KNOWLEDGE-SHARING WORKSHOP

Enabling Environment for Custom Hiring of Agricultural Machinery in the Dry Zone of Myanmar

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Introduction on Agricultural Mechanization
It is the application of animal and machine power to multiply man’s ability to perform production operations. Mechanization permits man to multiply his production by the use of animal or fuel power. Mechanization allows the performance of tasks efficiently. (Loyd Johnson, 1964).

The use of hand and animal-operated tools and implements as well as motorized equipment to reduce human efforts, improve quality, perform operations that cannot be done by other means, and improve the timeliness of various operations, thereby increasing yield, quality of product and overall efficiency. (STOUT and DOWNING, 1974)
It embraces the manufacture, distribution, utilization and provision of after-sales service of tools, implements and machines for land development, agricultural production and primary post-production processes. It includes the use of three main sources of power: human, animal and mechanical. (FAO, 1979)
**Definition: Agricultural Mechanization**

*Agricultural and fisheries mechanization* refers to the development, adoption, assembly, manufacture and application of appropriate, location specific and cost-effective agricultural and fisheries machinery using human, animal, mechanical, electrical, renewable and other nonconventional sources of energy for agricultural production and postharvest/postproduction operations consistent with agronomic conditions and for efficient and economic farm and fishery management towards modernization of agriculture and fisheries (RA 10601, 2013)
Models of Mechanization

High land area to farmer ratio: (example: USA)
Motivated into increasing the level of mechanization in order to cultivate large agricultural lands with limited available manpower and take advantage of favorable agricultural commodity prices. Thailand, Malaysia and Indonesia follow the USA model.

Low land area to farmer ratio: (example: Japan)
Motivated into increasing the level of mechanization in order to increase yields and cropping intensities to meet the growing demands for food and agricultural raw materials. South Korea, China, Taiwan, Sri Lanka and the Philippines follow the Japanese model.
Potentials of Agricultural Mechanization
Potentials of Agricultural Mechanization

Increased cropping intensity and production

- Tractors, power tillers, irrigation pumps, harvesters and threshers increase cropping intensities
- Irrigation pumps increased yields
- Harvester and threshers/shellers reduced losses which effectively increased yields
Potentials of Agricultural Mechanization

Increased productivity of labor

- Tractors in land preparation reduced 50% of the labor inputs
- Freed family labor can look for alternative work opportunities; children can go to school

Full utilization of farm products and by-products

- Availability of machines allow the processing of farm products and by-products
Potentials of Agricultural Mechanization

Reduction of losses

- Development of harvesting, threshing and processing machines reduced harvest and postharvest losses
- Losses: Rice: 10 – 37%  
  Corn: 30%

Increased value added of farm products

- Secondary and tertiary processing open up market potentials and lead to higher retail prices
Potentials of Agricultural Mechanization

Employment and livelihood generation

- Machines designed to increase cropping intensities and production will correspondingly increase labor requirements for production and post harvest operations.

- Machines designed to diversify farm products and by products open up various livelihood opportunities.

- Use of machines will require the putting up of repair shops in the village areas.
Import substitution

- Local agricultural machinery manufacturing will minimize the importation of agricultural machinery

Export possibilities

- Locally manufactured agricultural machinery can be exported to countries with similar farming conditions
1. **Horsepower per Hectare (hp/ha)**

   Sum of the contribution of each of the major sources of power multiplied by its assumed hp contribution divided by the total available area

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>LEVEL OF MECHANIZATION (Hp/Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>18.87 (2011)</td>
</tr>
<tr>
<td>Korea</td>
<td>9.38 (2011)</td>
</tr>
<tr>
<td>China</td>
<td>8.42 (2012)</td>
</tr>
<tr>
<td>Thailand</td>
<td>4.20 (2009)</td>
</tr>
<tr>
<td>Philippines</td>
<td>2.31 (2011) for all crops</td>
</tr>
<tr>
<td></td>
<td>1.23 (2011) for rice &amp; corn</td>
</tr>
<tr>
<td>India</td>
<td>2.22 (2011)</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1.46 (2008)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>1.20 (2010)</td>
</tr>
</tbody>
</table>

*Source: PHilMech 2011 as presented by Pollido, 2015*

Level of mechanization by type of technology (manual, man-animal power, man-machine power, combination of types of technology), by type of farm operation

\[
\text{Level of mechanization} = \frac{\text{Number of Farmers using (type of) technology}}{\text{Total No. of farmers responding}} \times 100
\]
## Levels of Mechanization

### 2. Percent Utilization of farmers (% utilization)

<table>
<thead>
<tr>
<th>Farm Operation</th>
<th>Manually Operated</th>
<th>Animal-Powered</th>
<th>Person-Machine-Powered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Camarines Sur (Region V)</td>
<td>Iloilo (Region VI)</td>
<td>Leyte (Region VIII)</td>
</tr>
<tr>
<td>Dike repair</td>
<td>93.75</td>
<td>78.95</td>
<td>88.04</td>
</tr>
<tr>
<td>Planting</td>
<td>100.00</td>
<td>100.00</td>
<td>98.91</td>
</tr>
<tr>
<td>Fertilizer application</td>
<td>100.00</td>
<td>100.00</td>
<td>97.83</td>
</tr>
<tr>
<td>Insecticide application</td>
<td>91.67</td>
<td>74.74</td>
<td>91.30</td>
</tr>
<tr>
<td>Herbicide application</td>
<td>85.42</td>
<td>95.79</td>
<td>35.87&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Harvesting</td>
<td>100.00</td>
<td>98.95</td>
<td>100.00</td>
</tr>
<tr>
<td>Drying</td>
<td>63.64</td>
<td>53.68</td>
<td>78.26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Farm Operation</th>
<th>Animal-Powered</th>
<th>Person-Machine-Powered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing</td>
<td>15.63&lt;sup&gt;a&lt;/sup&gt;</td>
<td>29.35&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Leveling</td>
<td>61.46</td>
<td>61.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Farm Operation</th>
<th>Person-Machine-Powered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing</td>
<td>29.35&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Harrowing</td>
<td>67.71</td>
</tr>
<tr>
<td>Threshing/Bagging</td>
<td>86.46</td>
</tr>
<tr>
<td>Milling</td>
<td>56.25</td>
</tr>
</tbody>
</table>

Note: <sup>a</sup> % utilization of the available power is not predominant.

