

Integrated Rural Economic and Social Development Programme for  
Livelihoods Improvement in the Dry Zone of Myanmar

# Knowledge-Sharing Workshop on Agricultural Engineering: Prevailing Practices in the Region

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# Outline

Time	Session	Activities	Duration
09:20 – 10:00	Session 2-x: Prevailing practices in the region	Topic: Custom hiring in agriculture: Motives and Challenges  - Discussion / Q&A	40 min
10:15 – 12:00	Session 2-x: Prevailing practices in the region	Topic: Custom hiring in agriculture: Regional experience from selected countries [Bangladesh, Cambodia, China, India, Indonesia]  - Discussion / Q&A	105 min
13:30 - 1450	Session 2-x: Prevailing practices in the region	Topic: Custom hiring in agriculture: Regional experience from selected countries (contd.) [Laos, Nepal, Sri Lanka, Philippines, Viet Nam]  - Discussion / Q&A	80 min

# **Custom hiring in agriculture: Motives & Challenges**

# Why Custom Hiring (CH)?

Increasing competition in agricultural markets; Growing concerns over productivity & efficiencies

Modern machinery help provide dramatic increase in yield

Farmers are trying ways to increase productivity and profits  
→ by a) switching to higher value products, b) keeping down production costs

Mechanization is generally expensive, specially for small farmers

Just like other actors in private sectors, they tend to tie less money into capital assets (machinery) OR they tend to increase %utilization of equipment over the year

Leaving them to choose between continually dependence on labor-intensive methods, b) swapping services with others, c) hiring equipment, or d) quit farming

**Custom  
Hiring**

## **Custom Hiring (CH):**

...it enables farmers to rent the appropriate equipment, often along with someone to operate it, for a defined period of time only, thus only paying for the services of the machine without having to own it.

# Motive: Push factors

- Growing scarcity of labor in agri-food systems
- Increasing labor costs
- New technologies are economically and technically out-of-reach from small holders (to buy at their own): Either very expensive or require advance operating skills
- Climate change has shortened the 'window' of completing critical agricultural operations – requiring more use of machines to ensure timeliness

# Motive: Benefits/Pull factors (1)

- Increased accessibility: Resource-poor farmers can access improved agricultural machines, which are otherwise cannot economically & technically out of reach
- Faster uptake of new technologies and machines: Opportunity to make a lower investment in machinery and being able to have latest technologies at disposal whenever needed
- Increased chances that machinery is modern and in good operating condition, and thus offering smooth operation without frequent stops due to breakdown
- Specialized agricultural operations: More skilled and higher quality operations often done by professionals
- Expand and intensify production: Custom Hiring offers prospects for rapid increase in mechanization level
- Better access to R&M services
- Greater rural entrepreneurship development

## Motive: Benefits/Pull factors (2)

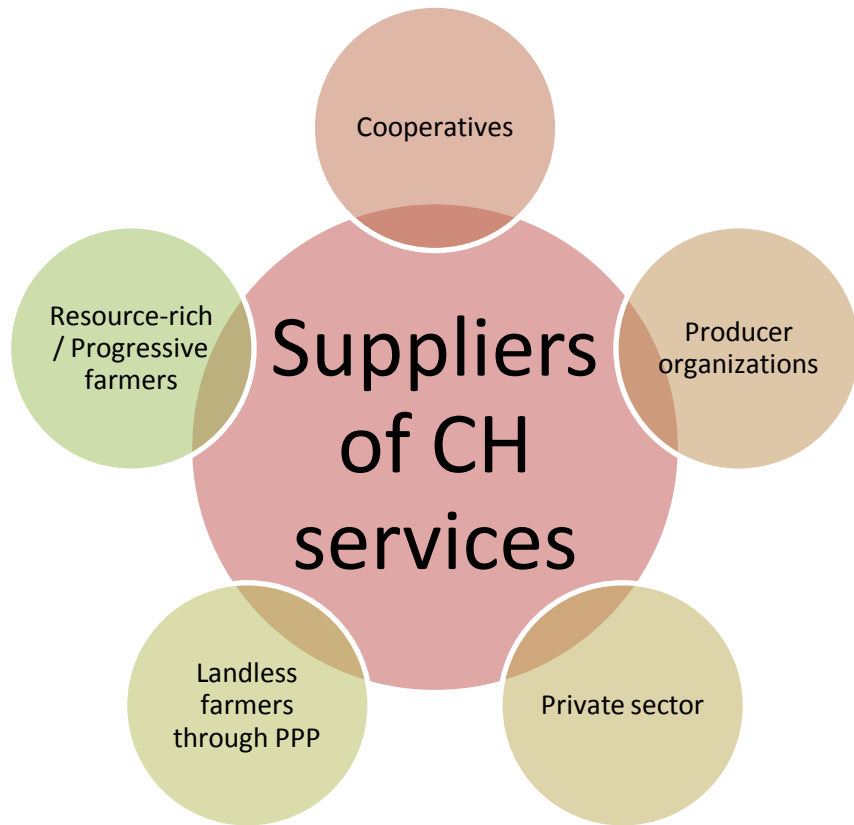
- Increase smallholders income: CH may enhance technical and economic efficiency across the value chain
- Facilitates the organization and implementation of subsidies and other incentive policies
- Full use of machine's service life: Every machine will be used by more farmers and renewed earlier – after fullest (potential) use during its service life
- Facilitate diversification of production
- CH makes cost estimates more predictable: by reducing risks for unexpected costs of R&M
- CH makes it possible to draw the costs of machinery from operating capital, as there is no long-term investment involved



# Challenges

- Having not enough service providers: due to competing demands (as during small window of harvest period) – the machinery (and/or its operator) may not be available at time desired by farmer → Leads to potential loss in harvest
- Farmers would not have full control over the job performed

## Suppliers of CH services



## Success factors to sustain CH enterprise



- Often, operator of machine would also be included in rental
- Tariff can be charged by the hour, or in some cases, by acre harvested
- Usually owner of the machine would be responsible for maintenance and major repairs; farmers only responsible for minor repairs on field

## Enabling environment is critical for the CH suppliers

Govt. commitment with a clear sustainable agricultural mechanization strategy

Suitable regulatory framework, and support policies to attract private sector investment

Financial mechanisms and incentives to facilitate both the users as well as service providers

Land tenure policies

Infrastructural support base to facilitate use of machinery

# **Custom hiring in agriculture: Regional experience from selected countries**

# Bangladesh

# Bangladesh: In a snapshot

Area of Bangladesh	1,47,570 sq.km
Total population	144.05 million
GDP	US \$ 118.42 billion
GDP Growth rate*	6.03%
Per capita Income	<b>US \$ 1044</b>
Manufacturing Sector contribution to GDP	<b>18%</b>
Manufacturing Sector Growth rate	5.73%
Small and Cottage Industries	6.3%
Medium and Large Industries	5.5%
<b>Agriculture contribute to GDP</b>	<b>18.70%</b>
Agricultural Growth rate	2.17%
No. of Farm Household	15.18 million
No. of Non-Farm Household	13.51 million
Cultivated Area	<b>8.52 million ha</b>
Cultivated Area per Household	<b>0.51 ha</b>
Cropping Intensity	<b>190%</b>
Irrigated area	62.96%

Source: Statistical Year Book of Bangladesh (BBS, 2013; \*Global Finance, 2012, www.gfmag.com

## Agricultural land holdings in different farming segments

<b>Segment of Land Holding</b>	<b>1983-84</b>	<b>1996</b>	<b>2008</b>
Small Farm (0- 1 ha)	70.34	79.87	84.27
Medium Farm (1 – 3 ha)	24.72	17.61	14.19
Large Farm (3 ha and above)	4.49	2.52	1.52
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Statistical Pocket Book of Bangladesh, 2010



# Agricultural machinery statistics in Bangladesh

Sl. No.	Farm Machinery	Number of unit
1	Power tiller	About 7,00,000
2	Tractor	> 60,000
3	High speed rotary tiller	> 4,000
4	Weeder	> 2,50,000
5	Seeder Transplanter	> 1000 > 150
6	Sprayer	12,50,000
7	Combine harvester	130
8	Reaper	500
11	Open drum thresher	> 2,80,000
10	Closed drum thresher	> 50,000
11	Winnower	> 3,000
12	USG Applicator	> 16,000
13	Hand maize sheller	12,000
14	Power maize sheller	30,000

