

# Development of Agricultural Engineering in the Philippines

*Arnold R. Elepaño*

Program Manager and Associate Professor  
Agricultural Mechanization Development Program  
Institute of Agricultural Engineering  
College of Engineering and Agro-Industrial Technology  
University of the Philippines Los Baños

International Seminar on Restructuring and Strengthening Research  
and Development for Agricultural Engineering  
Beijing, 28 April 2007

# The Philippine Agricultural Industry

- Philippine agriculture plays a vital role in the economy
- About 25% of gross domestic product
- Seventy percent of population is in the rural areas. Two-thirds depends on farming for livelihood
- One-half of labor force is engaged in agricultural activities

# Agricultural Engineering

- Agricultural engineering encompasses the science and technology of agricultural production, processing and management of natural resources.
- It is a critical component to help meet the demands of the farmers in increasing their income, reducing drudgery, increasing labor productivity, reducing production and postproduction losses.

# Philippine Agricultural Engineering: before 1960s

- use of plow, cultivators, corn planter and big combines
- early technologies from Spain and United States were technological failures mainly due to the lack of understanding of the local conditions and notion that the imported technologies can be transplanted into the Philippine agriculture

# Philippine Agricultural Engineering: 1960 - 1980

- use of power tillers, threshers, cleaners and dryers
- advent of high-yielding, non-photosensitive rice varieties increased the need for mechanization
- outbreak of hoof and mouth disease

# Philippine Agricultural Engineering: 1980 - 1990

- Comprehensive land reform program
- Farmers cooperative to engage in production, processing and marketing of their produce

# Philippine Agricultural Engineering today

- reorientation of the R&D program started from very hardware-focused technology development to a more information-driven, demand-responsive and system-based technology

# Agriculture and Fisheries Modernization Act (Republic Act 8435)

- poverty alleviation and social equity
- food security
- rational use of resources
- global competitiveness
- sustainable development
- people empowerment
- protection from competition



# Philippine Agricultural Engineering Act of 1998 (Republic Act 8559)

- promote and upgrade the practice of agricultural engineering profession in the country
- accelerate agricultural modernization through adequate and well trained professional agricultural engineers

# R&D Networking

- Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. Agricultural engineering as a “commodity”.
- Agricultural Machinery Information Network. It is the information source for agricultural engineering and mechanization.

# Agricultural Engineering Center of Excellence

- Commission on Higher Education
- allocate research and development funds
- facilitate scholarships
- monitors performance of schools offering Agricultural Engineering program

# Agro-industrial Development in the Rural Philippines: Constraints

- restricted access of small entrepreneurs to credit
- limited education and management capability
- inadequate marketing
- poor and inadequate infrastructure
- limited access to information/technology
- high cost of raw material
- insufficient and costly power and water utilities

# Lack of Impact of Agricultural Engineering

- lack of breakthroughs
- disregard of real farmers' need for technologies
- poor quality machines
- inadequate training in machine operation and maintenance
- public sector agricultural engineering lack of assistance to manufacturers

# Increasing R&D Impact

- use of system approach
- use of interdisciplinary approach
- promote participatory R&D with key players and stakeholders
- develop private-public partnerships
- limit machinery design and development

