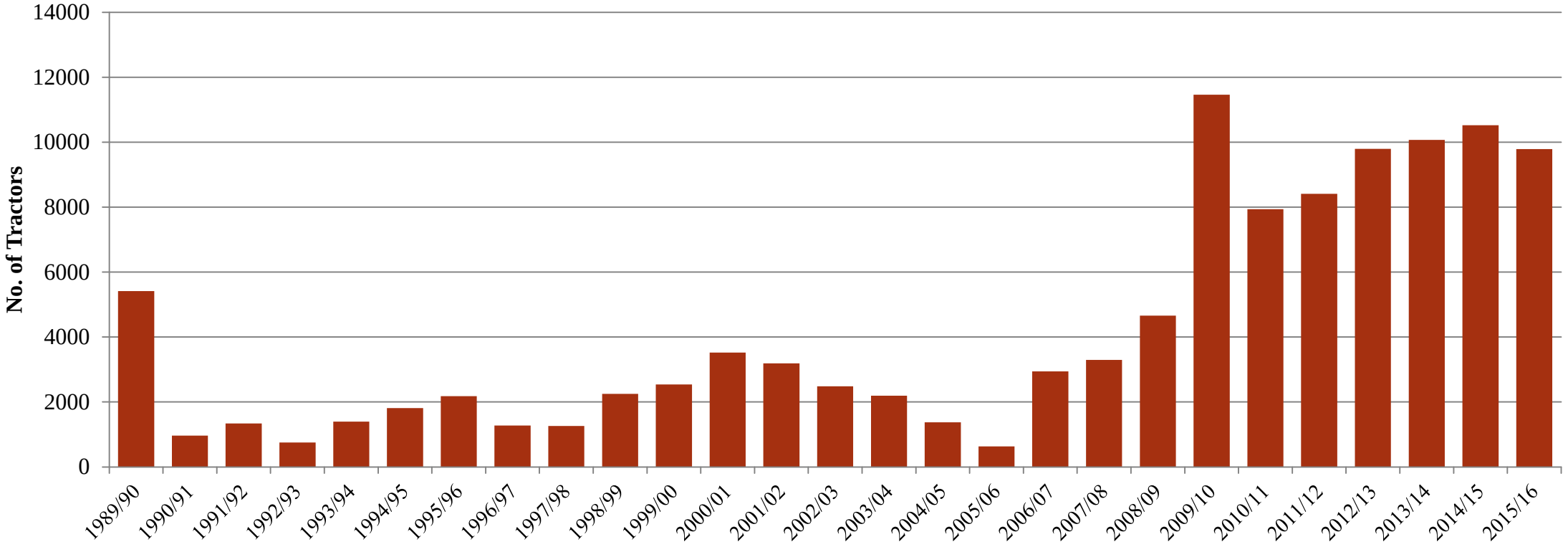
Trend of Agricultural Mechanization in 20 years

Types of Equipments	1991/92		2001/02		2011/12	
	Holdings using equipment (‘000)	No. of items (‘000)	Holdings using equipment (‘000)	No. of items (‘000)	Holdings using equipment (‘000)	No. of items (‘000)
Iron ploughs	315.1	354.5	870.3	890.2	1073.4	856.3
Power tillers	**5.6**	1.6	**15.6**	11.8	**75.7**	10.4
Shallow tube wells	50.9	48.2	119.7	109.5	367.7	262.0
Deep tube wells	20.1	15.7	58.6	51.5	159.7	82.0
Rower pumps	3.5	3.8	22.7	21.8	79.1	36.2
Tractors	**35.2**	5.5	**272.9**	150.6	**844.7**	37.4
Threshers	**85.6**	19.9	**249.5**	129.1	**803.1**	51.9
Pumping sets	81.1	41.3	210.4	146.1	548.2	150.3
Animal drawn cart	204.6	198.1	226.4	199.1	335.0	159.9
Sprayers	50.2	23.4	203.0	145.9	574.0	282.3
Others	296.5	878.4	449.0	1072.7	290.1	83.5

