# Agricultural Mechanization Development in the Philippines

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# The Challenges

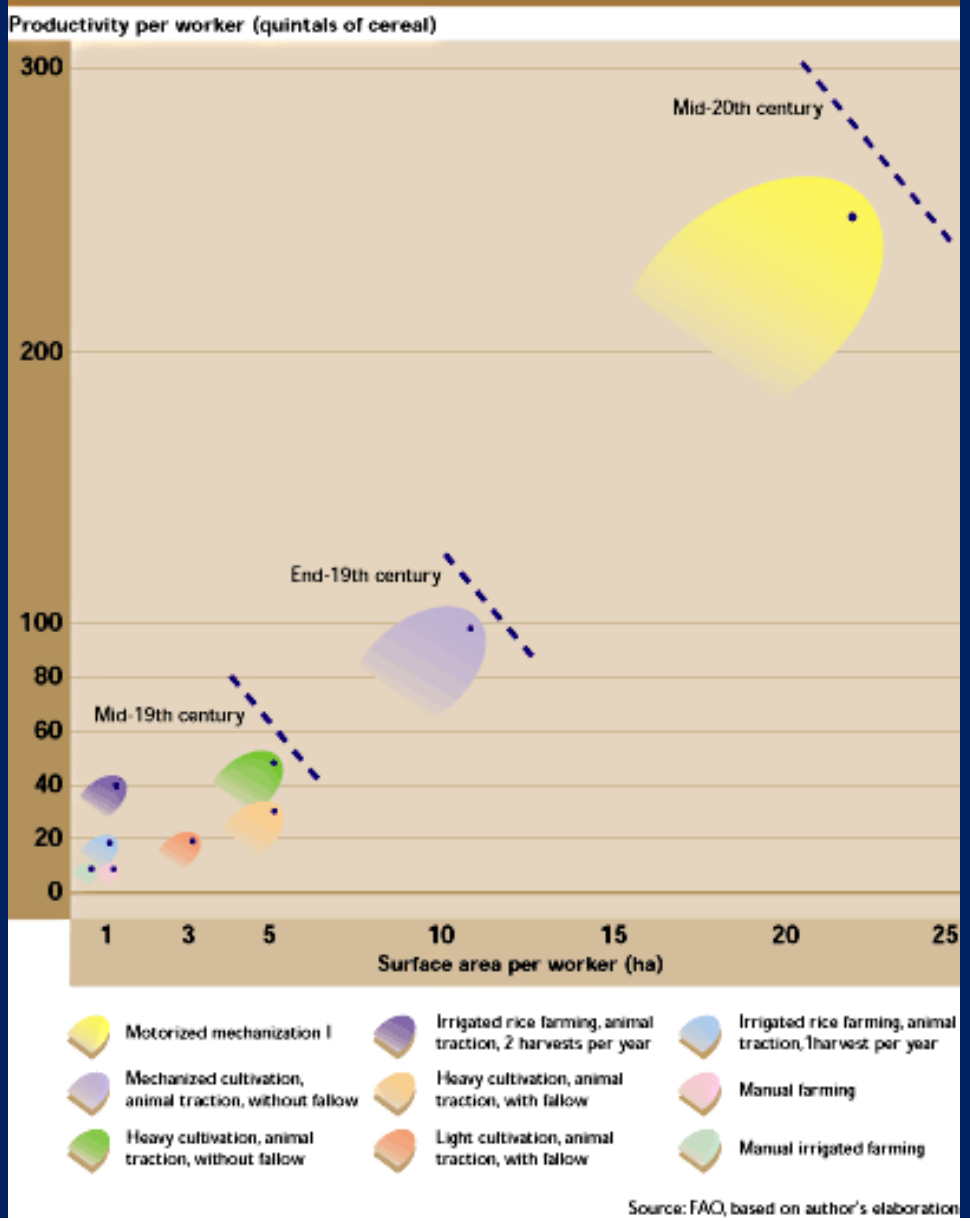
- To meet the growing demand for food, agricultural production in Asia must increase significantly in the face of less labor, less land, and less water, along with greater concern for the climate change.
- Profitability of the agricultural production system must be increased amidst global free trade.