Source of data: Amongo et al. 2013.

Level of mechanization by type of technology (manual, man-animal power, man-machine power, combination of types of technology), by type of farm operation

\[
= \frac{\text{Area serviced by (type of) technology}}{\text{Total area of farms surveyed}} \times 100
\]
3. Percent Area Covered (% area covered)

Source: Amongo et al. 2013
4. Three major levels (UPLB-BAR, 2001):

Low mechanization means that an operation is done with the use of non-mechanical power source such as man and animal.

Intermediate mechanization refers to operations done with the use of non-mechanical power source in combination with the use of a mechanical power source operated by man.

High mechanization involves operations done solely with the use of mechanical power source operated by man.
4. Three major levels (UPLB-BAR, 2001):

These three levels are further subdivided into three sub-levels indicating advancement in technology through process and strength of the power source.

A fourth albeit minor level is full mechanization wherein the operations are done with the use of mechanical power source with limited human intervention such as computerized machines or robots.
### Levels of Mechanization (UPLB-BAR, 2001)

<table>
<thead>
<tr>
<th>Operation</th>
<th>Rice &amp; Corn</th>
<th>Vegetables Legumes &amp; Root crops</th>
<th>Coconut</th>
<th>Sugarcane</th>
<th>Fruits</th>
<th>Fiber Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Prep</td>
<td>Intermediate to High</td>
<td>Low</td>
<td>Intermediate to High</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Planting/Transplanting</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low to Intermediate</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Crop care cultivation</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low to High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Harvesting</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Threshing/shelling dehusking</td>
<td>Intermediate to High</td>
<td>Low (Legumes)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Drying</td>
<td>Low</td>
<td>Low (Legumes &amp; Rootcrops)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Milling/Village level processing</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

*Source: UPLB-BAR, 2001*
5. Number of Tractors per Hectare

Some countries especially the developed countries currently express the level of mechanization based on the number of tractors utilized in a given unit area.
Conceptual Framework on Custom Hiring Services (CHS) of Agricultural Mechanization Technologies (AMTs)
The Custom Hiring Services for Agricultural Mechanization Technologies (CHS for AMTs) shall be operated as business enterprises that will provide the following services:

- After-sales service and warranty for their respective clients;
- Custom plowing, harrowing, harvesting, drying, milling and other farm mechanization services;
- Repair and troubleshooting services of agricultural and fishery machinery and equipment; and
- Training in maintenance and proper use of agricultural machineries and equipment.
Conceptual Framework for Custom Hiring Services of Agricultural Mechanization Technologies

**TECHNICAL**
- Technical suitability of Agricultural Mechanization Technologies (AMTs) to the environmental conditions, i.e. matching of available technologies to the field conditions
- Availability of after sales services for the O&M of AMTs
- Capability of local agricultural manufacturing to provide machinery for custom hiring
- Skilled operators for the custom hiring machines
- Availability of RDE technical support for the operation of custom services

**SOCIO-CULTURAL**
- Farmers’ willingness to mechanize/avail of custom services
- Farmers’ perception on use of AMTs
- Farmers’ traditional practices
- Labor availability
- Social arrangements for scheduling of custom services for farm operations in adjacent farm areas
- Capability of the custom service provider for operation and management of the enterprise

**ECONOMICS**
- Cost of traditional practices vs. cost of custom hiring (mechanized systems)
- Economic benefits of custom hiring
- Availability of capitalization to operate custom hiring enterprise
- Availability of credit facilities
- Optimum service areas for profitable operation

**SOCIO-POLITICAL (GOVERNMENT POLICY SUPPORT & OTHER SUPPORT SERVICES)**
Availability of support services (credit facilities, infrastructures- e.g. farm to market roads, etc.; policies to support custom services)

Amongo & Larona, 2014
Conceptual Framework for Custom Hiring Services of Agricultural Mechanization Technologies

Farmers as beneficiaries of custom services

Technical suitability of agricultural machines
Location specificity of AMTs

Farm size

Small farm holdings → Farm Clustering/Contiguous Farming → Large AMTs

Farmers’ traditional practices
Social preparation

Custom Hiring Services
Farmers as beneficiaries of custom services

Farmers’ preferences on use of agricultural machines

Operations which farmers would like to mechanize (Amongo 2013)
- land preparation
- planting
- harvesting
- drying

Ownership of large agricultural machines was low and farmers opted for hiring agricultural machines rather than owning the machines.
Farmers as beneficiaries of custom services

Labor Availability

Social issue in establishing custom services: possible displacement of farm labor.

Lantin et al. (2003) noted that agriculture should not be viewed as sink for employment since the gains that could be generated from farming activities (such as farm labor) is not enough to improve the quality of life of landless farm workers.

Other alternative income opportunities: establishment of agro-processing enterprises, training opportunities for possible employment in urban areas.
Farmers as beneficiaries of custom services

Cost of mechanized system vs. traditional practices

Major reasons of corn farmers for joining clustering and custom services facilities in Cauayan City, Isabela, Philippines:

➢ reduction in production cost
➢ improved production performance
➢ availability of support services from the government
➢ increase farm operation efficiency.