Agricultural Machinery Import in 2016/2017

HS Code	Description	Unit	Quantity	Value in NPR '000	Source Country
87011010/87011090/87019000	**Tractor including Power Tiller**	**PCS**	**38,986**	**11,451,192**	**India, China**
84321000	**Ploughs**	**PCS**	**18,946**	**20,386**	**India, China**
84322100	**Disc harrows**	**PCS**	**4,595**	**35,125**	**India, UK**
84322900	**Harrows (excl disc harrows), scarifiers, cultivators, weeders, hoes including Mini Tiller**	**PCS**	**221,151**	**1,070,647**	**India, China, Indonesia**
84323000	**Seeders, planters and transplanters**	**PCS**	**2,763**	**20,042**	**India, China**
84328000	**Soil preparation/cultivation machinery; lawn/sports-ground rollers**	**PCS**	**38,068**	**143,689**	**India, China**
84332000	**Mowers (including cutter bars for tractor mounting)**	**PCS**	**1,129**	**26,899**	**India, China, Australia**
84334000	**Straw or fodder balers (including pick-up balers)**	**PCS**	**677**	**9,095**	**India, China**
84335100	**Combine harvester-threshers**	**PCS**	**1,930**	**353,761**	**India, China, Japan**
84335200	**Threshing machinery for agricultural produce**	**PCS**	**21,933**	**654,189**	**India, China, New Zealand, Turkey**
84335300	**Root or tuber harvesting machines**	**PCS**	**2,711**	**23,855**	**India, China**
84335900	**Harvesting machinery**	**PCS**	**17,802**	**58,737**	**India, China, Japan**
84361000	**Machinery for preparing animal feeding stuffs**	**PCS**	**176,638**	**697,678**	**India, China, Netherlands, Germany, Republic of Korea**
84362100	**Poultry incubators and brooders**	**PCS**	**844,222**	**219,934**	**India, China, UK, Malaysia**
84371000	**Machines for cleaning/sorting/grading seed grain or dried vegetables**	**PCS**	**10,666**	**508,893**	**India, China, Germany, Republic of Korea**

Trend of Tractor/Power Tiller Registered



30% of registered tractors and 80% of power tillers only used in agriculture

Status of Agricultural Mechanization

Land Preparation/Tillage

Terai

- Over 95% of farms used tractors/power tillers in Terai (2018), Tractor: >80%, Power tiller: <15%
- Attachment: rotavator, cultivators, tillers
- Equipment: rented, custom hiring

Hills

- Approx. 5% area mechanized in Hills due to small terraces and difficulty in transportation of machineries.
- Animal drawn indigenous plough/improved iron plough or manually by spade
- Mini tillers are emerging in Hills due to easiness in transportation and suitable in small terraces.
- Approximately 11,000 Mini Tillers adopted in Hills