# Agricultural Mechanization Development Program

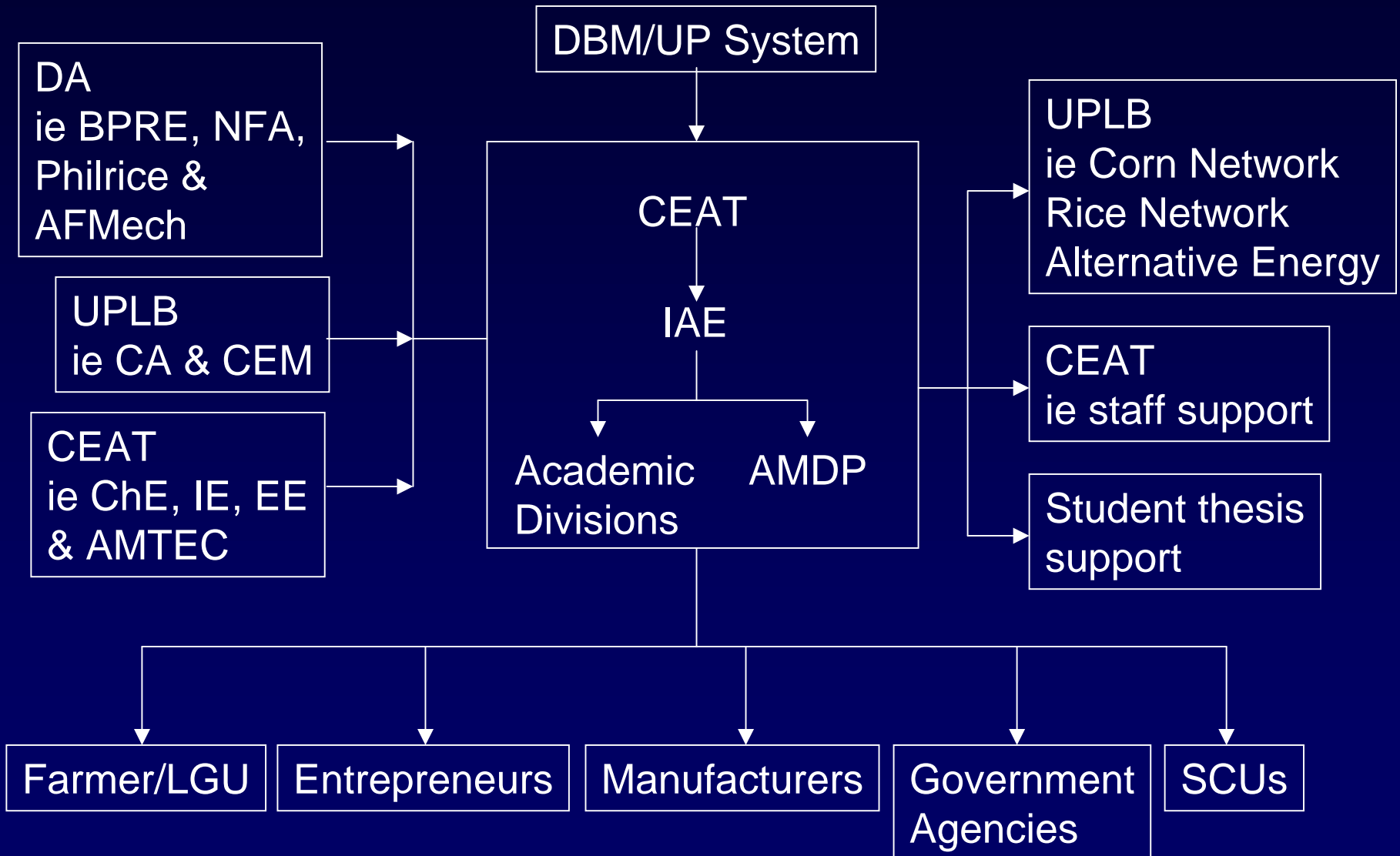
## General Objective

Raise the level of mechanization of Philippine Agriculture and Fisheries.

## Specific Objectives

- Undertake R&D activities to generate efficient use and cost effective technologies/systems/packages
- Undertake extension activities to promote/encourage the manufacture and commercialization of agricultural mechanization technologies
- Review, formulate and advocate policies that will hasten the adoption of agricultural mechanization technologies.
- Establish/strengthen linkages with other agencies involved in agricultural mechanization.

