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Agricultural Mechanization Policies in the Philippines

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I. Introduction

Government laws and policies influence the countryøs developmental direction. Laws and policies provide directions for the nationøs economy, trade, agricultural, industrial, and other sectors of the society. Many nations have flourished and developed because of the strong government commitment and political will in formulating and implementing policies.

During pre-industrialization stage in the western countries, one of the strategies to intensify agricultural production was through agricultural mechanization. At this stage, the agricultural sector utilized high capacity machines to perform agricultural operations which suit the large landholdings and to replace labor intensive operations. Land rearrangement, institutional and infrastructure development aided the success of agricultural mechanization. Recorded history proved that agricultural mechanization propelled rapid industrialization in the western hemisphere. Recently in the 21st century, many Asian nations have adopted this western thought and implemented agricultural mechanization related policies appropriate to their specific conditions.

In the Philippines, there is now an increasing awareness among Filipino farmers on the advantages of utilizing mechanization technologies in the agricultural production system. Moreover, government policies on agriculture are now gearing towards food self-sufficiency and security through the adoption and utilization of technologies to improve land, crop and labor productivity.

Republic Act 10601 also known as the Agricultural and Fisheries Mechanization Law of 2013 (AFMech Law) has strengthened the commitment of the government to enhance the adoption and utilization of agricultural mechanization technologies to modernize the agricultural sector and to be at par with the ASEAN neighbors. It is hoped that the AFMech Law will aggressively push the implementation of a sustainable agricultural mechanization to increase agricultural production towards ensuring food sufficiency, safety and security. This will also prepare the country for integration among ASEAN countries and in the Asia-Pacific region.

This paper presents the past policies and policy directions of the Philippines in relation to agricultural mechanization. It also provides the activities of the Agricultural Mechanization Development Program (AMDP), Institute of Agricultural Engineering (IAE), College of

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II. Agricultural Setting and Mechanization Status

A. Agricultural Setting

The Philippines is still an agricultural country where abundant agricultural raw materials are produced for food, feed, and industrial applications. About 32% (9.671M has) of the total land area of 29.817 million hectares is under intensive cultivation, where 51% and 44% are arable and permanent croplands, respectively. In 2014, the major agricultural land utilization by area harvested is devoted to palay, corn, sugarcane, mango, tobacco, cassava and onions (BAS, 2014).

Of the more than 100 M population of Filipinos with 2.96% growth rate in 2014 (NSCB, 2014), about 86% lives in the rural areas. Seventy-five percent (75%) of them depend on agriculture for employment and income. Although about 31% of the employment share comes from agriculture and the crops subsector has increased its gross value by about 14.52% more than the 2013 level (BAS,2014), many Filipinos remain unemployed or underemployed.

Food security can be attained with the use of appropriate, gender-sensitive technologies. In recent years, the application of mechanization technologies has been regarded as important contributor to modernize Philippine agriculture. The application of environment-friendly and suitable technologies can possibly enhance the agricultural uplands, hilly production system. The use of modern agricultural production systemsø technologies will, among others, enable the agricultural sector to fully utilize farm products and by-products; cultivate lands, swamplands and other non-arable lands on a sustained basis; intensify and diversify farming systems which will, in turn, generate employment; conserve or even earn foreign currencies through local manufacturing and export of these technologies; reduce or minimize postharvest losses; increase the value added to farm products through secondary and tertiary processing; reduce pressures in the environment that would in turn achieve food security.

B. Status of Agricultural Mechanization

In 2012, the University of the Philippines Los Baños-Agricultural Mechanization Development Program (UPLB-AMDP) in collaboration with Philippine Center for Postharvest Development and Mechanization (PHilMech) conducted a national survey on the level of mechanization in the country. The move aims to update the mechanization level as a result of the aggressive government intervention in the promotion of agricultural mechanization technologies in the Philippines. This is also to review the methodology of computing the hp/ha and relate it to the productivity of certain agricultural production sectors. The project on Determination of Agricultural Mechanization Level in the Production-Postproduction Systems of Rice and Corn in four provinces, namely Camarines Sur, Iloilo, Leyte, and Oriental Mindoro, provided an indication of the level of mechanization of rice and corn crops in those provinces.