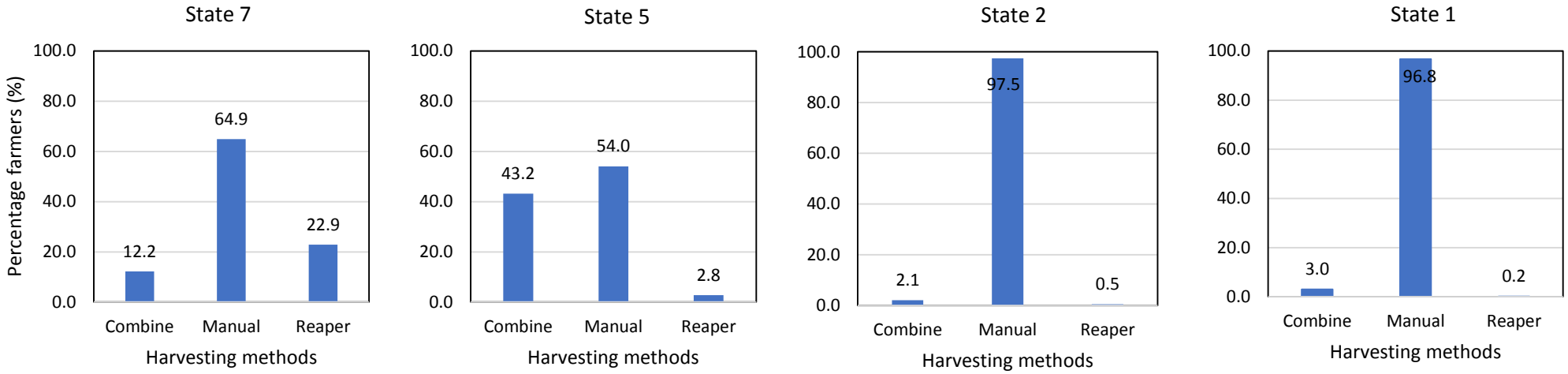
Status of Agricultural Mechanization

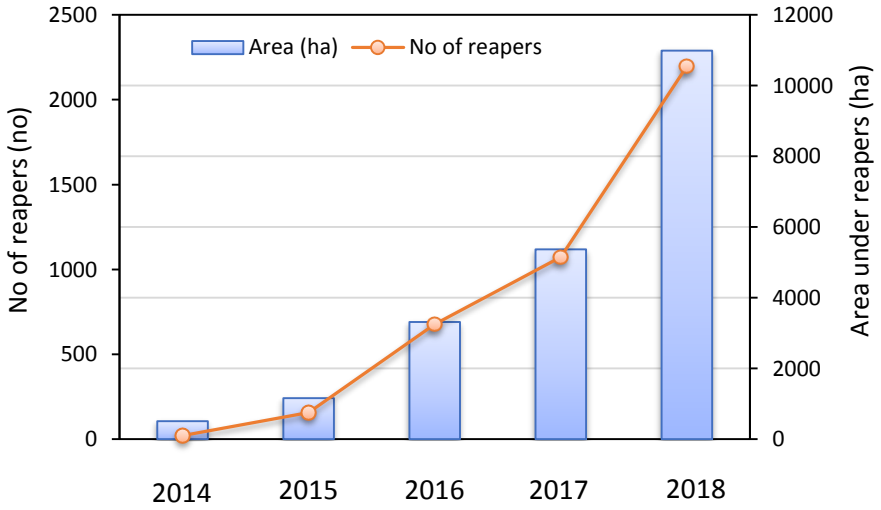
Planting/Seeding

- Rice is manually transplanted
- Wheat is broadcasted
- Maize is dibbed
- Mostly planting/seeding performed by women
- Rice transplanter are introduced in Terai, but adoption rate is still low.
- Seed Drills for wheat and maize is getting popular as15 to 20% productivity increment

Status of Agricultural Mechanization

Harvesting





No. of Reapers – 2800
Cost saved - $54/ha
No. of Combine Harvester – 350
Cost saved - $100/ha

Status of Agricultural Mechanization

Threshing

- Beating on stones/drums
- Animal treading
- Paddle threshers, electric threshers, PTO driven thresher
- 95% farmers use threshers in Terai (2018)
- $50/ha cost saved when threshing by thresher

Agricultural Mechanization Policy 2071

Approved on 29th August 2014

Vision

Contribute to national development through modernization and commercialization in present agriculture system using agricultural mechanization

Mission

To contribute to sustainable economic development through the agricultural mechanization and agribusiness modernization

Goal

To research, develop, adopt, extend, and promote agricultural machines, implements & equipment to increase agricultural productivity and make it sustainable and competitive

Agricultural Mechanization Policy 2071

4 Main Objectives

- **To increase productivity through appropriate agricultural mechanization as per the economic and geographical need of the country in order to develop the sustainable, competitive and commercial agriculture sector**
- **To develop the services and business of agriculture machineries through the coordination among the government, private sectors and cooperatives in order to increase the access of the farmers and the business people.**
- **To identification and promotion of women and environment friendly agriculture machineries.**
- **To establish and strengthen the organizational structural to develop, quality standardization, regulation, monitoring and promotion of agriculture machineries for agricultural mechanization.**

Agricultural Mechanization Promotion Operational Strategy Under Approval

- **It is the guiding document with**
  - **Implementation plan**
  - **Cost-estimation**
  - **Institutional and regulatory framework**
- **Focused on**

  “Sustainable Agricultural Mechanization for Food Security and Agricultural Commercialization”
- **Overall purpose**
  - **To raise the level of mechanization for increased land and labor productivity**
  - **Adopting appropriate and sustainable agricultural mechanization technologies**

Agricultural Mechanization Promotion Operational Strategy Under Approval

- **Strategic framework comprised of 4 interrelated elements**

1.Enhancing demand and use of appropriate agricultural machinery

2.Improving supply situation giving priority to domestic fabrication

3.Strengthening innovation system

4.Providing appropriate policy, institutional and regulatory measures

Agricultural Mechanization Promotion Operational Strategy Under Approval

Targets set for raising the level of Agricultural Mechanization

Indicators and unit	Current status	Short-term (2017-2019)	Medium-term (2019-2022)	Long-term (2022-2027)
% of agricultural mechanization	40% (Terai-61%, Mid-hill 15%, mountains-2%)	50	60	70
Power use in Kw/Ha (Mechanical)	0.67	0.74	0.85	1.19