Net income for a fully mechanized system = PhP 22,210/ha
Net income for traditional system = PhP13,045/ha

Source: Larona (2006)
Custom Service Provider

Technical suitability of agricultural machines
- Location specificity of AMTs
- Locally fabricated AMTs vs. Imported AMTs

Availability of after sales services
- Training on ORM
- Availability of spare parts

Local manufacturing
- available small to medium scale manufacturers
Custom Service Provider

Social arrangements for scheduling of custom services
  Synchronize farming

Operation and management of custom services
  Machinery pooling vs. Custom Services
Enabling Environment for CHS of AMTs
Labor Cost for Land Preparation, Crop Establishment, Harvesting and Threshing (based on Key Informant Interview of Selected ASIAN Countries) 2012

<table>
<thead>
<tr>
<th>Province, country</th>
<th>Labor cost for land preparation, crop establishment, harvesting, and threshing (in US$/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nueva Ecija, Philippines</td>
<td>484.50</td>
</tr>
<tr>
<td>Zhejiang, China</td>
<td>533.00</td>
</tr>
<tr>
<td>Tamil Nadu, India</td>
<td>268.00</td>
</tr>
<tr>
<td>West Java, Indonesia</td>
<td>430.50</td>
</tr>
<tr>
<td>Suphan Buri, Thailand</td>
<td>192.00</td>
</tr>
<tr>
<td>Can Tho, Vietnam</td>
<td>198.00</td>
</tr>
</tbody>
</table>

Source: Regalado, 2015
INCREASE IN PRODUCTION

Source: Regalado, 2015
Enabling Environment for Custom Hiring Services of AMTs

CUSTOM HIRING SERVICES

Government Support Services

- RDE Institutions
- Financial Institutions
- Farmer Beneficiaries Client
- Custom Hiring Services Provider
- Machinery Manufacturers
- NGOs, POs, Private Sector
# Enabling Environment for Custom Hiring Services of AMTs

## Government Support Services in Selected ASIAN Countries

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Nueva Ecija, Philippines¹</th>
<th>Zhejiang, China²</th>
<th>Tamil Nadu, India³</th>
<th>West Java, Indonesia⁴</th>
<th>Suphan Buri, Thailand⁵</th>
<th>Can Tho, Vietnam⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed Subsidy</td>
<td>No subsidy</td>
<td>Free inbred seeds; free hybrid seeds only to cooperative members.</td>
<td>0.2 $ subsidy per kg of seeds</td>
<td>0.91 $ subsidy per kg of seeds</td>
<td>No subsidy</td>
<td>No subsidy</td>
</tr>
<tr>
<td>Irrigation/Water</td>
<td>49 $/ha (wet season); 69 $/ha (dry season); Irrigation fee is free if crop is damaged</td>
<td>Free</td>
<td>Free</td>
<td>Free</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Land tax</td>
<td>28 US$/ha/year</td>
<td>Free</td>
<td>0.21 US$/ha/year</td>
<td>56 US$/ha/year</td>
<td>0.98 US$/ha/year</td>
<td>Free</td>
</tr>
<tr>
<td>Interest on Credit</td>
<td>24% per annum from cooperatives</td>
<td>5% per annum but govt pays for 80% (4% is paid by the govt and 1% is paid by the farmer)</td>
<td>0% interest if loan from govt bank is paid within 6 months</td>
<td>12% per annum from govt bank</td>
<td>6% per annum from Bank of Agriculture</td>
<td>12% per annum in Agri Bank</td>
</tr>
</tbody>
</table>

Source: Regalado, 2015
### Government Support Services in Selected ASIAN Countries

<table>
<thead>
<tr>
<th>Machine Acquisition</th>
<th>Government paddy procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>85% discount on farm machinery and post harvest facility for qualified irrigator’s association and farmer cooperatives.</td>
<td>Gov’t procures less than 5% of production at a support price.</td>
</tr>
<tr>
<td>30% discount on tractors and combine harvester-thresher; 50% on mechanical dryer.</td>
<td>Gov’t procures inbred rice production. Gov’t offers protection price for inbred rice.</td>
</tr>
<tr>
<td>Gov’t custom hires combine, leveler, mechanical transplanter, and tractor at 50% lower rental rate. However, gov’t can service only 2% of area.</td>
<td>Gov’t procures around 60% of harvest. Gov’t has minimum support price.</td>
</tr>
<tr>
<td>No subsidy</td>
<td>Gov’t does not procure paddy from farmers but from traders</td>
</tr>
<tr>
<td>No subsidy</td>
<td>Gov’t procures all production at a guaranteed price.</td>
</tr>
<tr>
<td>70% of the value of principal have low interest during the 1st year.</td>
<td>Gov’t procures through state-owned companies at a price giving 30% profit margin to farmers.</td>
</tr>
</tbody>
</table>

Source: Regalado, 2015
Enabling Environment for CHS of AMTs
Contiguous farming - shall be defined as a farming system comprising the development and organization of parcels of adjoining or adjacent agricultural lands with a minimum total area of 50-ha for the synchronized production of a particular crop such as but not limited to rice, corn, sugarcane, coconut and high value commercial crops utilizing agricultural mechanization technology. It shall include the necessary physical and institutional infrastructures. Physical infrastructures include the overall design layout of the area (e.g. field plot size, irrigation canal, farm drain, farm ditch, farm roads, postharvest facilities, etc.) while institutional infrastructures consist of the social base by which contiguous farming scheme shall operate.
Land Consolidation (Contiguous Farming)

BENEFITS OF LAND CONSOLIDATION

- development cooperation among farmers
  - for water management
  - synchronized harvesting
  - common warehouse, postharvest facilities, etc.

- developing market channels that demand bulk harvests

- efficient field operations

- efficient use of water and better weed control

- increase land and labor productivity

- increase crop production
Land Consolidation (Contiguous Farming)

Japan

BEFORE

AFTER
JAPAN

- Increase in large scale farms
- Crop diversification thru multi-purpose use of paddies
- Increase in rice production from 4.02 to 4.5 tons/ha
- Irrigation system has flood regulating function
- 40% overall work reduction in paddy field from 185 h/0.1 ha (1950s) to 39 h/0.1 ha (1993)
- Reduction in human labor from 1050 h/ha to 300 h/ha
KOREA

- 94-99% mechanized in 1998
- Around 40 years to finalized the concepts
- 5 years to implement scheme due to objections from landowners/farmers
PHASES OF Land Consolidation
1. Farm Layout
2. Site Clearing/Earth Moving

3. Leveling of field

4. Subsurface drainage works
5. Irrigation facilities

6. Construction of farm road, farm ditch, farm drain, other construction activity

7. Installation of power supply

8. Construction of production and post harvest facilities and shed
Significant accomplishments: Villaluna Multi Purpose Cooperative, Isabela Philippines (VLMPC)

Source: Larona, 2006
Factors in the Establishment of Custom Hiring Services
Technical Aspect