One of the indicators to measure the level of mechanization was based on percentage utilization of power (man, man-animal, man-machine systems) by the farmer-respondents

(Table 1). Rice production/postproduction operations that used predominantly manual power in all four (4) provinces were dike repair, planting, fertilizer application, insecticide application, herbicide application (except for Leyte), harvesting, and drying (except for Oriental Mindoro) (Amongo et al. 2013).

On the other hand, rice production operations that were done predominantly by man-animal system were plowing (Leyte) and leveling (Camarines Sur, Leyte, and Oriental Mindoro). Rice production operations that were done mainly through man-machine system were plowing (except for Leyte) and harrowing; threshing and milling, (except for Iloilo (32.63%) and Oriental Mindoro, where no survey data for milling operations were available.

Table 1. Predominant power sources (manual, man-animal, man-machine power) and level of mechanization in terms of percentage utilization of respondents in rice production/postproduction operations in Camarines Sur, Iloilo, Leyte, and Oriental Mindoro, 2012

| Farm Operation | Level of Mechanization (% Utilization of Farmer) | | | | |
|---|--|--------------------|--------------------|-------------------------|--|
| | Manually Operated | | | | |
| | Camarines Sur | Iloilo | Leyte | Oriental Mindoro | |
| | (Region V) | (Region VI) | (Region VIII) | (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 ^a | 96.84 | |
| Harvesting | 100.00 | 98.95 | 100.00 | 89.47 | |
| Drying | 63.64 | 53.68 | 78.26 | 44.21 ^a | |
| | Man-Animal-Powered | | | | |
| Plowing | 15.63 ^ª | 12.63 ^a | 59.78 | 6.32 ^a | |
| Leveling | 61.46 | 49.47 ^a | 88.04 | 55.79 | |
| | Man-Machine-Powered | | | | |
| Plowing | 73.96 | 72.63 | 29.35 ^a | 61.05 | |
| Harrowing | 67.71 | 80.00 | 84.78 | 55.79 | |
| Threshing/Bagging | 86.46 | 92.63 | 92.39 | 89.47 | |
| Milling | 56.25 | 32.63 ^a | 79.35 | No data | |
| Notes I and of machanization (0/ utilization non anomation - (Number of reasonadouts non taxa of - anon sources) V1000/ | | | | | |

Note: Level of mechanization (% utilization per operation = <u>(Number of respondents per type of power source)</u> X100% Total no. of respondents per province

^a % utilization of the available power is not predominant.

Source of basic data: Amongo et al. 2013

C. Mechanization Technologies for Rice Production/Postproduction Operations

The study of Amongo et al. (2013) identified the different rice production/ postproduction technologies utilized in the four (4) provinces surveyed. The machines that had a high level of utilization were hand tractors, threshers, and rice mills. Other machines utilized in rice production were four-wheel tractors, floating tractors, pump sets, harvesters, and dryers (Table 2). Results also revealed that there were high adoption of power tiller attachments, threshers, and rice mills in the provinces surveyed.

In spite of the availability of mechanization technologies in the country, some operations in the production of rice are still predominantly done manually particularly in harvesting and drying operations (Table 3). Furthermore, it shows that the utilization of machines/

equipment for postproduction operations significantly surpassed the capacities of operations that were done manually. Table 3 also indicates that postharvest losses are higher in operations that are done manually.

Table 2. Machines utilized in rice production/postproduction operations in Camarines Sur,Iloilo, Leyte, and Oriental Mindoro, 2012

| Equipment/ Machine | Camarines Sur | | Iloilo | | Leyte | | Oriental Mindoro | |
|--|-------------------------------|-------|-------------------------------|-------|-------------------------------|-------|-------------------------------|-------|
| Wachine | No. of Respondents N=96 | % | No. of Respondents N=96 | % | No. of Respondents N=95 | % | No. of Respondents N=95 | % |
| Hand tractor | 88 | 91.67 | 85 | 88.54 | 93 | 97.89 | 82 | 86.32 |
| Floating tractor | 16 | 16.67 | 11 | 11.46 | 1 | 1.05 | 32 | 33.68 |
| Four-wheel tractor | 0 | - | 1 | 1.04 | 0 | - | 4 | 4.21 |
| Pump set | 21 | 21.88 | 18 | 18.75 | 10 | 10.53 | 37 | 38.95 |
| Combine harvester | 0 | - | 0 | - | 0 | - | 11 | 11.58 |
| Thresher | 85 | 88.54 | 84 | 87.50 | 83 | 87.37 | 78 | 82.11 |
| Dryer | 2 | 2.08 | 8 | 8.33 | 3 | 3.16 | 5 | 5.26 |
| Rice mill | 53 | 55.21 | 33 | 34.38 | 74 | 77.89 | 18 | 18.95 |
| Source of basic data: Amongo et al. 2013 | | | | | | | | |