# Agricultural machinery adoption status in Bangladesh

✓ <b>Land preparation</b>	:	<b>&gt;90% mechanical power</b>
<ul style="list-style-type: none"> <li>✓ Seeding</li> <li>✓ planting</li> <li>✓ Transplanting</li> <li>✓ Fertilizer application</li> <li>✓ Insecticide application</li> </ul>	:	Started by machine (Showing encouraging)
✓ Irrigation	:	<b>&gt;95% by power operated</b> STW/DTW /LLP pump
<ul style="list-style-type: none"> <li>✓ Harvesting</li> <li>✓ Reaper &amp; combine harvester</li> </ul>	:	Mostly manually >90-95 %  >10-5 %
✓ Threshing	:	<b>Rice-wheat &gt;75%</b>
<ul style="list-style-type: none"> <li>✓ Shelling</li> <li>✓ Cleanning</li> <li>✓ Dryer</li> <li>✓ Storage</li> </ul>	:	<b>maize &gt;95% by sheller</b>  Started by machine (Showing encouraging)\

# Agricultural machinery manufacturing status in Bangladesh

<b>Manufacturing Units</b>	<b>Number</b>
<b>Foundries</b>	<b>70</b>
<b>Agri-Machinery Manufacturing Workshops and Industries</b>	<b>800</b>
<b>Spare Parts Manufacturing Workshops</b>	<b>1500</b>
<b>Repair and Maintenance Workshops</b>	<b>20,000</b>
<b>Mechanics</b>	<b>5,00,000</b>
<b>Village Artisans</b>	<b>1,00,000</b>

# Custom Hiring

- CH in Bangladesh started in early 70s
  - Power tiller (PT/2WT) and Tractor (4WT) were the first machines involved in CH
- Currently CH is available for a wide range of machines/operations
- In 2013, Min of Agri published the National Agricultural Policy; However, there is no Custom Hiring policy in Bangladesh

## 2WT and 4WT

- ❑ Power tiller: 7,00,000 units
- ❑ Annual import: 41,000 unit, worth 4100 million TK. (US \$ 50.0 million)
- ❑ Tractor: 60,000 units
- ❑ Annual import: 6,200 unit, worth 6570 million Tk. (US \$ 80.0 million)

## Tilling cost (PT/2WT & 4WT):

- Land preparation hiring charge ranges from
    - ✓ Taka 3000.00 to 3500.00 per hectare for one pass
    - ✓ Taka 6000.00 to 7500.00 per hectare 3-4 pass (Complete)
- (1 US\$ = BDT 78.00)



## Irrigation equipment

Shallow Tube Well (STW), Low Lift Pump (LLP), Deep Tube Well (DTW)

- ❑ Present population of STW: 14,98,386 units  
LLP: 1,77,216 units
- ❑ Annual production : 5,60,000 unit, worth 16.6 million US \$
- ❑ Potential demand : 8,50,000 units annually
- ❑ Unmet market size : 5.6 million US \$ annually

### Irrigation water charge:

Boro season: Tk 25,000 to 32,000 per ha

Aman and Rabi crops: Tk 3,000 to 3,500 per ha or Tk 70 – 100 per hour in case of 2 cusec pump

Wheat, Maize and Potato crops: Tk 7,500 to 8,000 per ha



PT operated Seeders (PTOS)  
High Speed Rotary Tillers (HSRT)

- Service providers opined that renting out PTOS/HSRT is highly profitable business
- Per unit coverage for land preparation and seed sowing by PTOS/HSRT ranges between 7 – 65 ha (average 36 ha) per year
- Custom Hiring charge for PTOS/HSRT ranges between Tk 4,500 – 5,600 per ha
- Average gross annual income by a Service Provider is about Tk 130,500

Combine Harvester  
Reaper

- **Total Number of Combine Harvester 130**
- Harvesting charge of rice and wheat range
  - ✓ Rice Taka 11,500 to 12,000.00 per hectare
  - ✓ Wheat Taka 13,500 to 14,000.00 per hectare
- **Total Number of Reaper 500**
- Manual method average harvesting, threshing and winnowing cost
  - ✓ taka 16000.00 per hectare and
  - ✓ It 35% higher than average cost of harvesting by combine harvester.

## Operating cost of Combine Harvester for rice harvesting in Bangladesh

- Effective Field Capacity: 1 acre/hr
- Fuel Consumption: 9 lit/hr Or 9 lit/acre
- Fuel Price =  $9 \times 44.00 = \text{Tk. } 630.00/\text{acre}$
- Operator + Lubricant + Others =  $\text{Tk. } 250.00/\text{acre}$  (Maximum)
- Total Cost =  $\text{Tk. } 880.00/\text{acre}$
- Harvesting Charge =  $\text{Tk. } 5,000.00/\text{acre}$
- Profit =  $\text{Tk. } 4,620.00/\text{acre}$
- **Profit per Day (10 hrs) =  $\text{Tk. } 46,200.00$**
- Profit per Month (30 days) =  $\text{Tk. } 13,86,000.00$

1 USD = 78 BDT



## Threshing

Population of Open Drum Thresher (ODT) : 2,80,000 units

Close Drum Thresher (CDT) : 50,000 units

Annual production of Open & Close Drum Thresher: 20,000 & 80,000

Annual market size: 3240 million TK. (US \$ 39.5 million)

## Threshing paddy and wheat

- Custom Hiring charge: Tk100 – 140 per ton





## Power Maize Sheller

**Present population of Maize Sheller: 30,000 units**

**Annual production of Maize Sheller: 6,500 units**

**Annual market size: 1.3 million US \$**

## Shelling maize

- Custom Hiring charge: Tk 30 – 50 per ton



# Custom Hiring: A summary

## Custom Hiring Machinery used in Bangladesh

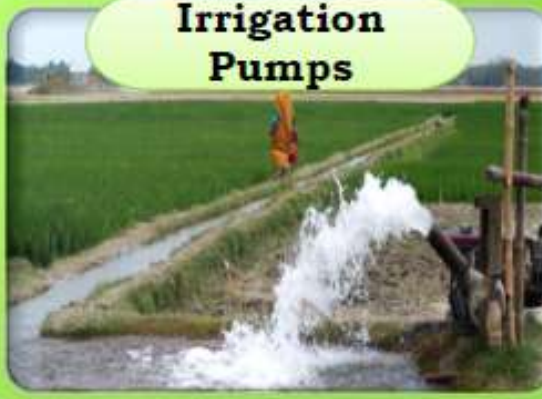
**Tractor**



**Power Tiller**



**Irrigation Pumps**



**Rice Transplanter**



**USG Applicator**





## Custom Hiring Machinery used in Bangladesh

**Rice Wheat  
Teaser**



**Reaper Binder**



**Combine  
Harvester**



**Maize Sheller**



**Reaper**



# Custom Hiring: A summary table of charges

S/ N	Name of Machinery	Use of Crops	Charge (BDT./ha)	Charge (USD./ha)
1.	4 Wheel Tractor	Rice (2 pass)	6,670.00	<b>86.00</b>
		Wheat (2 pass)	6,670.00	<b>86.00</b>
		Potato (4 pass)	13,340.00	<b>171.00</b>
		Maize (2 pass)	6,670.00	<b>86.00</b>
		Mustard (2 pass)	6,670.00	<b>86.00</b>
2.	2 Wheel Tractor	Rice (3 pass)	7,780.00	<b>100.00</b>
		Wheat (3 pass)	7,780.00	<b>100.00</b>
		Potato (6 pass)	15,560.00	<b>200.00</b>
		Maize (3 pass)	7,780.00	<b>100.00</b>
		Mustard (3 pass)	7,780.00	<b>100.00</b>

1 USD = 78 BDT

Continue....