- Projections of Machinery Requirements

Input
- Assumptions
  - Size of Area
  - Field Conditions
  - Crop
  - Agro-Climatic Conditions
  - Cultural Practices

Process
- Farm Layout
- Selection of Appropriate Cultural Practices
- Machine Selection and Determination of Coverage area
- Scheduling of Farm Operations
- Economic Analysis

Output
- Farm Mechanization plan for a rice based ecosystem with an area of 200ha, 300ha, and 500ha
Cropping Calendar

PSB Rc82 Growth Duration

- **FIELD**
  - **NURSERY**
  - **FIELD**

**Vegetative Phase**
- 45 Days
  - Sowing and early vegetative phase (germination to seeding stage)
  - Mid to late vegetative phase (tilering to stem elongation)

**Reproductive Phase**
- 35 Days
  - Early reproductive phase (panicle initiation to booting)
  - Mid to late reproductive phase (heading to flowering)

**Ripening Phase**
- 30 Days
  - Ripening phase (milky and doughy stage)
  - Ready for harvest (mature grain stage)
  - After harvest (seed storage stage)

Photo Credits: IRRI
## Rice Cropping Pattern (Amongo, et. al. 2013)

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>CAM. SUR</th>
<th>ILOILO</th>
<th>LEYTE</th>
<th>OR. MINDORO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration</td>
<td>Available Work Day</td>
<td>Duration</td>
<td>Available Work Day</td>
</tr>
<tr>
<td><strong>Seedling Prep</strong></td>
<td>Nov 15-Nov 30</td>
<td>12</td>
<td>May 16-May 31</td>
<td>13</td>
</tr>
<tr>
<td><strong>Land Prep</strong></td>
<td>Nov 14-Nov 30</td>
<td>13</td>
<td>May 14-May 31</td>
<td>15</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td>*Dec 1- Dec 31</td>
<td>25</td>
<td>*June 1-June 30</td>
<td>24</td>
</tr>
<tr>
<td><strong>Chem. App</strong></td>
<td>Dec 8-Jan 13</td>
<td>28</td>
<td>June 9-July 15</td>
<td>29</td>
</tr>
<tr>
<td><strong>Harvesting</strong></td>
<td>Mar 1-Mar 31</td>
<td>25</td>
<td>Sep 3-Sep 27</td>
<td>20</td>
</tr>
<tr>
<td><strong>Threshing</strong></td>
<td>Mar 1-Mar 31</td>
<td>25</td>
<td>Sep 3-Sep 27</td>
<td>20</td>
</tr>
<tr>
<td><strong>Drying</strong></td>
<td>Mar 2-Apr 5</td>
<td>28</td>
<td>Sep 4-Sep 28</td>
<td>20</td>
</tr>
</tbody>
</table>
## Technical Aspect

### Rice mechanization technology coverage area
(Amongo, et. al. 2013)

<table>
<thead>
<tr>
<th>MACHINE</th>
<th>OPERATION</th>
<th>CAM. SUR Coverage Area</th>
<th>No. of Units</th>
<th>ILOILO Coverage Area</th>
<th>No. of Units</th>
<th>LEYTE Coverage Area</th>
<th>No. of Units</th>
<th>OR. MINDORO Coverage Area</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Wheel Tractor</td>
<td>Seedling Prep</td>
<td>6.93</td>
<td>-</td>
<td>7.51</td>
<td>-</td>
<td>7.80</td>
<td>-</td>
<td>11.55</td>
<td>-</td>
</tr>
<tr>
<td>Four Wheel Tractor</td>
<td>Land Prep</td>
<td>23.40</td>
<td>11</td>
<td>27.00</td>
<td>9</td>
<td>34.20</td>
<td>7</td>
<td>30.60</td>
<td>9</td>
</tr>
<tr>
<td>Rice Drum Seeder</td>
<td>Broadcasting</td>
<td>18.75</td>
<td>14</td>
<td>18.00</td>
<td>14</td>
<td>18.75</td>
<td>11</td>
<td>18.00</td>
<td>16</td>
</tr>
<tr>
<td>Engine Powered Sprayer</td>
<td>Chemical Application</td>
<td>24.53</td>
<td>10</td>
<td>25.40</td>
<td>10</td>
<td>17.52</td>
<td>12</td>
<td>21.02</td>
<td>13</td>
</tr>
<tr>
<td>Combine Harvester</td>
<td>Harvesting</td>
<td>72.60</td>
<td>4</td>
<td>58.08</td>
<td>5</td>
<td>87.12</td>
<td>3</td>
<td>69.70</td>
<td>4</td>
</tr>
<tr>
<td>Thresher</td>
<td>Threshing</td>
<td>81.82</td>
<td>3</td>
<td>68.90</td>
<td>4</td>
<td>97.85</td>
<td>3</td>
<td>69.10</td>
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</tr>
<tr>
<td>Dryer</td>
<td>Drying</td>
<td>15.13</td>
<td>17</td>
<td>11.38</td>
<td>18</td>
<td>16.16</td>
<td>13</td>
<td>7.61</td>
<td>36</td>
</tr>
</tbody>
</table>
## Technical Aspect

### Projected Volume of Rice Mechanization Technologies

(Among, et. al. 2013)

<table>
<thead>
<tr>
<th>MACHINE</th>
<th>OPERATIONS TO BE MECHANIZED</th>
<th>Projected No. of Machines for the Province</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CAMARINES SUR</td>
<td>ILOILO</td>
</tr>
<tr>
<td>Two Wheel Tractor</td>
<td>Land Prep</td>
<td>10,780</td>
<td>14,867</td>
</tr>
<tr>
<td>Four Wheel Tractor</td>
<td>Land Prep</td>
<td>5,188</td>
<td>7,154</td>
</tr>
<tr>
<td>Engine Powered Transplanter</td>
<td>Transplanting</td>
<td>6,423</td>
<td>10,646</td>
</tr>
<tr>
<td>Rice Drum Seeder</td>
<td>Broadcasting</td>
<td>6,474</td>
<td>10,731</td>
</tr>
<tr>
<td>Engine Powered Sprayer</td>
<td>Chem. App.</td>
<td>4,949</td>
<td>7,604</td>
</tr>
<tr>
<td>Combine Harvester</td>
<td>Harvesting</td>
<td>1,672</td>
<td>3,326</td>
</tr>
<tr>
<td>Thresher</td>
<td>Threshing</td>
<td>1,484</td>
<td>2,804</td>
</tr>
<tr>
<td>Dryer</td>
<td>Drying</td>
<td>8,021</td>
<td>16,974</td>
</tr>
</tbody>
</table>
Technical Aspect