Constraints and Challenges

- Insufficient availability of spare parts in stock due to weak financial status of dealers and traders
- High import tax @15% and 13% VAT on spare parts & attachments, whereas 1% import tax and free VAT in Tractors and power tillers
- Heavy duty 15-45% in raw material – local manufacturer are reluctant to produce machinery, tools and spare parts
- Small land holding size, narrow terraces in hills – hindrance for mechanization
- dominant women farmers in rural areas as of male migration every year. Women friendly machinery need to be developed
- Weak research and extension institutions in mechanization – lack adequate resources, expertise and infrastructure facilities in agricultural engineering and technology on mechanization
- Limited access to institutional credit and insurance scheme
- Limited access to repair and maintenance service centers of agricultural machineries due to lack of adequate trained human resources
- Lack of testing, quality control and demonstration facilities of imported equipment – possibilities of failure technology import
- Low purchasing power to buy machineries as of small farmers

Custom Hiring Services in Nepal

- Renting of farm equipment, *e.g.*, tractors, power tillers, water pump etc. has been practiced by large farmers few decades ago.
- Concept of custom hiring services through private/cooperative farmers has been started few years back by the efforts of Directorate of Agricultural Engineering, Nepal (Currently Center for Agricultural Infrastructure Development and Agricultural Mechanization)
- Established 4 model CHS in 4 different states by CAIDAM
- Prime Minister Agricultural Modernization Project – 40 small to medium CHS and 160 under process

Custom Hiring Services in Nepal

Features of CHS established by CAIDAM

- Service Provider should have their own land to establish the center
- Subsidy 85% -the Government, 15%- private sector for Infrastructure Development like-Workshop, Garage, Training Hall, Office.
- Matching fund 50-50% for machinery like-Tractor, Tractor Attachments, Threshers, Laser Land Leveler, Combine Harvester, Straw management machines etc.
- Rental rate of machine less than general in the market.

Custom Hiring Services in Nepal

Some Remarks about CHS in Nepal

- Custom hiring service providers has **major role in promotion of agricultural mechanization** among small holder farmers in Nepal.
- Privately owned agricultural machine custom hiring service is found to be more successful than the group owned agricultural machinery service provider.
- Custom hiring service in tillage, water pumping, harvesting and threshing has been successfully used in terai region, milling and transportation all over Nepal.
- Almost all the custom service providers are informal. as some of them are registered.
- There are several important issues raised by custom hiring service provider and the farmers which is needed to be addressed by the government for promotion of agricultural mechanization in Nepal.

Recommendation

- promotion of small scale mechanization focusing on women and youth friendly machineries in hills and mountain
- Promotion of custom hiring services with relatively large scale machineries in Terai
- Encourage Cooperative Farming, Contract Farming and Land Consolidation supported by policy to reduce cost of production, increase machinery use efficiency and increase productivity
- Institutional and human resource development in farm mechanization
  - strengthening of existing organization with adequate human resources for R&D and extension,
  - farm mechanization units in each districts for adoptive research,
  - private sector repair and maintenance workshops spread over local level in mountain, hills and terai
- Targeted Policy Interventions with Portfolio of Incentives and Support Measures
  - Considering the need to focus on small-scale environmentally safe farm mechanization, differentiated and targeted import duty is needed for raw materials, spare parts, machineries, accessories and attachments.
  - Promote credit policy with soft and easy loans for agricultural machineries and commercial agriculture in rural areas
  - Initiate Implementation of insurance schemes to minimize risks in farming is essential for the adoption of farm mechanization and commercialization of agriculture
  - Formulation of contract Farming Act, Land leasing legislation, Agriculture Land Use Act, Cooperative Act, *etc* support Agricultural Mechanization policy 2014.
  - Rational and appropriate subsidy policy should be in place depending on price and use of farm machineries and attachments

Conclusion

Promotion of sustainable agricultural mechanization for small holder farmers intervened by appropriate policy and technology has become urgent need for the country to end hunger and poverty in Nepal as targeted by Sustainable Development Goal by 2030. It helps to reduce cost of cultivation and increase crop productivity which ultimately supports in income generation and food security of country and its people.