S/N	Name of Machinery	Use of Crops	Charge (BDT./ha)	Charge (USD./ha)
3.	Irrigation Pump	Rice (Full Time)	33,590.00	<b>430.00</b>
		Wheat (3 Times)	8,890.00	<b>114.00</b>
		Potato (3 Times)	8,890.00	<b>114.00</b>
		Maize (3 Times)	8,890.00	<b>114.00</b>
4.	Rice Transplanter		7,410.00	<b>95.00</b>
5.	Rice Thresher		3,950.00	<b>50.00</b>
6.	Wheat Thresher		4,940.00	<b>64.00</b>
7.	Maize Sheller		6,000.00	<b>77.00</b>
8.	Combine Harvester	Rice	12,350.00	<b>158.00</b>
		Wheat	14,820.00	<b>190.00</b>
9.	Transportation up to 5 km (round trip)		1,000.00	<b>13.00</b>
10.	Transportation for 5 km to 20 km (round trip)		1,500.00	<b>20.00</b>

# Cambodia

## Agricultural machinery statistics in Cambodia

Year	Harvester	Thresher	Rice milling	Tractor	Power Tiller	Water pump
2004	-	6,220	36,531	3,857	20,279	106,569
2005	-	7,338	38,606	4,166	26,504	120,968
2006	325	7,795	38,618	4,247	29,706	127,610
2007	395	8,036	38,680	4,475	34,639	131,702
2008	430	8,237	39,429	4,611	38,912	136,061
2009	836	13,798	47,620	5,495	53,220	164,974
2010	947	14,390	48,217	6,200	66,548	166,633
2011	1,548	15,210	48,753	6,786	77,421	183,502
2012	4,820	16,146	54,328	8,961	128,806	231,942
2013	4,580	17,542	55,270	9,467	151,701	255,954



## Ag mechanization ratio in terms of mechanized area by major farm operations

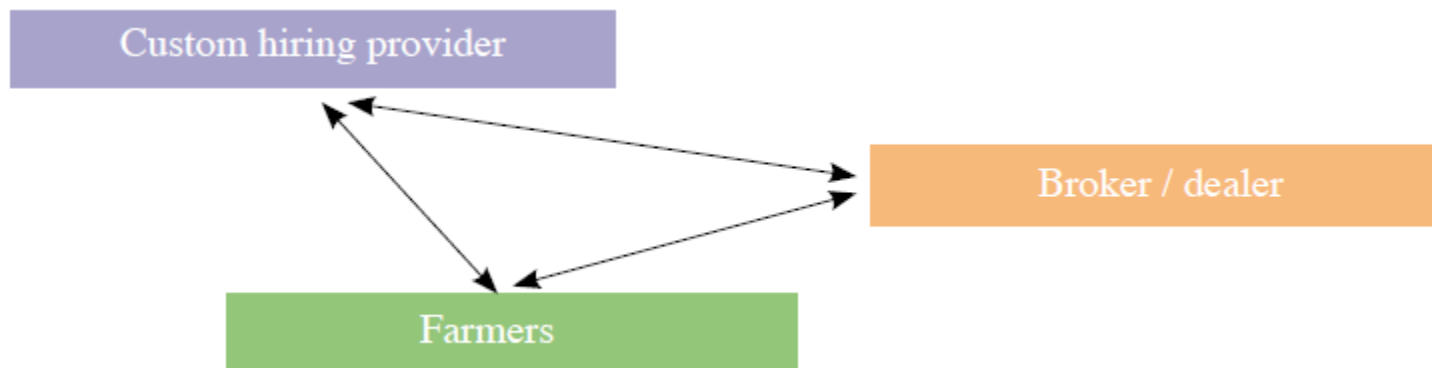
Total of land preparation in 2013 was 3,852,494 ha in which 1,037,307 ha done by draft animal and 2,815,187 done by agricultural machinery

Items	Manual	Animal Power	Agri. Machinery
Land preparation	0	27	<u>73</u>
Broadcasting and transplanting	99.9	0	0.01
Weeding	90	0	10
Fertilizing	100	0	0
Spraying	70	0	<u>30</u>
Harvesting	30	0	<u>70</u>
Threshing	1	1	<u>98</u>
Transportation	0	40	<u>60</u>
Drying	95	0	5
Milling	0	0	<u>100</u>
Average	48.6	6.8	44.6



# Custom Hiring

- Custom hiring on farm machinery in Cambodia is different from one region to another region;
- Most of farmers prefer to hire tractor for land preparation such as land leveling, plowing, harrowing and rotavating whereas combine harvester for harvesting.
- Normally, the custom hiring service can be offered directly from a farmer to the individual service provider or through a broker who deals with requests made by farmers.



## Farm Machinery for Paddy Production

Operations	Agricultural Machinery used
Land leveling	- <b>For tractor:</b> 20-25 US \$ / hr (front shield equipped with tractor) - <b>For power tiller:</b> 15-20 US \$ / hr (front shield equipped with power tiller)
Plowing	- <b>For tractor:</b> 35-70 US \$ / (depend on distance and field condition) - <b>For power tiller:</b> 5-45 (depend on distance and field condition)
Harrowing	- <b>For tractor:</b> 20-40 US \$ (depend on distance and field condition) - <b>For power tiller:</b> 15-20 US \$ (depend on distance and field condition)
Rotavating	- <b>For tractor:</b> 50-70 US \$ (depend on distance and field condition)
Harvesting	70-90 US \$ / ha (by combine harvester and the cost is depended on distance and field condition)
Threshing	8-10% of total paddy after threshing
Transportation	075-1.25 / 100kg (1 sack) It depends on distance and road condition
Drying	20-25 US \$ / ton of paddy (it depends on paddy varieties and moisture content)

The price varied from one region to another region

## Farm Machinery for Maize, Soybean, Cassava Production

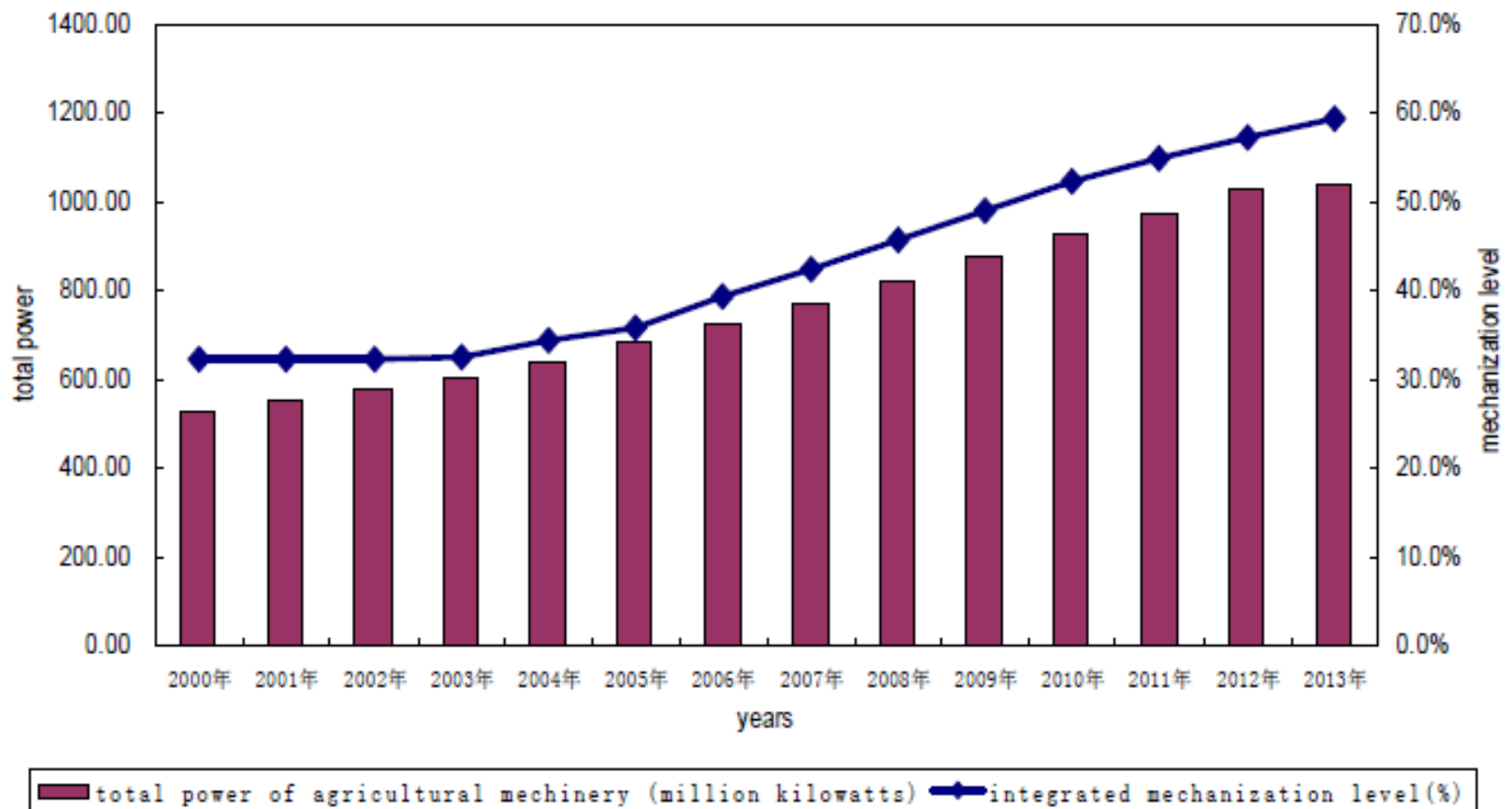
Operations	Agricultural Machinery used
Land leveling	- <b>For tractor:</b> 35-40 US \$ / ha (depend on distance and field condition) - <b>For power tiller:</b> 25-30 US \$ / ha(depend on distance and field condition)
Plowing	- <b>For tractor:</b> 18-20 US \$ / ha (depend on distance and field condition) - <b>For power tiller:</b> 12-15 US \$ / ha

The price varied from one region to another region

China, P.R.