Table 3. Rice postproduction operations and technologies

| Operation | Technology | Capacity | Utilization (%) | Losses ^a (%) |
|--|---------------|---------------------------|--------------------|----------------------------|
| Harvesting | Manual | 240 person-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 | Sun drying | 24 kg/m ² | 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 | 53–63 ^b |
| | Cono | 0.5–2.0 t/h | 33.2 | 65 ^b |
| | Rubber roll | 0.5–2.5 t/h | 56.1 | 65–70 ^b |
| Storage | Bag | 14 m²/t | 99.1 | 2.0-6.0 |
| | Bulk | 1.5–1.7 m ² /t | 1.0 | nil |
| [*] As cited by Lantican et al. 2011. | | | | |

^bMilling recovery

The application of agricultural mechanization, along with other farm inputs (e.g., fertilizers, irrigation, crop care, etc.) contributes to crop, labor, and land productivity. However, with considerable advances in agricultural mechanization, most farmers still use inefficient manual tools. The differences in mechanized systems and manual systems in farm operations often result in a disparity in agricultural productivity. With the advent of new developments in agriculture and active government efforts toward food sufficiency and sustainability, farm

producers must shift from manual farm operations to machine-assisted operations to take advantage of economies of scale to be able to make a profit.

Recent survey from the Philippine Center for Postharvest Development and Mechanization (PHilMech) recorded a 1.23 hp/ha mechanization level for all crops (DA, 2013). This has increased over the 1990s record of 0.52 hp/ha. For the rice and corn which is the staple food of Filipinos, the quick index survey in 2013 revealed a 2.31 hp/ha which has improved over the years compared to 1.68 hp/ha in 1998 (Rodulfo, et al. 1998). The increase in values may be attributed to the purposive campaign of the government for food self-sufficiency, safety and security.

III. Past Policies on Agricultural Mechanization

- A. Republic Act No. 3927 An Act to Regulate the Practice of Agricultural Engineering in the Philippines or the "Philippine Agricultural Engineering Law (Approved on June 18, 1964) The law established agricultural engineering as a profession which õconsists in the application of the fundamental and known principles of mechanical, civil and electrical engineering to the peculiar conditions and requirements of agriculture as an industry and as a field of science. The practice of agricultural engineering shall embrace the following activities: (1) farm power and machinery, (2) farm buildings and structures, (3) farm electrification and farm processing, (4) soil and water conservation which includes farm irrigation and drainage, land clearing, flood control, soil erosion control and related problems, and (5) education and research.ö
- **B.** Republic Act No. 8559. An act regulating the practice of agricultural engineering Philippines Act of 1998 or the "Philippine Agricultural Engineering Act of 1998." (Approved on February 6, 1998) The law declares the õpolicy of the State to promote and upgrade the practice of agricultural engineering profession in the Philippines by instituting measures that will result in relevant agricultural engineering education and better career prospects for professional agricultural engineers.ö The policy also stateøs guarantee for the õdelivery of basic and technical services to accelerate agricultural engineers through ut the countryö.
- C. Republic Act 8435. Agriculture and Fisheries Modernization Act of 1997 ó The law prescribed urgent measures to modernize the agriculture and fisheries sectors of the country to enhance their profitability, and prepare A/F sectors for the challenges of the globalization through an adequate, focused and rational delivery of necessary support services. The support services for the implementation of the law include: (1) Production and Marketing Support Services; (b) Credit; (c) Irrigation; (d) Information and Marketing Support Services; (e) Other infrastructures including public and private such as fish ports, sea ports and airports, farm to market roads, common infrastructures, water supply system, research and technology infrastructures, research and technology facilities, public markets, abattoirs, and agricultural machinery.