# The need for mechanization

- Even with considerable advances in agriculture, most farmers still use inefficient manual tools
- There is disparity in productivity among the different agricultural systems
- Farm operations and equipment must take advantage of the economies of scale to be able to gain profit

Figure 18

**COMPARATIVE PRODUCTIVITY OF THE WORLD'S MAJOR AGRICULTURAL SYSTEMS IN THE MIDDLE OF THE TWENTIETH CENTURY**




Source: FAO, based on author's elaboration


# THE PHILIPPINES

- An archipelago without river deltas
- 13 million hectares devoted to crops
- Mostly small farms with average landholding size of 2 ha
- Harvested area for rice is 4.27M ha at 3.8 mt/ha ave. yield
- Current population is 88 million and growing at around 2% annually

# Rice Postproduction Operation and Technologies

| Operation | Technology | Capacity | Usage (%) | Losses (%) |
|---|---|---|---|---|
| Harvesting | Manual | 240 man-h/ha | 99.8 | 2.0-3.0 |
| | Reaper | 2.4-3.8 ha/d | nil | 0.2-0.4 |
| | Combine | 4.5-8.0 ha/d | nil | - |
| Threshing | Manual | 0.05-0.1 t/h/person | 31.0 | 2.1-4.2 |
| | Axial Flow | 0.5-5.0 t/h | 69.0 | 0.1-1.6 |
| Drying | Sundrying | 24 kg/m2 | 86.0 | 1.0-5.0 |
| | Flatbed | 1-6 t/batch | 14.0 | 0.4-1.2 |
| | Recirculating | 6-10 t/batch | | |
| | Continuous | 2-10 t/h | nil | - |
| Milling | Kiskisan | 0.1-0.3 t/h | 10.5 | 6.0-8.0 |
| | Cono | 0.5-2.0 t/h | 33.2 | - |
| | Rubber Roll | 0.5-2.5 t/h | 56.1 | - |
| Storage | Bag | 14 m2/t | 99.0 | 2.0-6.0 |
| | Bulk | 1.5-1.7 m2/t | 1.0 | - |

# Status of Agricultural Mechanization

Level of mechanization in rice and corn farms, 2005

| OPERATION | POWER SOURCE | | |
|---|---|---|---|
| | Manual | Man-Animal | Mechanical |
| Land Preparation | 3.2 | 64.7 | 13.2 |
| Planting | 98.7 | 1.2 | 0.2 |
| Weeding | 85.2 | 14.8 | 0 |
| Fertilizer Application | 98.7 | 1.7 | 0 |
| Spraying | 100 | 0 | 0 |
| Harvesting | 99.8 | 0 | nil |
| Threshing/Shelling | 31 | 0 | 69 |
| Drying (Farm Level) | 100 | 0 | 0 |
| Milling | 0 | 0 | 100 |
| AVERAGE | 56.5 | 19.2 | 21.7 |

Source: AMDP, 2005

# Status of Agricultural Mechanization

Level of mechanization in rice and corn farms in hp/ha, 2005

| SOURCE OF POWER | hp/ha |
|---|---|
| 1. Human Labor | 0.24 |
| 2. Draft Animal | 0.08 |
| 3. Four-wheel Tractor | 0.24 |
| 4. Engines | |
| a. Power Tiller | 0.56 |
| b. Thresher | 0.34 |
| c. Irrigation Pump | 0.07 |
| d. Harvesting, drying & shelling equipment | 0.15 |
| TOTAL | 1.68 |