# Agricultural mechanization level in China

## 2000-2013 China's agricultural mechanization



## Custom hiring began in 1979

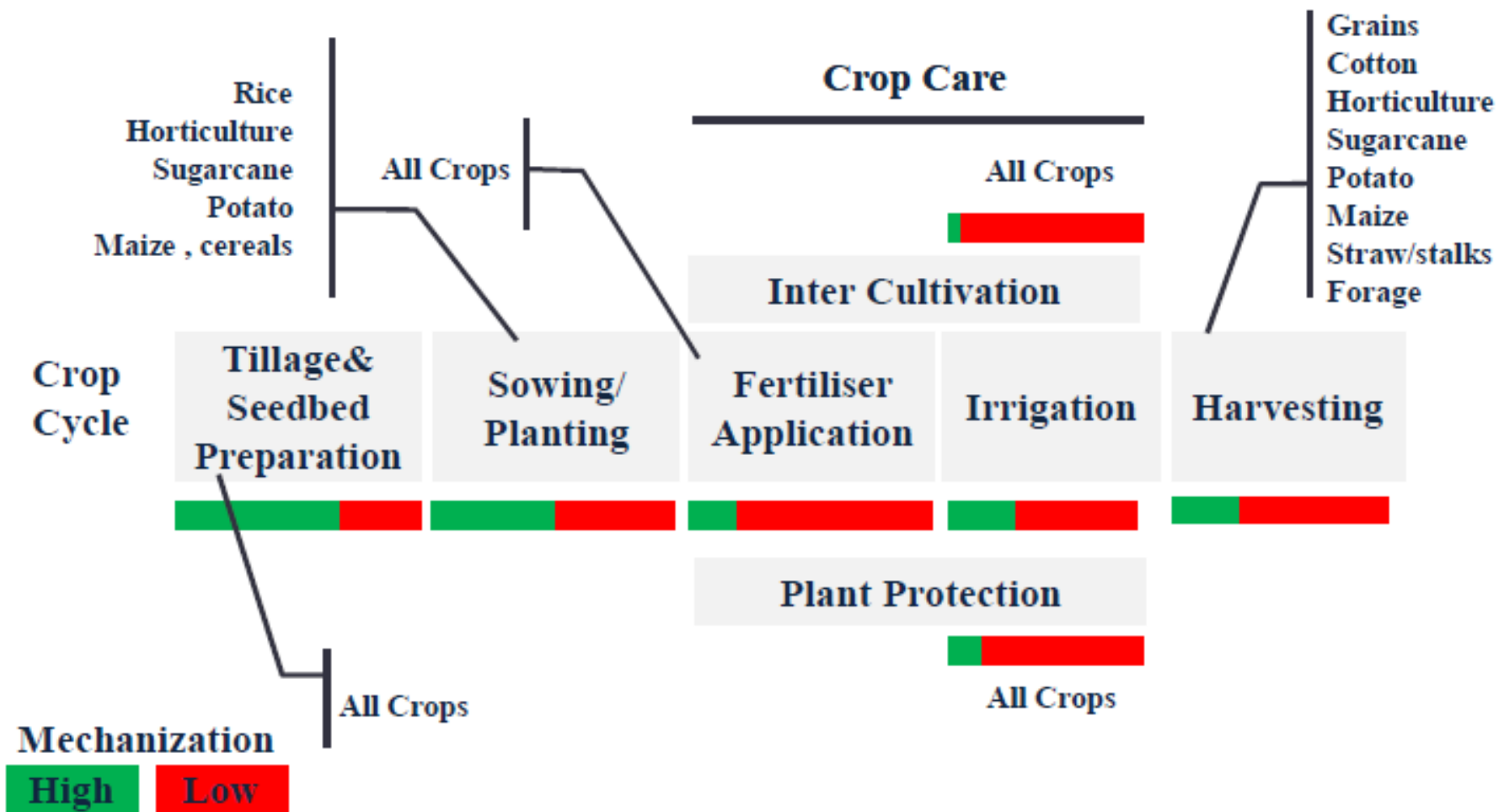
- Before 1979, China's rural farmland and farm machinery were collectively owned. Custom hiring is impossible.
- After 1979, China began the reform of household contract responsibility system.
- This reform laid the foundation for the custom hiring of farm machinery in China, and custom hiring organizations and households began flourishing.

- Nowadays, many Chinese rural households purchase farm machines not only to care for their own fields, but also for custom hiring.
- 42 million are farm machine owners, 15.8% of the total rural households; the total operating income of farm machinery-owning households reached 430 billion RMB.
- Households that make over 60% of their total income out of custom hiring services are called machinery service-providing households. In 2013, the number of such households reached 5.2 million, 12.3% of the total number of farm machinery-owning households.

# India



## Status and Needs of Mechanization in India



Harvesting, crop care and seeding are top priorities for the farmer

## Overall about 45%

Operation	Percentage
Soil working and seed bed preparation	40
Seeding and planting	29
Plant protection	34
Irrigation	37
Harvesting and threshing	60-70 percent for wheat and rice and <5percent for others

# Status of Farm Mechanization Industry

Equipment manufacturers	No. of units
• Agricultural tractors	22
• Power tillers	5
• Irrigation pumps	600
• Plant protection equipment	300
• Combine Harvester	48
• Reapers	60
• Threshers	6000
• Seed Drills and planters	2500
• Diesel oil engines	200
• Plough, cultivators, harrows	5000
• Chaff cutter	50
• Rural artisans	>1 million

# Custom Hiring of Farm Machines

- Early decades of nineteenth century
  - ✓ 30-inch (diameter) steam thresher
- Mid-1960 - organized custom hiring
  - ✓ Agro-Industries Corporation (AIC) established
  - ✓ 1970s to 1990s - land development and tillage
- 1971 – GOI scheme to set up Agro-Services Centres
- 1990s - in a limited way under NATP and NAIP
- 2005 – All India Coordinated Research Projects (AICRP) (FIM) – 24 centres
- 2010 – National Initiative on Climate Resilient Agriculture (NICRA) - 100 Agriculture Science Centres (KVKs)
  - ✓ in drought/ flood/ hill area and difficult situations
  - ✓ centres managed by farmers through Village Climate Risk management Committees

# Farm Machinery Banks for Custom Hiring

- ✓ To promote mechanization in districts with low farm power availability
- ✓ To facilitate hiring services of various agricultural machinery/implements applied for different operations.
- ✓ To expand mechanized activities during cropping seasons in large areas especially in small and marginal holdings.
- ✓ To Introduce improved/newly developed agricultural implements and machines in crop production