AFMA upholds the equitable distribution of opportunities, income and wealth, sustained supply of the nationøs goods and services for the benefit of the people; and an increasing production performance as an important factor in improving the quality of life for all, especially the underprivileged. Moreso, AFMA aims to promote industrialization through agricultural development the development of industries that make efficient use of human

and natural resources. for development All sectors of the economy (including private enterprises, corporations, cooperatives and other collective organizations) shall be given opportunities for improvement and enjoy the benefits of development.

Market approach strategies are to be utilized to assist the A/F sectors which contribute significantly to food security, environmental protection, and balanced urban and rural development. The welfare of the consumers especially the lower income groups shall be ensured especially the lower income groups. Farmers shall be encouraged to shift to more profitable crops.

The law promulgates the development and sustainability of the agricultural and fisheries sectors in accordance with the following principles of a) poverty alleviation and social equity; b) food security; c) rational use of resources; d) global competitiveness; e) sustainable development; f) people empowerment; and g) protection from unfair competition.

D. Past policies supporting the implementation of land consolidation/contiguous farming

1. **Republic Act No. 6657 -** An act instituting a comprehensive agrarian reform program to promote social justice and industrialization, providing the mechanism for its implementation, and for other purposes June 10, 1988. CARP is the redistribution of public and private agricultural lands to farmers and farm workers who are landless, irrespective of tenurial arrangement. Its vision is to have an equitable land ownership with empowered agrarian reform beneficiaries who can effectively manage their economic and social development to have a better quality of life. One of its major programs of CARP is the Land Tenure Improvement that aims to hasten distribution of lands to landless farmers. The government will provide support services to beneficiaries, including infrastructure facilities, marketing assistance program, credit assistance program, and technical support programs.

Section 39 of the law on land consolidation stated that õThe DAR shall carry out land consolidation projects to promote equal distribution of landholdings, to provide the needed infrastructures in agriculture, and to conserve soil fertility and prevent erosion.ö

- 2. **Executive Order No. 129-A -** Modifying Executive Order No. 129 Reorganizing and Strengthening the Department of Agrarian Reform and for other Purposes
 - i. In Section 4 on Mandate the Department shall be responsible for implementing the Comprehensive Agrarian Reform Program and, for such purpose, it is authorized to Undertake land consolidation, land reclamation, land forming, and conservation in areas subject to agrarian reform.
 - ii. In Section 20, the Bureau of Land Development was created to absorb the relevant functions of the Bureau of Land Acquisition, Distribution and Development. The Bureau shall be responsible for the development of policies, plans and programs, and for providing technical assistance, relative to land surveys, land use, capability and classification, engineering services, and land consolidation.

iii. In Sec. 26, the DAR shall have as many Municipal Agrarian Reform Offices as may be necessary in promoting efficiency and effectiveness in the delivery of its services, which shall be headed by a Municipal Agrarian Reform Officer. Among other the MAR Office shall:

a) Implement policies and programs on land acquisition and distribution and transfer of landowners to actual tillers, including identification of farms, landowners, and beneficiaries, leasehold arrangements, land valuation, landowner compensation and transfer actions as determined in accordance with law;

e) Organize/establish compact farms, land consolidation, integrated farm system, sloping agricultural land technology and other cooperative-cultivatorship schemes;

- 3. Letter of Instructions No. 650 of Pres. Marcos dated Jan 5, 1978 In the Letter of instruction addressed to the Secretary of Agrarian Reform, Chairman, Board of Directors, Land Bank of the Philippines President, Land Bank of the Philippines, the following statements related to land consolidation were stipulated:
 - i. the establishment of pilot land consolidation projects under the Agrarian Reform Program in the provinces of Nueva Ecija, Pampanga, Camarines Sur and Pangasinan, has transformed self-reliant and economically and socially stable farmers, and has brought about maximum land utilization and development, and increased farm production, through multiple cropping and crop sequencing, and farm income through cooperative endeavors;
 - ii. The setting up of such land consolidation projects needs the attention and encouragement of the government; and
 - iii. The acquisition of the 638-hectare property of landowner Emerito M. Ramos in Arayat and Candaba, Pampanga, is necessary in order to put up a modern land consolidation project in the province similar to that of the General Ricarte cooperative settlement in Llanera, Nueva Ecija.
- 4. Letter of Instructions No. 253 of Pres. Marcos dated Feb 19, 1975 The following statements related to land consolidation were stipulated in the letter of instruction addressed to the Secretary of Agrarian Reform; Chairman, Board of Trustees, Land Bank of the Philippines; and President, Land Bank of the Philippines:
 - i. Nueva Ecija, has been designated since 1972 as a pilot province for land reform integrated development program with emphasis on land tenure improvement, institutional development, physical development, and agricultural development;
 - ii. As a part of this integrated approach to land reform, barrio General Ricarte of Llanera, Nueva Ecija, has also been chosen as the site for a pilot agricultural cooperative settlement;