# AMDP Network



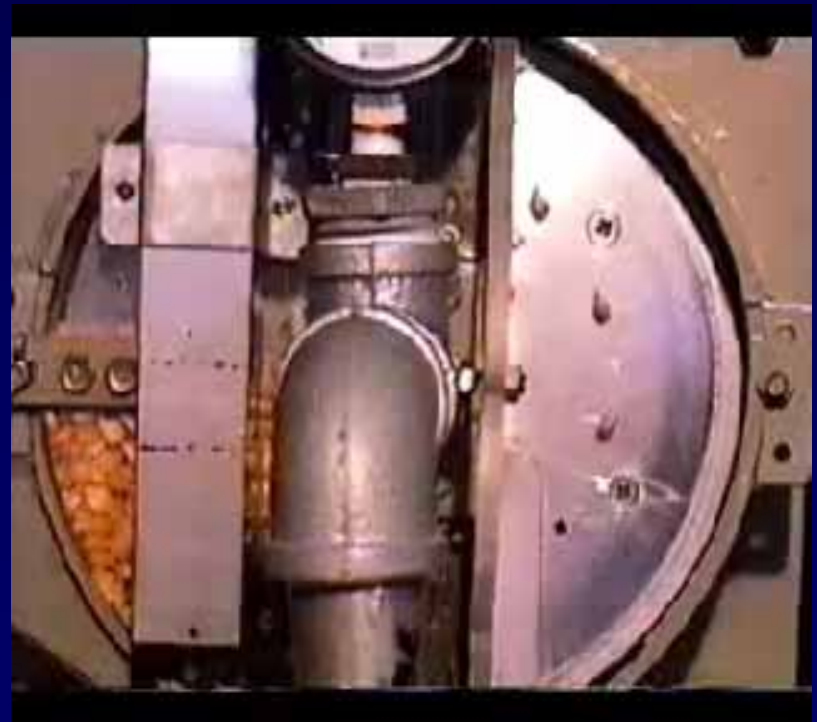


# Research Thrust

Commodity	Multi-Disciplinary	System Integration	Network	Public-Private Interaction
Corn				
High Value Crops				
Energy				

# Corn Proj 1

- Multicrop Pneumatic Seeder with Fertilizer Applicator
- Tested for IPB 911, soybean, peanut & white bean
- For AMTEC testing and collaborative work with manufacturer

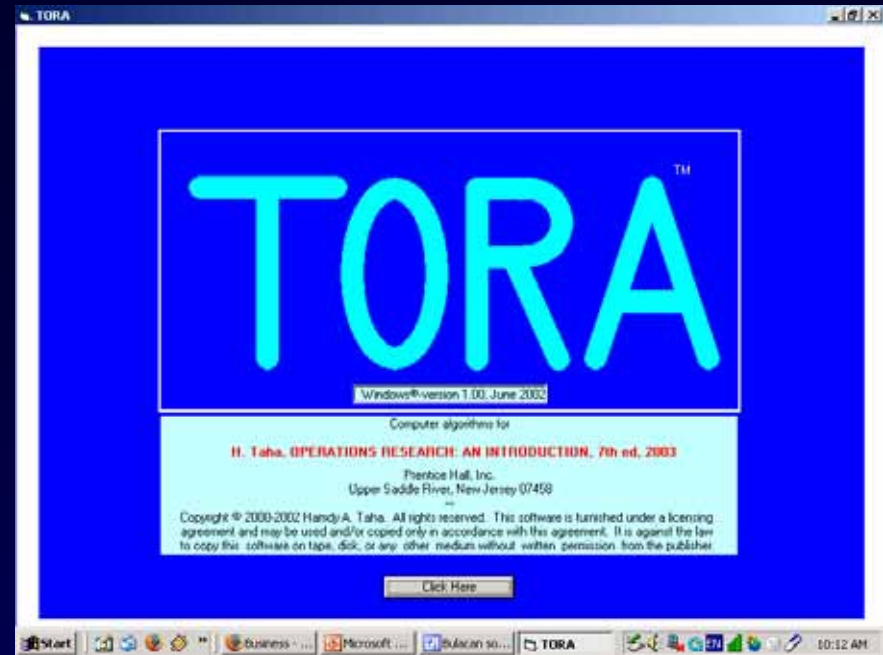


# Corn Proj 2

- Saccharification and Fermentation of Mixed Corn and Corn Wastes for Ethanol Production
- Evaluated the effect of pretreatment (hot water, 0.5 % H<sub>2</sub>SO<sub>4</sub>) of corn waste mixtures on ethanol production;
- Determined the effect of cellulase concentration (10 %, 20 %) on saccharification of corn waste mixtures;
- Determined the effect of amylase concentration on saccharification of corn starch;