# Indonesia

# Custom Hiring for Rental Services of Agricultural Machineries - CHR SAM

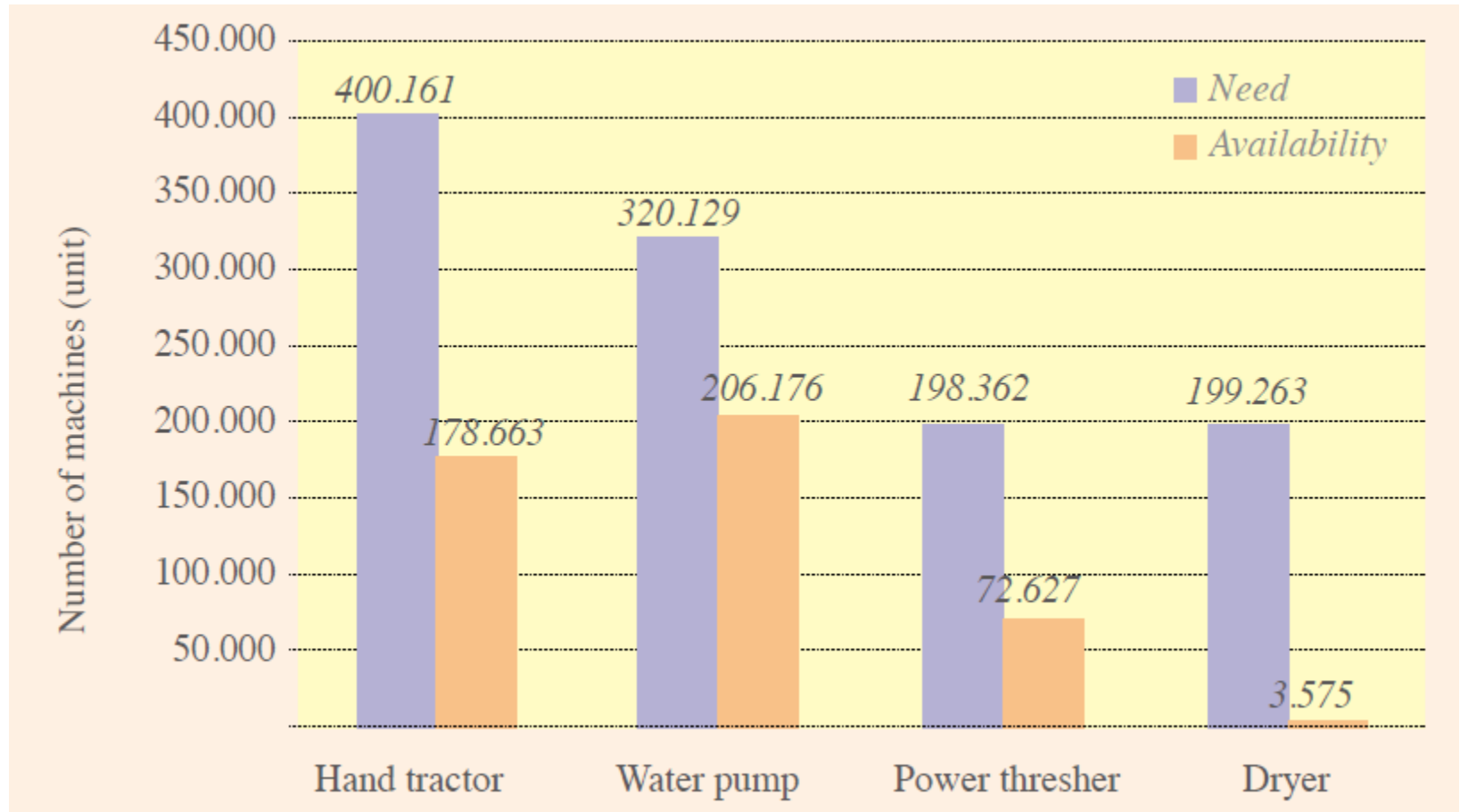
In 2008, MOA issued a decree to define guidelines for Custom Hiring.

The decree includes the scope to optimize agricultural machinery utilization, both for the farmer's group and the service providers

Guideline for development of CHR SAM → MOA  
Decree 25/Permentan/PL.130/5/2008

Small size of farmland ownership (0.4-0.9 ha/farmer household)

# Need and Availability of Agricultural Machinery in Indonesia





Today in Indonesia has more than 12,000 institutions that support the rice production by custom hiring

Known as **Institution for Rental Services of Agricultural Machineries** (IRSAM), which can be operated by farmer's group or private sector.

### Number of IRSAMs for Rental Services of Agricultural Machinery in Indonesia, 2006-2012

Year	CHRSAM class			Total
	Beginner	Improved	Professional	
2006	7,390	141	39	7,570
2007	7,543	409	65	8,017
2008	8,571	851	100	9,522
2009	8,145	1,783	318	11,103
2010	8,887	2,250	219	11,356
2011	8,801	2,693	453	11,947
2012	9,485	2,136	423	12,044

## Cost of land preparation and coverage area of hand tractor

CHRSAM	
<b>Beginner</b>	
Cost of land preparation (Rp per ha)	875,000 – 1,200,000
Coverage area (ha per machine)	8 - 15
<b>Improved</b>	
Cost of land preparation (Rp per ha)	600,000 – 800,000
Coverage area (ha per machine)	9 - 15
<b>Professional</b>	
Cost of land preparation (Rp per ha)	650,000 – 800,000
Coverage area (ha per machine)	9 - 12

Iran

# Status of Custom Hiring

- 5% of farmers own tractors and agricultural equipment, who usually have farming area of 50 ha or more. These farmers usually have both capacity and willingness to buy the machinery.
- However, most farms own an average of 2 ha. They usually hire mechanization services from other farmers
- Rural cooperatives, agricultural products cooperatives, agricultural technical advisory units, or mechanization service units → provide machinery services to farmers
- Most popular machines for CH are tractors and combine harvesters
- Usually machines are rented alongwith operators

Historically, Iranian farms have been quite small because of the heritage customs. In 2011, the parliament passed a law to prevent the division farmlands between different heirs.

## Beneficiary Systems of Agricultural Machinery

### (BSAM)

... is responsible for establishment of the mechanization unities network

- The network is constituted by a group of experts and is equipped by a complete set of machinery.
- It provides different agricultural operations (land preparing, planting, and harvesting)

## Units that operate under the BSAM

The agricultural mechanization servicing unities network		Number	Percent in Network	Area Covered (ha)	Area covered Percent in the Network
1	Mechanization servicing unities	1381	50.27	1907977	33.25
2	Advisory agricultural technical and engineering unities	521	18.97	1026237	17.89
3	Agricultural products cooperative	635	23.12	2088568	36.4
4	Rural cooperative	210	7.64	714987	12.46
	Sum	2747	100	5737769	100

Future plan is to cover about 7.5 million ha of cultivated farms using this BSAM mechanization method

Another operating system to provide services is through occupational machine owners (alongwith operators), especially for tractors and combine harvesters

- Nowadays, there are 107,000 tractor occupational drivers and 14,532 harvesters occupational drivers.
- Tractor owners usually have some mounted or draft equipment, and for other purposes they hire them from another or sometimes from equipment holders.
- Combine harvesters travel from south to the north harvesting wheat, barley and rice across regions

**Current Subsidy Scheme:** To buy new machines, the allocated subsidy is 20% of the total price; the loan is 70% of the total price of machines; and only 10% of the price is to be paid by the suppliants.

According to the new mechanization plan, the government is going to further regulate this service in order to facilitate the creation of agricultural bank loans to replace the old machines.

# Lao, PDR



- 80% of the Lao population lives in rural areas
- Per capita gross domestic income is about US\$1,646 annually (2013);
- In 2008, economic growth was 7.0%
- GDP
  - agriculture 44.3%
  - industry 30%
  - manufacturing & services 25.7%

## Tractors:

In general, the first plough operation is done by using tractor, rotary mulcher and heavy power-tiller – that cost about **25 USD per ha**, however, majority of small farmers are using small hand tractor due to farmers can easily invest in this machines with affordable cost.

## Planter/transplanting machine:

Custom Services on rice transplanting are also availed by small farmers, one service package including seedling and transplantation cost about **233 USD per ha**.

## Harvester:

- The cost of harvesting operation using combined harvester is about **38 USD per ha**
- Small mowing machines are used by several small farmers, for about **12 USD per ha**, but it needs another step for threshing. Usually charged in kind method, not cash; for instance, 1 bag will be withdrawn from 20 bags as fee for threshing operation.

## **Flat bed dryer for Rice & corn:**

The cost of drying operation

- ✓ For rice is about **6 US\$ per ton**
- ✓ For corn is about **4 USD per ton**

## **Rice mill:**

The cost of rice milling operation is about **38 US\$ per ton**; or almost free of charge; if service provider takes back the rice bran.

# Malaysia

# Mechanization in Rice Production

## Mechanization in Rice production

- Rice production is almost 100% mechanized
- Large tractor of 80hp is used for rotovation /land preparation
- Large combine of more than 100hp is used for harvesting
- Spraying, fertilizing, seeding mainly by power blower
- Transplanting in smaller scale by riding transplanter
- Large centrifugal pump at main pump house and smaller motorized pump at field

## Percentage of machinery utilization in Malaysia rice production

Operation	Machinery	% Machine Utilization
Land preparation	80hp tractor w / rotovator	98
Seed broadcasting	Power blower	85
Transplanting	Riding transplanter	5
P&D spraying	Power sprayer	90
Fertilizer application	Power blower	85
Harvesting	Large combine harvester	97
Bulk transportation	1 ton truck	97

*Source: Mechanization Technology Status, Plan for Farm Mechanization and Automation, MoA Inc, (2010)*

# Custom Hiring in Rice Production

## CH in Rice production

- Tractors, combine harvesters and trucks are 100% hired from contractors
- Seeding , crop care, fertilizing operations 50% custom hired
- Machinery service provider, <10% Gov't agency, >90% private contractors
- 4 wheel tractor: Gov't provides 250; private contractor 2,950 units
- Combine harvester: Gov't provides 92 units; private contractors 1,116 units

# Mongolia



# Agricultural snapshot - Mongolia

- Agricultural sector produces 21.7% of total GDP
- Agriculture comprises 80% livestock and 20% crop
- 40% of total working force is worked in agricultural sector
- Main crops are wheat, potato, vegetables

The government has set apart 7.7 billion tugriks for facilitating the establishment of **custom hiring centres** in the 2009-12 year as part of its efforts to set up the centres in every aimak (province) in a phased manner.