Rice Mechanization Technologies
Rice Mechanization Technologies
<table>
<thead>
<tr>
<th>Name of operation</th>
<th>Equipments</th>
<th>Operation speed (km/h)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Standard</td>
</tr>
<tr>
<td>Sowing and Fertilizing</td>
<td>Knapsack power duster</td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td>Pest and disease control</td>
<td>Knapsack power applicator</td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Power sprayer</td>
<td></td>
<td>2.0</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Power duster</td>
<td></td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Manual type granule applicator</td>
<td></td>
<td>1.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Harvesting by reaping &amp; binding</td>
<td>Binder</td>
<td>2.0</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Harvesting &amp; Threshing</td>
<td>Head-feeding type Combine</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Standard Combine harvester</td>
<td>0.7</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: JICA-TBIC2001
### Technical Aspect

<table>
<thead>
<tr>
<th>Name of works</th>
<th>Equipments</th>
<th>Field efficiency (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Standard</td>
</tr>
<tr>
<td>Plowing</td>
<td>Suki for hand tractor</td>
<td>75</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Bottom plow</td>
<td>50</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Rotary tiller</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td>Plowing &amp; pulverizer</td>
<td>Plow with pulverizer</td>
<td>50</td>
<td>62</td>
</tr>
<tr>
<td>Pan-breaking</td>
<td>Sub-soiler</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Pulverizer (harrowing)</td>
<td>Rotary &amp; tiller</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Disk-harrow</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>Leveling</td>
<td>Tooth-harrow</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Pressing</td>
<td>Roller</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Puddling</td>
<td>Paddy harrow</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>Transplanting</td>
<td>Rice transplanter with young seedling</td>
<td>33</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>37</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Rice transplanter with large seedling</td>
<td>39</td>
<td>56</td>
</tr>
</tbody>
</table>

*Source: JICA-TBIC 2001*
## Technical Aspect

<table>
<thead>
<tr>
<th>Name of works</th>
<th>Equipments</th>
<th>Field efficiency (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Standard</td>
</tr>
<tr>
<td>Fertilizer application</td>
<td>Manure spreader</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Lime sower</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Broad-castor</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Sowing &amp; fertilizing</td>
<td>Grain drill (Drill seeder)</td>
<td>54</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38</td>
<td>52</td>
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<tr>
<td>Pest and disease control</td>
<td>Knapsack type power duster</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Power sprayer</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Power duster</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Manual hand sprayer</td>
<td>37</td>
<td>54</td>
</tr>
<tr>
<td>Reaping &amp; binding</td>
<td>Reaper binder</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>Threshing</td>
<td>Self-propelled power thresher</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>Harvesting &amp; threshing</td>
<td>Head-feeding type Combine</td>
<td>34</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>51</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Standard type Combine</td>
<td>43</td>
<td>55</td>
</tr>
</tbody>
</table>

*Source: JICA-TBIC, 2001*
Size of Farm roads should be based on the type of machine and PAES 421 Farm to Market Roads (Source: Ruzgal et. al.)
1. Condition of Farm Area

a. Field Condition:
   1. lowland field – flooded condition, transplanted
   2. upland field – dry, un-bunded, directly seeded
   - Machinery utilization would depend on the condition of the field/farm.
b. Soil hardness estimation using human foot

(JICA, 2001)

<table>
<thead>
<tr>
<th>Standard Judgment</th>
<th>Tractor with attachments</th>
<th>Combine (Minimum height from ground)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rotary</td>
<td>Bottom plow</td>
</tr>
<tr>
<td>Limits of ease of operation</td>
<td>&lt; 2cm</td>
<td>0</td>
</tr>
<tr>
<td>Limits of possible operation</td>
<td>2-5cm</td>
<td>0-2cm</td>
</tr>
<tr>
<td>Limits of impossible operation</td>
<td>&gt; 5cm</td>
<td>&gt; 2cm</td>
</tr>
</tbody>
</table>
Machinery Coverage Determination

c. Hard pan and soil moisture
   Mechanized operation in lowland field condition requires the presence of hardpan.
d. Size and shape of field
   Preferably rectangular in shape
e. Inclination of field

1) In case of contour line operation in upland field:
   ridging - 6°
   broadcasting, flat ridging or standard cultivation – 10°
   operation of maximum contour line direction – 10°
f. Inclination of field for other crops

3) Combine:

operation along the contour line - 3°
maximum inclined direction - < 5°
g. Length of headland

<table>
<thead>
<tr>
<th>kind of machine</th>
<th>length of headland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor</td>
<td></td>
</tr>
<tr>
<td>fruit garden</td>
<td>about 4 m</td>
</tr>
<tr>
<td>mulberry garden</td>
<td>2–3 m</td>
</tr>
<tr>
<td>Trencher</td>
<td></td>
</tr>
<tr>
<td>self propelled type</td>
<td>about 2 m</td>
</tr>
<tr>
<td>(walking type)</td>
<td></td>
</tr>
<tr>
<td>loading type</td>
<td>about 5 m</td>
</tr>
<tr>
<td>self propelled type</td>
<td></td>
</tr>
<tr>
<td>(riding type)</td>
<td>about 5 m</td>
</tr>
<tr>
<td>Power sprayer</td>
<td></td>
</tr>
<tr>
<td>loading type</td>
<td>3.5 m</td>
</tr>
<tr>
<td>pulling type</td>
<td>4.5 m</td>
</tr>
<tr>
<td>self propelled type</td>
<td>4.0 m</td>
</tr>
</tbody>
</table>

