Testing of Hand Tools and Non Motorized Machines used in Agriculture in Asia Pacific Region

Shreemat Shrestha
Agricultural Engineering Division,
Nepal Agricultural Research Council
Khumaltar, Nepal
Background

- Agricultural hand tools & implements have played an important role in human civilization.
- These indigenous-developed tools/implements were tested and continuously evolved.
- Despite significant progress in agricultural mechanization in this region, hand tools & non-motorized machines still play a critical role in agriculture due to:
  - Small and irregular farm size
  - Lack of appropriate machinery
  - Less affording capacity
  - Lack of other job opportunities
  - Lack of awareness & skill
- If the farm size is small, most mechanized equipment will not increase the amount of food produced, but will only decrease the amount of labor required.
- "No small farmer wants to mechanize himself out of a job."
- Agriculture in the least developed in this region will continue to depend for many years on hand tools, animal powered implements, and non-motorized agricultural machinery.
Hand tools used in agriculture

*Tillage for Seedbed Preparation:*

- In majority of countries it is mechanized by using tractor and 2wheel tractor
- The majority small farmers of least developed countries depend upon animal and human powered implements
  - Indigenous plough
  - M B Plough
  - Disck harrow
  - Cultivator
  - Leveller
  - Hand tools (spade, hand hoe etc.)
Hand tools used in agriculture

Tillage and Seedbed Preparation:

- Spade, Shovel and Forks
- Hand Hoes
- Pick Axe
- Rake
Hand tools used in agriculture

Interculture Operation

- Khurpi
- Weeding hoe (flat/pointed & long/short handle)
- V blade
- 3 tyne hoe
- Wheel Hoe
- Rotary paddy Weeder
- Cono weeder
Weeding in rice field
Hand tools used in agriculture

Sowing, transplantation and Fertilizer application

- Manual rice transplanter
- Drum seeder
- USG applicator
- Jab seeder
- Rotary dibbler
- Fertiliser/ seed broadcaster
Hand tools used in agriculture

Irrigation

- Low head drip irrigation
- Treadle Pump
Hand tools used in agriculture

Harvesting

- Sickle (Serrated, plain)
- Scythe
- Fruit harvestor
- Secature
- Cotton stalk puller
- Leafy vegetable harvestor
- Lady’s finger plucker
Hand tools/ non motorised machine used in agriculture

**Threshing**

- Corn Sheller
- Tubular Corn Sheller
- Octagonal corn Sheller
- Paddy Thresher (pedal Operated)
- Millet thresher cum pearler
Hand tools/ non motorised machine used in agriculture

**Processing**

- Groundnut decorticator
- Coffee Pulper
- Chaff Cutter
- Seed Cleaner
- Apple Peeler
- Manually operated Grinder
- Potato Peeler
- Solar dryers
Transportation

- Wheel barrow
- Bullock cart
- Cycle rickshaw trailer
- Gravity rope way
## Estimated Number of hand tools

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<td>19</td>
<td>Papua New Guinea</td>
<td>2.11</td>
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Total: 996.07 million hand tools

Total: 2988.20 million hand tools
Hand tools production and Use

- Small farmers and the women are the main user of the hand tools.
- Most of hand tools are locally fabricated by the village artisans tiny and small scale industries.
- It is estimated that 85 percent of these agricultural hand tools are locally fabricated by the village blacksmiths (Manandhar 1999).
- There are about 1 million local artisans and 18000 tiny and small scale manufactures producing agricultural machinery in India (G Singh, 2005).
- In general, there is no or very limited subsidy provided to these hand tools in this region.
- Farmers prefer to invest their own money for the purchase of hand tools and bullock drawn machinery and for others they avail the credits from the Banks. (G Singh, 2005)
Injuries related agricultural hand tools

- Machinery has the highest farm injury frequency and fatality rates worldwide (ILO, 2000)
- Hand tool related injuries are a problem specifically seen commonly in the low income countries (LICs).
- Hand tool injuries (e.g., cuts on the hands, feet and skins) have been classified as minor they often go unnoticed
- 34.2% accidents were due to hand tools in India (ICAR 2004-07)
- 1700 injuries related to hand tools per hundred thousand farm workers per year in rural India. Spades and sickles were involved in 46% of farm injuries in India
- Axe, sugar cane cutter and chaff cutter higher severity injuries were sustained on upper extremities
- Survey on agricultural work-related injuries among farmers in Hubei, People's Republic of China in 1997 indicated that total of 33% of the farmers reported at least 1 work-related injury in the 24 months before the survey. Major external causes of the injuries were hand tools (50%)
- The high rate of work, awkward work posture and design deficiencies of the hand tools result in cumulative musculo-skeletal strain and injuries in farm activities (A Nag et al, 2004)
Implications of hand tool related injuries

• Hand tools related injuries are often painful and disabling because of delayed treatment.

• Some of the hand tools viz. Axe, sugar cane cutter and chaff cutter related injuries cause permanent disabilities.

• A survey conducted in India indicated that seventy percent of agricultural hand tool injuries had a recovery time of more than 7 days.

• Productivity was impaired to the tune of 24,000 days per hundred thousand population because of injuries (A Kumar et. al., 2008).
Objectives of Testing

• to provide reliable information to the farmers on the performance, safety, economic benefit on the use of hand tool and non motorized agricultural machinery
• to provide information to the manufacturer, importer and exporter on hand tool quality parameters, performance, durability and positive and negative aspects of the product (hand tool and non motorized agricultural machinery)
• To standardize the hand tool and non motorized agricultural machinery in the country and in the region
Test Parameters

• Technical Specification given by the manufacturer
  – Dimension
  – Weight
  – Performance (field capacity, efficiency, losses etc. depending upon the tool/machine for particular operation & crop)
  – Material of construction
  – Specify the user for which it is designed (male/female; target community for ergonomic considerations)

• Safety parameters
• Heat treatment and hardness specifications
• Strength test
• Operation manual and safety considerations
Testing of hand tools & non motorised machinery

• FAO has prepared comprehensive guideline for testing agricultural handtool
• India & Indonesia have test code and test facility for hand tools. Nepal and PNG do not have standard and testing facility.
• Hand tools test Voluntary ??
• Mandatory for agricultural hand tools and non motorised machinery imported, exported and that are provided subsidy
• Injury prone certain hand tools and non motorized agricultural machinery viz. hand operated chaff cutter, fan type winnower etc. should be tested mandatorily for safety parameters
• Lab as well as field test
Challenges in testing of hand tools.

- There is **low level of awareness** of the farmers & importers on the testing for standard, safe and quality hand tools and agricultural machinery.
- There are **numerous hand tools and non motorized farm machines**.
- The performance of the hand tools and non motorized agricultural machinery depend upon the user.
- As majority of hand tools are **produced by the unorganized local artisans** in the village level.
- Majority of village artisans and tiny industries use **scrap material** to produce hand tools, so the quality of hand tool produced vary from one piece to next moreover the tiny industries may **increase the cost** of tested hand tools and agricultural machinery.
- Poor **capacity and low level of technology adopted by the village artisans** in production of hand tools hinders the enforcement of quality hand tool production.
- Lack of strong **policy in standardization and testing** of agricultural hand tools in some of the countries in this region.
- Lack of **institutional setup & facilities** for the testing of agricultural hand tools in some countries.
THANK YOU!