Custom Hiring Centers rent farm machinery to farmers.

## **Crop Supporting Fund (CSF):**

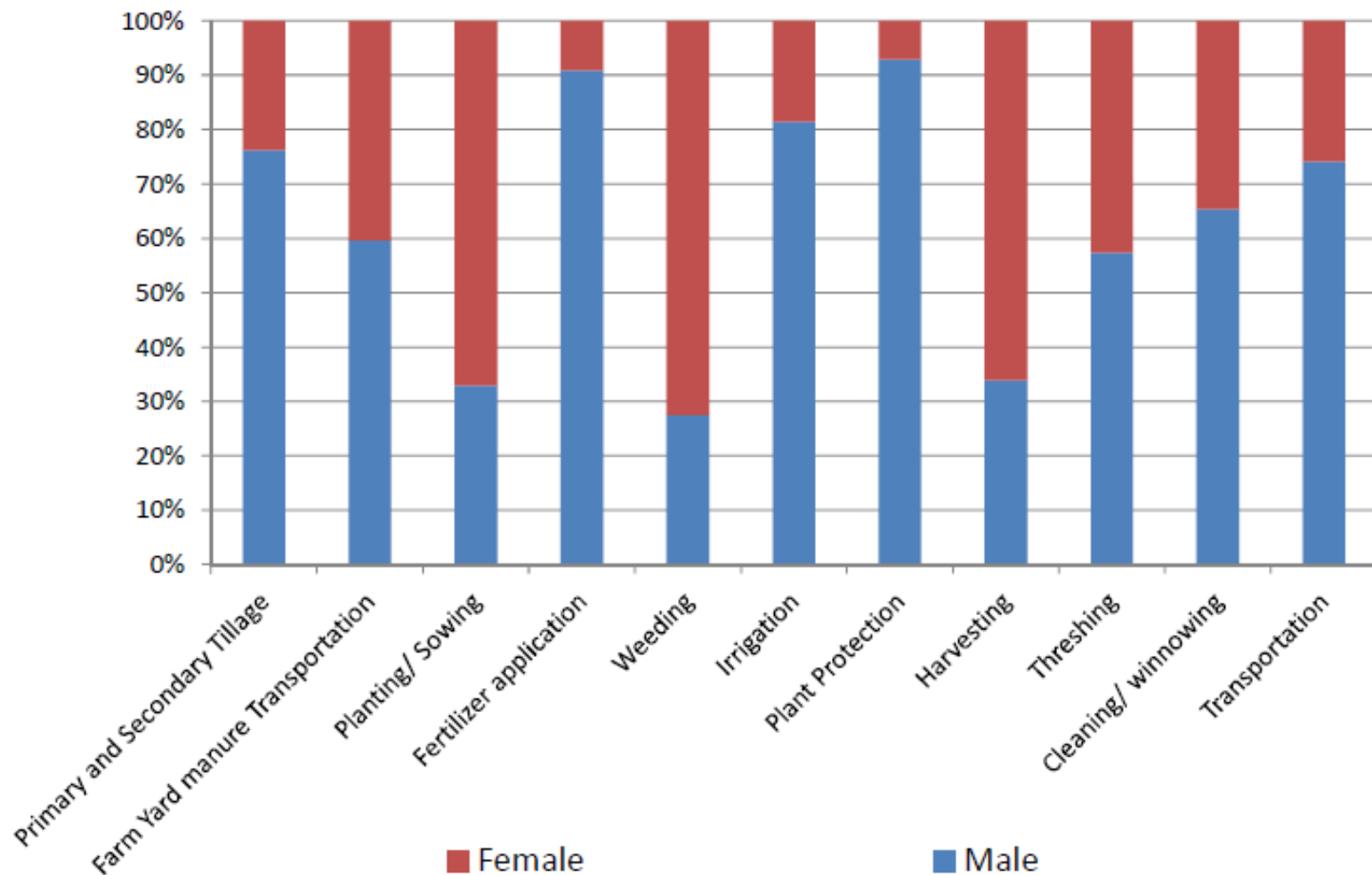
MOA encourages big farmers or groups of farmers, to jointly purchase high cost machinery and run custom hiring centers.

CSF rents machinery with 20-30% advance payment and get back rest payment within 3-5 years.

# Nepal

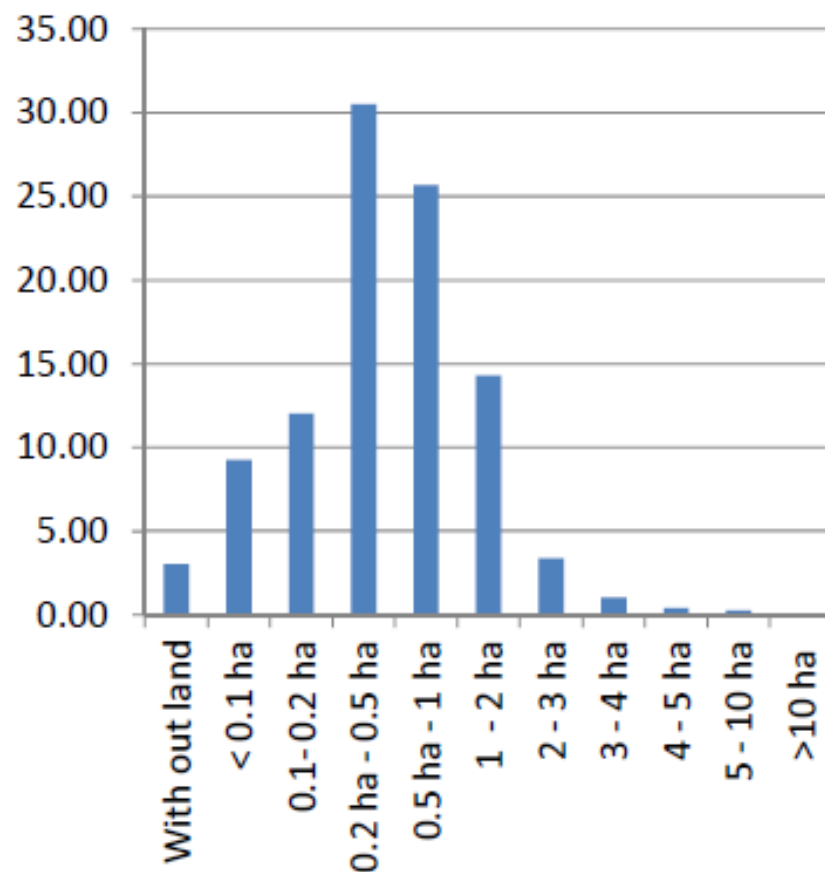
- Dominated by subsistence and small holder agriculture  
Average land size <0.65 ha.
- Agriculture contributed 34% AGDP and employment to about 60 percent of population
- Young people moving away from agriculture.
- Aging of farm labour
- Feminization in agriculture
- Emerging commercialization in agriculture