Source: AMDP, 2005

# Agricultural Machinery Industry Problems and Possible Solutions

| | PROBLEM | SOLUTION |
|---|---|---|
| 1. | Technical<br>– High acquisition cost<br>– Inappropriate Technology<br>– Low Reasearch & Extension capability of appropriate farm machinery | – Collective machinery ownership / machinery pooling / custom hiring<br>– Needs assesment of AM suitability<br>– Capacity/capability enhancement/training |
| 2. | Socio-economic<br>– Low Income/lack of capital<br>– Small & fragmented land holdings<br>– Unfavourable market price for the farmer<br>– Cheap & abundant labour (in some areas) and seasonal labour shortage | – Provision of credit facilities, Clustering farmers into groups<br>– Farm Clustering & custom services<br>– Floor price, train farmers into entrepreneurs (processing & business)<br>– Absorbing unemployed into other jobs, retooling<br>– Encourage farm business enterprises<br>– Creating new jobs in agricultural activities (processing, waste handling, food processing, etc.) |

# Agricultural Machinery Industry Problems and Possible Solutions

| | Problem | Solution |
|---|---|---|
| 3 | **Environment / infrastructure**<br>– Lack of infrastructure<br>– Diversity in Agroecosystem<br>– Weak agricultural manufacturing industry<br>– Environmental degradation | – Put in place irrigation, processing facilities, farm roads, access to market<br>– Adjust the AM to the local-specific conditions<br>– Select the most promising machines to produce locally<br>– Support local manufacturers, through R&D, training, financial asistance<br>– Introduce the business of service and maintenance of AM<br>– Promote joint ventures with foreign manufacturers<br>– Control the utilization of chemical materials<br>– Promote sustainable farming systems |
| 4. | **Political / Institutional**<br>– Lack/inconsistant Political-will to support AM | – Educate the political leaders on the importance of AM<br>– Put AM into strategic long-term programs<br>– Promote AM through International Networking & Cooperation |

# Agriculture and Fisheries Modernization Act of 1997

- Credit
- Irrigation
- Information and marketing support service
- Other infrastructure
- Product standardization and consumer safety
- Human resource development
- Research development and extension
- Trade and fiscal incentives

# Agricultural and Fisheries Mechanization Law

- Research, extension and human resource development
- Local assembly, manufacture, supply and after-sales service
- Registration, licensing and standardization

## National Agricultural Engineering RDE Network

1. Strengthen RDE Network
2. Conduct benchmark and needs surveys
3. Adaptation of technologies to local conditions
4. Development of technologies for machinery pooling
5. Establishment of technical standards and improvement of test facilities

# Agricultural Engineering RDE Network

6. Piloting system integrated technologies
7. Conduct of training on technical and business aspects of technologies
8. Establishment of centralized information service

# Agricultural Mechanization Development Program (AMDP)

| | Research Thrust | Projects |
|---|---|---|
| 1 | Corn | Anthropometric survey of farmers agricultural machinery design<br>Integrated corn mechanization technologies (planter, fertilizer applicator, irrigation, combine, dryer, mill) |
| 2 | High-value Crops | Soil sterilization<br>Hot water treatment of mango<br>Multi-crop washer |
| 3 | Renewable Energy | Integrated Jatropha biodiesel production<br>Micro-hydro development |

# Technology Dissemination

- Display area
- Exhibition/Fair
- Techno-Demo
- Seminar resource speaker
- Machinery Design and Blueprints
- Collaboration with manufacturers
- Mechanization Congress

# Information Dissemination

- Philippine Journal of Agricultural and Biosystems Engineering (refereed)
- Philippine Agricultural Mechanization Journal
- Mechanization Update

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In this issue:

# Agricultural Machinery Testing and Evaluation Center (AMTEC)

- Establish standard specifications, test procedures and performance indices for agricultural and fisheries machinery
- Conduct test and evaluation of agricultural and fisheries machinery
- Train students, technicians and engineers on standards development, test and evaluation of agricultural and fisheries machinery
- Publish and disseminate standards and test results

# Agricultural Machinery Testing and Evaluation Center

- Philippine Agricultural Engineering Standards
  - Multicrop processing machines
  - Slaughterhouse for large ruminants
- Testing and evaluation of agricultural machinery
  - Prime movers, irrigation, production, processing equipment
- Training of regional and provincial engineers
- Information dissemination

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