*Source: JICA, 2001*
Machinery Coverage Determination

Tractor

Trencher
Machinery Coverage Determination

Power operated sprayers

Self Propelled Power Sprayer
Source: agrio-sprayers.eu

Tractor Mounted Power Sprayer
Source: ycbestmachine.en.made

Tractor Trailer Type Power Sprayer
Source: farmsandequipment.com
### Machinery Coverage Determination

#### h. Farming area measurements

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paddy field</strong></td>
<td><strong>Up-land field</strong></td>
</tr>
<tr>
<td>Hight between paddy field to road</td>
<td>Inclination angle</td>
</tr>
<tr>
<td></td>
<td>Radius of curvature</td>
</tr>
<tr>
<td>Go into field from road</td>
<td>Head land</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. 30 cm: Tractor.
2. < 20 cm: head feeding Combine (cutting width 0.8～1.2 m)
   < 25 cm: combine (cutting width 1.2～3.5 m)
   < 40 cm: combine (< 3.5 m cutting width)

(1) In case, if there is more than 30 cm height between paddy field to farm road, and also there are canal between paddy field to farm road, the width should be more than tractor or equipment width, and inclined angle should be less than 12 degree.

*Source: JICA, 2001*
<table>
<thead>
<tr>
<th>FARM OPERATION</th>
<th>AGRICULTURAL EQUIPMENT AND MACHINERY</th>
<th>FIELD CAPACITY</th>
<th>DAILY COVERED AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Working Width (m)</td>
<td>Operating Speed (kph)</td>
</tr>
<tr>
<td>Land Preparation</td>
<td>Four-Wheel Tractor</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Disc Plow</td>
<td>1.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Rotary Tiller (1st Pass)</td>
<td>1.6</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Rotary Tiller (2nd Pass)</td>
<td>1.6</td>
<td>6.0</td>
</tr>
<tr>
<td>Transplanter</td>
<td>Self-propelled Rice Transplanter</td>
<td>1.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Crop Protection</td>
<td>Knapsack Power Sprayer</td>
<td>8.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Harvesting and Threshing</td>
<td>Combine Harvester</td>
<td>1.9</td>
<td>4.4</td>
</tr>
</tbody>
</table>
Economics of Agricultural Machinery
Economics play a vital role in agricultural machinery management.

Selection of the size and capacity of a machine for a particular job requires careful evaluation of all cost items.

Oversized machines require higher investment and may be too large for economic operation with the rest of the machines in the farm (Hunt, 1983).

Undersized machines may give a lower investment but the increased labor cost may offset the savings.
The machine that would give the lower investment and operating costs is recommended.

The final decision is influenced by the following:

- suitability of the machine to the crop, to the field, and to weather conditions.
- timeliness of field operation which is governed by the capacity of the machine.
- availability of capital.
- cost and availability of labor and fuel.
Benefits and Costs of Agricultural Machinery Operation

Costs can be grouped into two categories:

*Fixed costs*

are expenses incurred regardless of whether the machine is operated or not.

(a) depreciation
(b) interest on investment
(c) shelter
(d) taxes and insurance
(e) repair & maintenance
Fixed costs

1. Depreciation (D) is the reduction in the value of the machine as a result of use (wear and tear) and obsolescence availability of newer and better model).

Straight-line method.

\[
D = \frac{\text{Initial cost} - \text{Salvage value}}{\text{Useful life}} = \frac{\text{IC} - \text{SV}}{L}
\]

where:

\[
\text{SV} = \text{salvage value of the machine at the end of useful life usually estimated at zero to 10 percent of initial cost.}
\]

\[
L = \text{useful life based on experience and similar machines}
\]
Fixed costs

2. Interest on Investment (IOI) is the charge for the use of the money invested on the machine regardless of whether the money was borrowed or not. It is given by the equation below.

\[
IOI = \frac{(IC + SV) \times r}{2}
\]

Eqn. 2

where \( r = \) interest rate

= bank interest rate on agricultural loans
**Fixed costs**

3. Shelter is provided to protect the machine from robbers and adverse weather conditions, for ease of making repairs, and for better appearance of the farm. Included in the computation of depreciation, interest on investment, insurance, and repair and maintenance.

4. Insurance is the cost of protection of the machine and shelter against calamities and theft.
Fixed costs

5. Repair and maintenance costs are fixed allowances provided for the repair of machine and shelter. Usually estimated at 10 percent of initial cost.

6. Taxes are sometimes collected in some places when machine is required to be registered with the local government.
Benefits and Costs of Agricultural Machinery Operation

Costs can be grouped into two categories:

**Variable costs**

- are expenses incurred as a result of machine operation
- power costs
- labor
- other inputs.
Project Appraisal

Project appraisal provides a comprehensive review of all aspects of the project.

It includes economic and financial analysis wherein analysis of economic soundness of the project, quantification and valuation of costs and benefits and ensuring financial viability are done.
Project Appraisal

The methods more often used for evaluating a project as presented by (Sarma, 2010) are:

1. Simple rate of return (SRR),
2. Payback Period (PBP),
3. Break-Even Point (BEP),
4. Benefit Cost Ratio (BCR),
5. Net present Value (NVP) or Net Present Worth (NPW)
6. Internal Rate of Return (IRR)
**Project Appraisal**

Undiscounted measures of project appraisal do not take into consideration the change in the value of money over time

i.e. SRR, PBP and BEP

Discounted measures of project appraisal take into account the time value of money through the process of discounting

i.e. BCR, NVP and IRR
**Undiscounted Measures of Project Worth**

Simple Rate of Return

The SRR is a commonly used criterion of project evaluation. It basically expresses the average net profits (Net Cash Flows) generated each year by an investment as a percentage of investment over the investment’s expected life

\[
SRR = \frac{Y}{I} \quad \text{eqn. 3}
\]

where:

- \(Y\) = the average annual net profit (after allowing depreciation) from the investment
- \(I\) = the initial investment
Undiscounted Measures of Project Worth

The calculated SRR should be compared with the investor’s Required Rate of Return (RRR) to judge the profitability of the investment.

The investment will be accepted if SRR > RRR, otherwise it will be rejected.

When the SRR of all the investment opportunities is greater than the RRR of the investor, then the investment yielding the highest SRR should be selected.
Undiscounted Measures of Project Worth

Payback period (PBP) is length of time it takes to recover the invested capital or until the net benefits equal the investment cost.