# Corn Proj 3

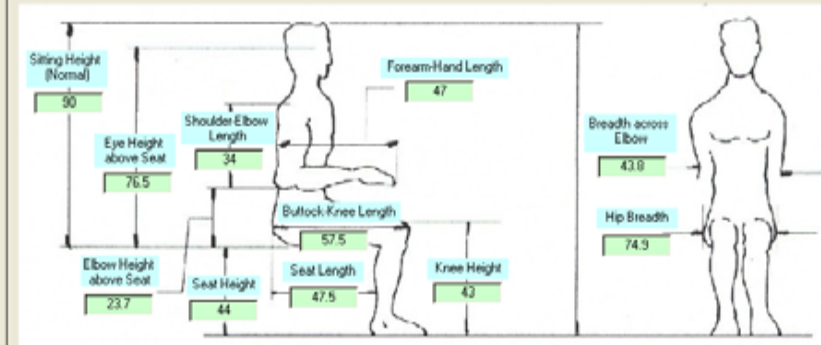
- Philippines' Corn Supply Chain
- Distribution Linear Program



# Corn Proj 4

- Anthropometric Survey of Corn Farmers in Calabarzon
- also with Commission on Higher Education support

## SITTING POSITION



## OTHER MEASUREMENTS

Total Span	174.5	Foot Breadth	11.3	Hand Breadth	9.4	Head Circumference	53.5
		Foot Length	26	Hand Length	19.5	Chest Circumference	63.5
						Grip Circumference	3.5
						Thigh Clearance	12

Record: 14 | 5 | of 50

Microsoft Access - [Data]

Number: 3  
Name: JESUIT SALASAM  
Age: 27  
Weight (kg): 60  
Municipality: LOS BARDOS  
Province: LAGUNA

Add Record  
Save Record  
Close Form

## STANDING POSITION

Diagram illustrating anthropometric measurements for a person in a standing position. The measurements are as follows:

Measurement	Value
Standing Height	168.8
Eye Height	156.3
Shoulder Breadth	42
Hip Breadth	30.8
Upward Reach	215
Sideways Reach	87.3
Arm Length	53
Forward Reach	86
Shoulder Height	138
Elbow Height	104
Chest Depth	20.9
Knuckle Height	67.5

# New Corn Projects

- Evaluation of the sustainability of a drip irrigation system and its potential in increasing the level of mechanization in a corn-based farm in Calamba City.
- Determination of a suitable mechanization technology package for corn after rice cropping culture.

# HVC Proj 1

- Local Vegetable Production
- Conducted rapid mechanization needs appraisal
- Modified hand tractor
- Fabricated garden rotavator



# HVC Proj 2

- Controlled Environment Structure
- For lettuce, tomato & chili



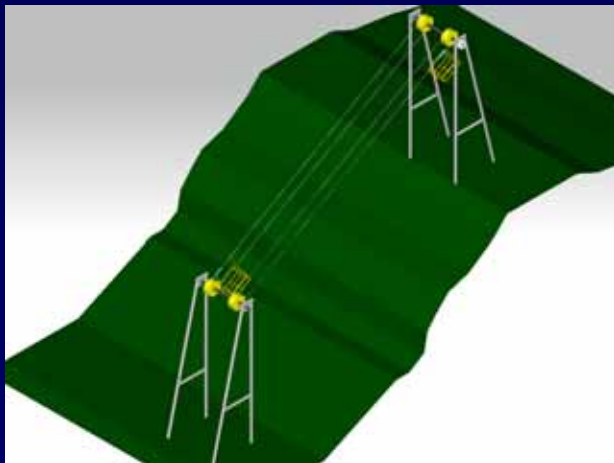


# HVC Proj 3

- Mechanization of Heat Treatment of 'Carabao' Mango for Quarantine Disinfection and Disease Control.
- Finite element model to predict the temperature profile in the mango.
- Design and fabrication of a continuous-flow hot water treatment for mango.