## Gender-wise Farm Labour Involvement in Agricultural Operation in Terai



## Agricultural Mechanization and Custom Hiring

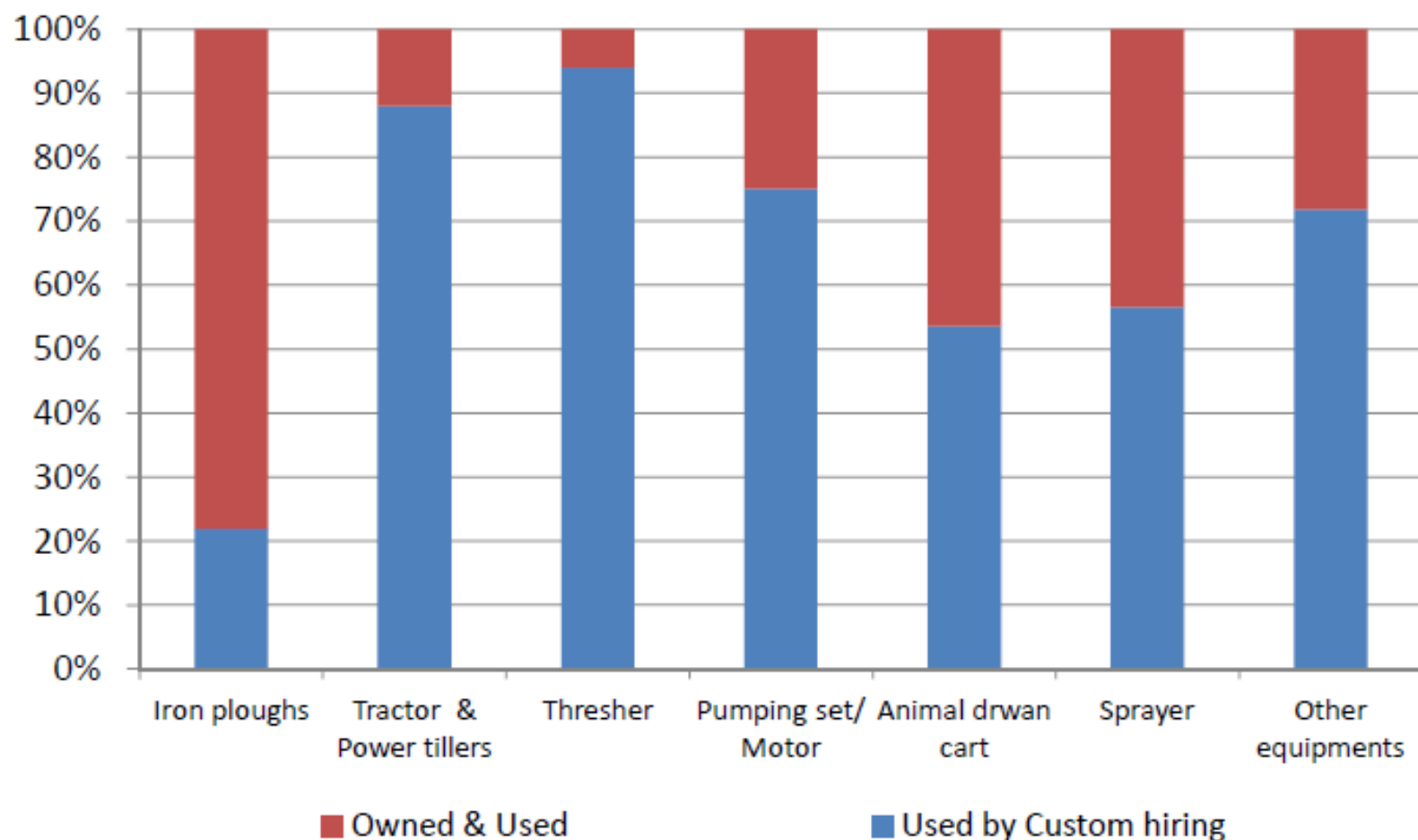
- Custom hiring has got major role in agricultural mechanization due to following reasons
  - **Small land holding**
  - **Low purchasing capacity**
  - **Less technical capability**
  - **Economy in renting in of agricultural machinery than self owning**



## Custom Hiring of Equipment

	Used HH	Owned HH	Custom Hiring HH	Used/ Owned
Iron ploughs	1073441	838176	235265	1.28
Power tillers	75671	9123	66548	8.29
Tractor	844700	36158	808542	23.36
Thresher	803154	48157	754997	16.68
Pumping set	548203	136607	411596	4.01
Animal drawn cart	334978	155272	179706	2.16
Sprayer	574014	248790	325224	2.31
Other equipment	290084	81684	208400	3.55

## Share of HH Using Custom Hired Agricultural Equipment and Self Owned Equipment





## Custom Hire Charge of Agricultural Operation

Custom Hiring Service	Eastern	Central	Western	Mid Western	Far Western
Tractor with Cultivator (Rs. Per hour)	1200 to 1500	1200 to 1500	1200	1000 to 1200	1100 to 1500
Tractor with rotovator (Rs. per hour)	1600 to 2000	1500 to 2000	2000	1400 to 2000	-
Power Tiller (per hour)	500 to 600	500- 600	600	300 to 500	400 to 600
Animal Drawn Plough (Rs. Per day)	450 to 1000	1000	1000	700 to 1000	1300
Sprayer (per day)	25 to 100	80 to 100	25 to 40	80 to 100	15 to 50
Pump set (Rs. Per hour)	300 to 400	250 to 350	300 to 500	250 to 400	250 to 300
Thresher ( grain: grain threshed)	1:20 to 1:10	1:12 to 1:8	1:15 to 1:10	1:13 to 1: 8	1: 9 to 1:07
Combine Harvester (Rs./hr)	5000	5000	4800 to 5000	-	4500

1USD= Rs. 98

# Farmer's Perspective on custom hiring service provided

- Monopoly of custom hiring service provider
- High rate but quite cheaper than traditional practice
- Service not available at right time and have to wait for long time
- Some case poor quality of service ( grain cracking in threshing)
- Some times operation at night
- Difference in rate from one service provider and other
- Straw burning after harvester led to lack of fodder for livestock farmers

## Custom Hiring Service Provider's Perspective

- Lack of spare parts and repair and maintenance service
- Difficult in credit availability and high interest rate from bank
- High competition in same location
- Lack of technicians/ operators
- Farmers not demanding service in advance
- Difficulty in collection of service charge specially during tillage
- No support from government
- Obstruction of use of agricultural tractor in non agricultural use
- Government's inconsistent approach

# Pakistan

# Agricultural snapshot in Pakistan

1. Area under Cultivation	<u>22.20 Million Hectare</u>		
2. Major Crops	Wheat, Rice, Cotton, Sugarcane, fruits and vegetables .		
3. Share of Agriculture GDP: Employment :	21% 43.7%		
4. Farm Numbers & Area (%)	<u>Size (Ha)</u>	<u>Farm Number &amp; Share%</u>	<u>Area</u>
Total Farm number : 6.62 million	<u>Upto 2.0 Ha</u>	<u>( 3.6 M) 58%</u>	<u>(3.2 M Ha) 14%</u>
	<u>2.0 - 5.0</u>	<u>(1.8 M) 27%</u>	<u>(5.7 M Ha) 26%</u>
	>5.0 – 10.0	(0.58 M) 09%	(3.89 M Ha) 18%
	>10.0 – 20.0	(0.26 M) 04%	(3.30 M Ha) 16%
	>20.0	(0.17 M) 1.6%	(4.30 M Ha) 21%
5. Subsistence level ( 5.0 Ha)	So upto <u>5.0 ha land holders</u> are the Target Farmers for Policy Makers , who are more in numbers and less in resources.		

Source : Economic Survey & Agri. Stat Pakistan`

# Agricultural mechanization

## MECHANIZATION OF CROP PRODUCTION OPERATIONS Present Practices – and where Custom Hiring needs Improvement

Crop	land Preparation	Sowing	Irrigation	Spraying	Inter-culture	Harvesting	Threshing
Wheat	Semi Mech.	Low Mech.	Partial Mech.	Low Mech.	Nil	Semi Mech.	Full Mech.
Cotton	Semi Mech.	Full Mech.	Partial Mech.	Full Mech.	Full Mech.	Nil	-
Rice	Full Mech.	Nil	Partial Mech.	Nil	-	Semi Mech.	Partial Mech.
Sugarcane	Partial Mech.	Partial Mech.	Partial Mech.	Nil	Semi Mech.	Nil	-
Maize	Full Mech.	Semi Mech.	Partial Mech.	Nil	Semi Mech.	Low Mech.	Full Mech.
Potato	Full Mech.	Semi Mech.	Partial Mech.	Full Mech.	Full Mech.	Partial Mech.	-
Pulses (Grams)	Low Mech.	Full Mech.	Low Mech.	Nil	Low Mech.	Nil	Full Mech.

- A very common practice in Pakistan. Mostly in farmers upto 10 ha (Offer and Seek)
- Mainly for land preparation/sowing/spraying equipment and wheat threshing by tractor driven threshers.
- **New Segment : Tractor driven fodder harvesting machines - Silage (rapidly becoming popular)**

Sri Lanka



# Agricultural snapshot of Sri Lanka

- Land area - 60,600 km<sup>2</sup>
- Population - 20.3 million
- Arable area - 30 % of the total land area
- Avg land holding size - 1.0 ha
- Main crops - Paddy, Maize, Vegetable, Fruits, Spices, Grain Legumes, oil crops and root crops
- Plantation crops - Tea, Coconut, Rubber, Sugarcane
- Families engaged in Agriculture - 1.8 mill (49%)
- Agricultural contribution to GDP - 11.1 %
- Paddy cultivated area - 34 % of the arable land
- Average yield (PADDY) - 4.5 MT/ha

## Daily Wage rate variation from 2003 – 2012

Operation	Wage rate in 2003 (\$)	Wage Rate in 2012 (\$)
Ploughing	2.44	6.59
Sowing	2.30	6.33
Transplanting (F)	1.78	4.66
Spraying	2.54	6.63
Weeding (F)	1.84	-
Harvesting	2.17	6.18

# Machinery Supply Chain

- Very few machinery are locally produced like water pumps, sprayers, seeders and hand tools
- Majority is imported
- However supply of machinery is not regulated
- Inferior quality machinery inflows to the country
- Local production also not supported by unfavorable trade policy and small local market