- iii. The implementation of the agricultural cooperative settlement will not only translate into reality the integrated approach to agrarian reform but will also substantially increase the farm family's income;
- iv. Then President F.E. Marcos ordered the Secretary of Agrarian Reform to carry out a land consolidation scheme within the project area and allocate the farm lots as well as the home lots in accordance with the integrated development plan for this pilot projects;
- 5. Letter of Instructions No. 370 of Pres. Marcos dated Feb 3, 1976 The subject matter was the order to the Land Bank for the acquisition of the Jacinto Estate in Nueva Ecija; and the Department of Agrarian Reform to undertake land consolidation thereat.

IV. Policy Directions in Agricultural Mechanization

A. Republic Act 10601 - The Agricultural and Fisheries Mechanization (AFMech) Law of 2013

RA 10601 is the most recent law on agricultural and fisheries (A/F) mechanization in the Philippines. The law recognizes the importance of agricultural mechanization as a significant contributor in agricultural development. It promulgates the (a) promotion of appropriate A/F mechanization technologies to increase agricultural productivity for food security and safety and increase farmers income; (b) improvement and the local assembling and manufacturing industry; (c) development and enforcement of standards, testing and evaluation, and registration of A/F machineries to ensure their quality and safety; and accreditation of suppliers, assemblers and manufacturers for their compliance to quality standards; (d) improvement of support services including marketing and credit facilities, research, training and extension programs, infrastructures, and postharvest facilities; (e) strengthen implementation of A/F mechanization programs; and (f) provision of integrated support services to farmers and stakeholders for the successful operation and management of A/F mechanization projects.

The law enjoins the support and participation of various stakeholders including farmers/fisher folks and their associations or cooperatives, government line agencies, local government units, academic institutions, private agencies (local assemblers, manufacturers, suppliers, importers, cooperatives), and all other concerned agencies for the successful implementation of the law.

Contiguous Farming

Contiguous farming is a strategy similar to the concept of land consolidation which the Philippines is currently adhering to encourage the organization of group of farmers to join their land together for synchronized and efficient operation of high capacity machines such as four-wheel tractors, hand tractor, planter, thresher, harvester and other suitable mechanization technologies.

Land consolidation is a land rearrangement strategy to increase crop, land and labor productivity by improving the farm physical and institutional infrastructures. Physical infrastructures consist of the overall farm design layout that include among others, field plot size, irrigation canal, farm drain, farm ditch, farm roads, post harvest facilities, while, institutional infrastructures consist of the activities and strategies for the operation and management of land consolidation schemes.

Asian countries experienced similar farming conditions, problems and constraints to mechanization that still exist in the Philippines. Some of these problems include: small farm sizes, low crop productivity, ageing farmers, declining agricultural laborers, and low adoption of mechanization technologies. These problems influenced some Asian countries government such as Japan, Korea, and Taiwan to implement on land consolidation and farm mechanization.

Contiguous farming as defined in R.A. 10601 is õa 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, post harvest facilities, etc.) while institutional infrastructures consist of the social base by which contiguous farming scheme shall operate.ö (IRR of R.A. 10601).

Implementation of contiguous farming shall be implemented by two major Philippine government line agencies, namely the Department of Agriculture (DA), together with the Department of Agrarian Reform (DAR). AFMech Law states that the key activities for contiguous farming include: (a) Promote farm land clustering with a minimum of fifty (50)-hectare cluster for synchronized farming operations, from land preparation to harvesting, in cooperation or contract with agricultural mechanized operation service providers; (b) Undertake farm development planning; and (c) Promote the strengthening of farmersøcooperatives and associations.