Depreciation is not included in the computation of cost to avoid double accounting since the initial capital is included in the computation.
Undiscounted Measures of Project Worth

\[ PBP = \frac{\text{Initial investment}}{\text{Average annual net benefits}} \]  
\text{eqn. 4}

where:

\[ \text{Ave. annual net benefits} = \frac{\sum_{1}^{n} (\text{Total Benefits} - \text{Total Costs})}{n} \]

\[ n = \text{no. of years of benefits} \]
Undiscounted Measures of Project Worth

Individual investments are ranked according to their relative pay back period with the shortest being the most favored.

The acceptability of the investment is determined by comparison with the investor’s required pay back period (RPP).

Accept the investment when the PBP < RPP, otherwise reject the investment.
Undiscounted Measures of Project Worth

Although it is simple and easy to use, the PBP method has two major weaknesses as a measure of investment worth:

(1) this method fails to consider earnings after the pay back period is reached
(2) it fails to consider the difference in timing of cash flows.
**Undiscounted Measures of Project Worth**

Break-even point (BEP) is level of operation where it neither produces a profit nor incurs a loss.

\[ AFC + VC (X) = B (X) \]

where:
- **AFC** = annual fixed cost
- **VC** = unit variable cost
- **B** = Unit benefit
- \( X \) = no. of units for break-even point

**Economics of Agricultural Machinery**
**Undiscounted Measures of Project Worth**

Break-even point (BEP)

Select an investment with BEP that has a lower break-even point among the alternatives.

An investment should be operated above the BEP to be economical.
**Discounted Measures of Project Worth**

Discounting is a process of translating future values in present worth by applying a set of discount factors.

$$PW = DF \times V$$

**eqn. 6**

where:

- **PW** = present worth
- **DF** = Discount factor = \( \frac{1}{(1 + r)^n} \)
- **r** = prevailing bank interest rate
- **n** = no. of years
- **V** = worth of money in the future

Economics of Agricultural Machinery
Discounted Measures of Project Worth

Example: Find the present worth of P1,000 to be received two years from now at the prevailing bank rate of 21%.

Solution:

\[
PW = \frac{1}{(1+0.21)^2} \times P1,000
\]

\[
= 0.683 \times P1,000 = P683
\]
Discounted Measures of Project Worth

Benefit-cost ratio (BCR) is the ratio of present worth of benefit stream to present worth of cost stream and is given by the equation below:

\[
BCR = \frac{\sum_{i=0}^{n} \frac{B_i}{(1 + r)^i}}{\sum_{i=0}^{n} \frac{C_i}{(1 + r)^i}} = \frac{\text{PWB}}{\text{PWC}} \quad \text{eqn. 7}
\]

where:
- \(B_i\) = benefits in period \(i\) where \(i\) runs from zero to \(n\)
- \(C_i\) = Costs in period \(i\) where \(i\) runs from zero to \(n\)
- PWB = present worth benefits
- PWC = present worth costs
 Discounted Measures of Project Worth

The investment is said to be profitable when the BCR is one or greater than 1.

Depreciation and interest on investment are not included in the costs to prevent double accounting.

Depreciation is taken cared of by the inclusion of the investment cost while interest on investment is taken cared of by the discount factor.
**Discounted Measures of Project Worth**

Net Present Value is computed by finding the difference between the present worth of benefit stream less the present worth of cost stream.

It is simply the present worth of the cash flow stream since it is a discounted cash flow measure of project worth along with internal rate of return.

\[
NPV = PWB - PWC = \sum_{i=0}^{n} \frac{B_i - C_i}{(1 + r)^i}
\]

eqn. 8


**Discounted Measures of Project Worth**

Internal rate of return (IRR) is that discount rate which just makes the net present value (NVP) of the cash flow equal zero.

It is considered to be the most useful measure of project worth. It represents the average earning power of the money used in the project over the project life.

It is also sometimes called yield of the investment.
Discounted Measures of Project Worth

It is the maximum interest that a project can pay for the use of resources if the project is to recover its investment and operating cost and still break-even.

At this point, the BCR is equal to one. This is usually done by trial and error and by interpolation and using following equations:

$$ IRR = \left[ \text{LIR} + (\text{HIR} - \text{LIR}) \times \frac{\text{NPV}_{\text{LIR}}}{\text{abs} / \text{NPV}_{\text{HIR}} - \text{NPV}_{\text{LIR}}} \right] \quad \text{eqn. 9} $$
Discounted Measures of Project Worth

NPV = net present value \[ \sum_{i=0}^{n} \frac{B_i - C_i}{(1 + r)^i} \] = PWB - PWC

where:

LIR = lower interest rate
HIR = higher interest rate
Procedures in conducting area assessment for CHS of AMTs
**Rapid Rural Appraisal (RRA)**
A systematic procedure of interdisciplinary activities for generating community information and analyses

**Other Terms for RRA:** (Cardenas, 2000)
- Participatory Rapid and Systematic Appraisal (PRSA)
- Rapid Community Appraisal (RCA)
- Participatory Rapid Rural Appraisal (PRRA)
- Participatory Rapid Community Appraisal (PARCA)

**Why the need of RRA?**
rapid, reliable and cost-effective site assessment that involves stakeholders participation, community knowledge using the bottom-up planning approach.
Assessment Procedure

Tools and Methods

- personally talking to local people
- directly observing the local conditions
- studying existing conditions prior to project implementation

Variations in RRA application

- type of topic, questions or issues
- purpose or context for which the information is needed
- conditions in the particular area

Aspects on Type of Topic, Questions or Issues

- scope and specificity
- degree and precision needed
- type of subject matter
RRA Applications

- **Exploratory and baseline appraisal** - usually employed in the beginning of a development activity to aid in understanding project implementation

- **Planning appraisals** - used to plan a whole project or some aspect of a project, gain consensus, stimulate accountability and initiate implementing plans of action among local folks

- **Feasibility appraisals** - type of a topical appraisal that can be used to detect flaws in technical design and suggest better alternatives for the project

- **Monitoring appraisals** - used in performance review and detecting problems during the project implementation

- **Evaluation appraisals** - aid project implementers in making project changes and in concluding projects
Formulation of Guide Questions

*Exploratory appraisal should cover the following aspects:*
- bio-physical aspect
- socio-cultural and political aspect
- economic aspect

**Field Work**

- Respondents should be well represented and informed of the activity (sampling method can be applied)
- Key informants should be carefully identified
- Use Semi-Structured Interview (SSI) questionnaire.
- Suggested techniques for gathering bio-physical information are:
  - participatory modeling
  - participatory transects and diagramming
  - village mapping, etc.