## Level of Mechanization

- Paddy Cultivation - Highly mechanized
- Vegetable cultivation - Low level
- Other field crops mechanized - Moderately
- Fruit sector - Low level
- Plantation crops - Low level
- Spices - Very low

## History of custom hiring

- Government owned tractor hiring centres established in late 60's
- Objective was to introduce tractors
- Closed down all the centres in late 70's
- As a major break through, tractors (both four wheel and power tillers) have been introduced to the country
- Farm machinery research and training programs initiated

# Present status of custom hiring

- Common hiring machines
  - Combine harvester
  - Combine thresher
  - Four wheel tractor
  - Sprayer
  - Two wheel tractor
  - Reaper
  - Water pump

- Hiring rates

Operation	Hiring rate (\$)
Ploughing	120 – 140 /ha
Reaping	95 – 115 /ha
Threshing	25 – 30 /h
Combine harvesting	200 – 225 /ha*

\* Now it has been reduced up to \$ 100/ha



# Thailand



Major crops:

Rice, maize, sugarcane,  
soybean, cassava, rubber,  
horticulture crops, oil palm

<b>Crops</b>	<b>Planting area mil. ha</b>	<b>Production mil. tons</b>
Rice	9.5	20
Maize	1.2	4.1
Cassava	1	18

In the present, most of the agricultural equipment used in Thailand is locally produced such as tractor, power tiller, disc plough, disk harrow, water pump, sprayer, threshing machine, reaper, combine harvester, cleaning equipment, dryer, rice milling machines, and processing equipment etc.

However local machines produced from small manufacturer, are not standardized in quality, efficiency and durability. Some agricultural machines are imported from overseas by companies for Thai agricultural productions.

## Status of Custom Hiring

At present there are two forms of utilizing agricultural machinery as machine owner and/or machine hiring service. The ratio of machine owner to machine hiring service depends on size, type and price of machine or equipment.

Most farmers own the small and inexpensive machine such as two-wheel tractor, water pump and chemical sprayer etc.

For four-wheel tractor (attached with rotovator for land preparation) and power thresher, only 6.4% and 6% of total machines were possessed by farmers.

However, there still are a number of farmers who have small holding area or in the remote rural area, they are unable not only to possess farm machinery and also can not call for the hiring service because their production is too small.

Custom-hire contracting with large farm machinery in Thailand happens to be a reliable and appropriate service for most farmers. More than 99 percent of combine harvesters are operated on custom-hire service basis. With this pattern of farm machinery utilization, mechanization for agricultural production will keep expanding and will catch up with the requirement of farmers.





# Philippines

# Agricultural Mechanization

Level of mechanization by percent utilization using man, man-animal and man-machine systems in rice production/post production operations in selected regions in the Philippines.

FARM OPERATION	LEVEL OF MECHANIZATION (% UTILIZATION OF FARMER)			
	MANUAL OPERATED			
	Camarines Sur (Region V)	Iloilo (Region VI)	Leyte (Region VIII)	Oriental Mindoro (Region IV)
Dike Repair	93.75	78.95	88.04	86.32
Planting	100.00	100.00	98.91	98.95
Fertilizer application	100.00	100.00	97.83	100.00
Insecticide application	91.67	74.74	91.30	78.95
Herbicide application	85.42	95.79	35.87*	96.84
Harvesting	100.00	98.95	100.00	89.47
Drying	63.64	53.68	78.26	44.21*



## Machines utilized in rice production/post production operations in selected regions in the Philippines.

EQUIPMENT/MACHINE	Camarines Sur (Region V)	Iloilo (Region VI)	Leyte (Region VIII)	Oriental Mindoro (Region IV)
	%	%	%	%
Hand tractor	91.67	88.54	97.89	86.32
Floating tractor	16.67	11.46	1.05	33.68
Four wheel tractor	-	1.04	-	4.21
Pump set	21.88	18.75	10.53	38.95
Combine harvester	-	-	-	11.58
Thresher	88.54	87.50	87.37	82.11
Dryer	2.08	8.33	3.16	5.26
Rice Mill	55.21	34.38	77.89	18.95

# Custom Hiring

## Percentage of Farmers Availing Custom Hiring Services in **Rice Production** / Post Production Operations in Selected Regions in the Philippines

Operation	Camarines Sur Region V		Iloilo Region VI		Leyte Region VIII		Oriental Mindoro Region IV	
	Machine %	Animal %	Machine %	Animal %	Machine %	Animal %	Machine %	Animal %
Seedling Preparation	15.63	7.29	1.04	2.08	37.89	38.95	16.84	5.26
Irrigation	5.21		2.08		4.21		4.21	0.00
Plowing	35.42	13.54	30.21	18.75	20.00	52.63	26.32	7.37
Harrowing	30.21	19.79	32.29	3.13	60.00	17.89	23.16	12.63
Leveling	6.25	46.88	9.38	36.46	2.11	66.32	6.32	26.32
Weeding							22.11	
Harvesting					1.05		41.05	
Threshing / Bagging	53.13		55.21		72.63		41.05	
Hauling Farm to Road	1.04	2.08	1.04	2.08	3.16		2.11	17.89
Hauling Road to Storage	4.17	1.04	6.25	1.04	22.11	1.05	7.37	
Drying	2.08		8.33		4.21		1.05	
Transportation	5.21		1.04		24.21		0.00	
Milling	52.08		31.25		73.68		18.95	

## Percentage of Farmers Availing Custom Hiring Services in **Corn Production** / Post Production Operations in Selected Regions in the Philippines

Operation	Camarines Sur Region V		Iloilo Region VI		Leyte Region VIII	
	Machine %	Animal %	Machine %	Animal %	Machine %	Animal %
First Plowing	9.38	50.00	3.13	13.54		
First Harrowing	7.29	50.00	2.08	7.29	1.05	
Furrowing		66.67		43.75		
Cultivation - Hilling Up		34.38		6.25		25.26
Cultivation - Off Barring		4.17		3.13		1.05
Dehusking	3.13					
Hauling - Field to		20.83	8.33	19.79		
Hauling - Road to	3.13	8.33	11.46	4.17	5.26	
Hauling - Road to	3.13	8.33	11.46	4.17	5.26	
Shelling	73.96		67.71		2.11	
Drying - Before Shelling	0.00		1.04		1.05	
Drying - After Shelling	10.42		4.17		2.11	
Transportation	2.08		50.00	4.17	63.16	
Milling			1.04		75.79	

**Viet Nam**

According to 2013-statistical data, the level of agricultural mechanization in Viet Nam in terms of available mechanical power is still low with only 1.16 hp/ha of cultivated land, including the Mekong River Delta (the region has highest rate) with 1.85 hp/ha

## Level of Mechanization in rice production (stat. data 2013)

<b>Agricultural production activities</b>	<b>Mechanization Rate (%)</b>
<b>Soil preparation for rice cultivation (mainly used two-wheel tractors of 8÷15 hp and four-wheel tractors of 20÷50 hp)</b>	<b>90</b>
<b>Transplanting</b>	<b>≤ 1</b>
<b>Active irrigation for rice</b>	<b>94</b>
<b>Rice harvesting (combine harvesters, windrow-reapers and threshers)</b>	<b>35</b>
<b>- in Mekong River Delta (MRD)</b>	<b>65</b>
<b>- in Red River Delta (RRD)</b>	<b>60</b>
<b>Rice drying in summer-autumn season in MRD</b>	<b>45</b>
<b>Rice milling</b>	<b>95</b>

## Level of Mechanization in Sugarcane production (stat. data 2013)

<b>Agricultural production activities</b>	<b>Mechanization Rate (%)</b>
<b>Soil preparation for sugar cane cultivation (at flat terrains (about 60% of the total sugarcane growing areas))</b>	<b>80÷90</b>
<b>Crop care, weed tilling, fertilizing</b>	<b>10</b>
<b>Transportation</b>	<b>100</b>
<b>Planting, collecting, handling and harvesting</b>	<b>Mostly by hand</b>

- Former owners of agricultural machines and equipment (before 1986) were mainly state-owned enterprises, they are now moving to private ownership and households.
- Providers of mechanization services include:
  - ✓ Agricultural Cooperatives
  - ✓ Private Enterprises

**These both providers buy agricultural machines to provide services**

- "Land consolidation" policy was initially achieved positive results
  - ✓ Average number of plots from 6.8 plots/household dropped to 4-5 plots/household.

System of agri-machinery services through stores and selling agents and logistics is growing very fast. These services are largely operated by private cooperatives, accounting for about 80% of the service providers.





# Thank you

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