- **B.** Philippine Agricultural And Biosystems Engineering Act of 2014 Senate Bill No. 2434; C.R. No. 82 The senate bill seeks to repeal Republic Act No. 8559, which currently governs the practice of agricultural engineering in the country, and to strengthen its practice into agricultural and biosystems engineering. The bill also aims to improve the different areas of practice of our agricultural engineers through Career Progression and Specialization; and to mainstream the agricultural and biosystems engineers in agro-industrial development, food security, bio-energy and environmental protection program through proper recognition, appropriate positions and greater professional responsibilities. The move is to further help professionalize the Philippine agricultural and environmental bureaucracy, and improve the productivity and efficiency in farm operations. Other specific features of the current bill include (<u>https://www.senate.gov.ph/press_release/2014/1021_trillanes2.asp</u>, 2014):
 - Development and updating of the education curriculum of the agricultural and biosystems engineering;
 - examination, registration of licensure of the practitioners;
 - development of the professional competence of the practitioners through continuing professional education;
 - accreditation of an integrated national professional organization; and
 - prohibition of foreign agriculture and biosystems engineer to be issued a temporary license to practice the agricultural and biosystems engineering profession unless

his/her country of origin permits Filipino agricultural and biosystems engineers to practice within its territorial limits.

V. Role of UPLB-AMDP in the Agricultural and Fisheries Mechanization Law of 2013 or Republic Act 10601

A. UPLB-AMDP and AMTEC Roles in the Agricultural and Fisheries Mechanization Law of 2013

The Agricultural Mechanization Development Program of the Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños (AMDP-IAE-CEAT, UPLB) has important roles in the implementation of the Agricultural and Fisheries Mechanization Law of 2013. Among these significant roles include:

- 1. The UPLB-AMDP along with other academic institutions involved in agricultural mechanization shall take an active role in the formulation of the five-year National Agri-fishery Mechanization Program (NAFMP) which will be spearheaded by DA. The NAMP shall be prepared every 5 years there after using participatory methods and close coordination among member agencies and stakeholders.
- 2. The UPLB-AMDP will be involved in the formulation of the Unified National Research and Development and Extension Agenda (NAFMechRDE). The DA, through the Philippine Center for Postharvest Development and Mechanization (PHilMech) as focal agency, shall spearhead and integrate and unify all agricultural and fisheries mechanization RDE programs and projects of all concerned national government agencies, Local Government Units (LGUs), state universities and colleges (SUCs). The RDE agenda shall be geared towards development of machineries and equipment, job generation, address market and industry demands and help accelerate agricultural and fisheries modernization in the countryside. National and local public consultations on the formulated unified NAFMechRDE agenda shall be conducted for validation and confirmation prior to adoption and implementation.
- 3. The UPLB through the AMDP-IAE-CEAT, the lead agency among academic institutions shall consolidate and integrate the NAFMechRDE agenda of academic institutions through consultation workshops and coordinated meetings for submission to PHilMech.
- 4. As part of the NAFMechRDE Network, UPLB-AMDP shall be strengthened and institutionalized to lead and coordinate the agricultural and fishery mechanization RDE program of all academic institutions in the country.
- 5. UPLB-AMDP shall be involved in the formulation of the necessary guidelines for the operation of AFMechRDEN, which will be led by PHilMech.
- 6. The UPLB-AMDP shall be strengthened through the provision of funding support for additional manpower complement, equipment, supplies and other logistical requirements for inclusion in the Annual General Appropriation Act (GAA) of the UPLB. The funding support is intended to strengthen the capability of UPLB-AMDP

for the implementation, coordination and monitoring of AFMechRDEN activities of all academic institutions in the country.