**Other forms of participatory data gathering and analysis**

- seasonal calendar
- farm diagram
- village map
- product flows
<table>
<thead>
<tr>
<th><strong>RRA Applications</strong></th>
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### Information checklist

#### a. Socio-Economic Setting
- Demographic information
- Income sources (off-farm, on-farm)
- Labor availability and distribution
- Transport facilities
- Market and credit
- Channels of market information
- Cooperatives and other organizations
- Land holdings and inheritance pattern
- Land tenure status
- Social Services

#### b. Cultural Setting
- Migration and ethnic groups
- Ethnicity and preferences
- Leadership patterns
- Social structure
- Customs and traditions
- Organizations in the community, their roles and impacts
- Social network
- Rights and obligations with regards to sex, age and groups
- Prevailing attitudes and beliefs
- Indigenous practices related to the use of natural resources
- Peace and order situation
- History of the area

#### c. Bio-physical Environment
- Land use pattern* & soil fertility*
- Rainfall pattern
- Availability of water supply
- Typhoon occurrence
- Drought periods
- Land size
- Cropping pattern/ farming system
- Availability of seeds, seedlings & animal stock
- Dominant pests & diseases
- Topography, elevation and temperature range*

*Can be observed and need not be asked from farmers
### Interview/Discussion Techniques
- semi-structured
- key informant
- focus or interest groups
- individual and house

### Other Oral Linguistic Techniques
- eliciting indigenous technical knowledge
- folk taxonomy
- local custom analysis
- eliciting traditional systems of orgs.
- historical profile analysis
- oral histories
- socio-linguistic status distinction
Community Exploration
- community appraisals
- group trek
- brainstorming
- participatory workshop

Site Characteristic Techniques
- agro-ecosystems zoning
- rapid site description

Transect Techniques
- transect analysis
- cross-section
- mapping/drawing

Ranking, Rating and Sorting
- item/class ranking
- contrast sets, etc.
Assessment Techniques

RRA Techniques

Map Techniques
- sketch mapping
- thematic maps
- overlay analysis
- mapping of aerial photos
- historical pattern mapping

Diagrams and other Graphics
- categorical (circle, pie and Venn Diagram)
- resource diagrams
- seasonal diagrams
- patterns analysis
- decision and logic trees

Significant Time Analysis
- seasonal events calendars
- timelines
- flow charts

Source: ENS 211, 2001
Assessment Techniques

RRA Principles

- Accuracy and appropriate precisions
- Avoiding assumptions and haste
- Conscious judgment
- Exploration and flexibility
- Indigenous knowledge
- Interdisciplinary
- Iteration
- Progressive Learning
- Triangulation
RRA Principles

• Organize the RRA team

• Introduce the team, explain the purpose, keep a low profile, be polite, thank the participants for attending the discussion after the interview.

• Assign roles to RRA team (e.g. topic leaders of topic, group “facilitator” who guides interview or discussion, an arbiter who courteously pacify potential arguments, etc.)

• Summarize the day’s activity. Discuss and identify findings, determine data gaps and plan for the next activities.
Post Evaluation
Identify the following:

______________ 1. The application of animal and machine power to multiply man’s ability to perform production operations.
______________ 2. Mechanization model that motivates in increasing the level of mechanization in order to cultivate large agricultural lands with limited available manpower.
______________ 3. Examples of machines that reduce yield losses.
______________ 4. The most common form of representing the level of agricultural mechanization of a country.
______________ 5. A farming system comprising the development and organization or grouping of parcels of lands to effect the efficient application and utilization of powered machines. This includes the necessary physical and institutional infrastructures.
______________ 6. The expenses incurred regardless of whether the machine is operated or not.
______________ 7. It is the reduction in the value of the machine as a result of use (wear and tear) and obsolescence availability of newer and better model.
______________ 8. It is considered to be the most useful measure of project worth. It represents the average earning power of the money used in the project over the project life.
______________ 9. A systematic procedure of interdisciplinary activities for generating community information and analyses.
______________ 10. It is usually employed in the beginning of a development activity to aid in understanding project implementation.
Self Assessment Test

Enumerate the needed information

1-2 Models of Mechanization

3-5 Potentials of Mechanization

6-7 Purpose of the establishment of Custom Hiring Services

8-12 Major key players in the implementation of Custom Hiring Services

13-14 Beneficiaries of Custom Hiring Services

15-17 Benefits of Land Consolidation (contiguous farming)

18-20 Three major aspects to be considered in the establishment of Custom Hiring Services
True or False: Write T if the statement is true and F if the statement is false.

1. High land area to farmer ratio mechanization model is motivated into increasing the level of mechanization in order to increase yields and cropping intensities to meet the growing demands for food and agricultural raw materials.

2. Tractor increases labor productivity.

3. Intermediate level of mechanization involves operations done solely with the use of mechanical power source operated by man.

4. Farmers preference on agricultural machines should be considered in establishing the custom hiring services.

5. Land consolidation encourages synchronize farming to make better use of resources.

6. Large area and large farm plots are prerequisite for the implementation of custom hiring services of agricultural mechanization technologies.

7. The availability of Custom Hiring Service for agricultural mechanization technologies in the area will automatically displaces human labor.

8. The technical aspect of Custom Hiring Services of agricultural mechanization technologies include the perception of the farmer beneficiaries.

9. Livelihood generation can be realized when implementing Custom Hiring Services of agricultural mechanization technologies.

10. In Custom Hiring Services of agricultural mechanization technologies, the economic aspect of using the machines is not important.
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END OF PRESENTATION
Thank you for listening ! 😊