# HVC Proj 4

- Tramline for hauling of highland tomatoes
- Liliw, Laguna



# Energy Proj 1

- Primary processing of Jatropha
- Shelling and Oil Extraction



# Energy Proj 2

- Biodiesel from *Jatropha Curcas* Oil
- Determination of the most economical methanol to oil ratio at constant amount of catalyst;
- Determination of the most economical catalyst to oil ratio at constant amount of methanol ;
- Determination of optimum reaction temperature; and
- Determination of the physical and chemical properties of a crude and esterified *Jathropa curcas* oil.

# New Energy Project

- Integrated System for Village-Scale Ethanol Production from Sweet Sorghum
- In collaboration with the Department of Energy and the University's Renewable energy Program

# Energy Proj 3

- Development of a corncob/rice hull energy system for batch recirculating dryer
- Evaluation of existing corn cobs/rice hull non-power applications
- Design and fabrication of dryer-biomass furnace system

# Critical Issues

- Target beneficiaries: small, medium, large farmers
- Mix of R&D Activities: corn, high value crops, livestock, aquaculture
- Level of research intensity: basic vs applied
- Funding scheme
- Budgetary allocation for equipment
- Intellectual Property Rights
- High-technology research
- How AMDP can serve clientele better?

# Commercialization of Technologies

- decreasing supply of hired labor in the farm
- innovative machines versus market-driven machines
- improve technology transfer mechanisms
- improve support services
- support local manufacturers



# Local Manufacturing

- supporting the local manufacturing will trigger the development of high tech manufacturing techniques
- multiplier in the development of the local economy ie employment to many skilled workers
- savings in foreign exchange
- increase agricultural engineering R&D

# AMDP Extension

- Extension of Hand Tractor and Corn Sheller
- Dissemination to DA Calamba, DA Calauag & Alaminos City, Pangasinan
- Demo to agricultural equipment manufacturers



# Technology Dissemination

- Display area
- Exhibition/Fair
- Techno-Demo
- Seminar resource speakers
- Machinery Design and Blueprints
- Collaboration with manufacturers
- Corn Mechanization Congress – Feb 2007



# Information Dissemination

- Philippine Journal of Agricultural and Biosystems Engineering
- Philippine Agricultural Mechanization Bulletin
- Mechanization Update
- CEAT Newsletter

ISSN-0118-8275



**PHILIPPINE AGRICULTURAL MECHANIZATION BULLETIN**

Agricultural Mechanization Development Program  
Institute of Agricultural Engineering  
College of Engineering and Agro-Industrial Technology  
University of the Philippines Los Baños  
College, Laguna

Vol. XIII No.1 January to June Issue 2006

---

**In this issue:**

	Page
<b>Acoustic Impulse Response Characteristics of Tender Coconuts</b> <i>Delfin C. Suministrado</i>	3
<b>Benchmark Survey on Farm Mechanization Status in Irrigated Lowlands of Regions I, II, and III</b> <i>Romeo B. Gavino, Ma. Cella M. Fernando, Emmanuel V. Sicat, and Michelle M. Romero</i>	13
<b>Development of a Power-Driven Peanut Sheller</b> <i>Miriam P. Banlawa</i>	27
<b>Design, Manufacture, Test and Evaluation of Biomass Energy Technologies: A Review of the Philippine Literature</b> <i>Arnold R. Elepaño</i>	30

# An Invitation

- The 58<sup>th</sup> Philippine Society of Agricultural Engineers Annual National Convention and 6<sup>th</sup> International Agricultural Engineering Conference and Exhibition
- 21 to 25 April 2008
- University of the Philippines Los Banos/International Rice Research Institute, Laguna