- 7. The UPLB-AMDP shall be a member of the Agri-fisheries Mechanization and Engineering Resource Network. The existing network of PHilMech shall be strengthened into an agri-fishery mechanization and engineering resource network. This network shall be utilized for the online registration of agri-fisheries machinery and equipment, and monitoring of agri-fisheries mechanization and infrastructure projects. It shall be linked to other existing information and database networks of the DA, the Department of Science and Technology (DOST), the Agricultural Mechanization Development Program (AMDP)-UPLB and other government agencies.
- 8. The UPLB-AMDP shall be a member of the National Committee on Agri-fisheries Mechanization and Engineering Resource Network (AFMechERN) to be created by DA chaired by PHilMech and co-chaired by DA-ITCAF. Other members of the national network shall include concerned government agencies such as BAFE, PhilRice, BAFS, BFAR, NAFC, UPLB-AMDP, DOST-PCAARRD, PSAE and AMMDA or other private agri-fishery machinery manufacturers, assemblers and distributors.

B. Role of UPLB-AMTEC on Testing and Evaluation, Registration, Standardization and Accreditation

Testing and Evaluation

- 1. The UPLB-Agricultural Machinery Testing and Evaluation Center (UPLB-AMTEC) in accordance with the national policies and guidelines to be promulgated by the Secretary, shall test and evaluate agricultural and fisheries machinery and equipment to be sold in the market shall pass through testing and evaluation. Moreover, the model of the machine and any modification, thereof should be tested by the AMTEC and should pass the prescribed quality and performance standards machinery prior to their assembly, manufacturing and selling in market. AMTEC shall conduct regular testing and evaluation of machinery sold and new models and design. Moreover, it shall conduct field tests of test and commercial units to ensure consistent quality. The BAFE shall maintain a certification registry of equipment and machinery as well as a registry of those denied certification.
- 2. AMTEC shall be actively involved in the consultative process to be coordinated by the National A/F Council on A/F Mechanization Committee (NAFC-AFMeC) for the promulgation of national policies and guidelines on testing and evaluation of agricultural and fisheries machinery and equipment.
- 3. AMTEC shall conduct test and evaluation of an agricultural machinery and equipment before it can be assembled, manufactured and commercially sold in the market. The model of the machine and any modification thereof shall be tested by AMTEC according to the prescribed quality and performance standards of the Philippine Agricultural Engineering Standards (PAES).
- 4. AMTEC in consultation with BAFE and NAFC-AFMeC will establish an official evaluation scheme for the test results within six months after approval of the IRR of



RA 10601. The results of test will be evaluated based on prescribed quality and performance standards as stated in PAES.

Standards Development and Enforcement

- 1. AMTEC shall be involved in the development of standards specifications and test procedures of agricultural and fishery machinery and equipment that conform with the International Standards Organization (ISO) and shall be part of the existing Philippine Agricultural Engineering Standards (PAES).
- 2. The development of standards specifications and test procedures shall be headed by DA, through the Bureau of Agriculture and Fisheries Product Standards (BAFPS), in coordination with the DTI, the DOST, the Board of Agricultural Engineering (BOAE) and the AMTEC, and in consultation with the accredited associations of farmers and fisherfolk, agricultural machinery assemblers, manufacturers and distributors and agricultural engineers. The prescribed standards on the manufacture, sale and distribution of agricultural and fisheries machinery and equipment, and its accreditation system for agricultural and fisheries facilities and establishments shall be enforced by DA and the LGUs, in collaboration with the BoAE.
- 3. AMTEC shall be involved in the development of new standards and update existing standards under the Philippine Agricultural Engineering Standards which include irrigation, farm-to-market, post harvest facilities and other agricultural engineering facilities and equipment. This activity shall be lead by BAFS in collaboration with BAFE and concerned DA bureaus and attached Agencies, BOAE, DTI, DOST, including AMTEC. The standards to be developed should be towards the attainment of international standards and shall be part of the existing Philippine Agricultural Engineering Standards (PAES).
- 4. The AMTEC of CEAT-UPLB, the designated as the premier and reference testing center in the country, is institutionalized to implement the law. It shall closely coordinate its activities with the BAFS and BAFE for purposes of functional coordination and integration. It shall assist the BAFS in the formulation of quality, safety and performance standards of agricultural and fisheries machinery and of accreditation guidelines for testing centers. It shall also provide technical assistance in the establishment of testing centers in other parts of the country.
- 5. The AMTEC shall closely coordinate its activities with BAFE and BAFS. It shall assist the BAFS in the formulation of quality, safety and performance standards of agricultural and fisheries machinery and accreditation guidelines for testing centres and shall coordinate with BAFE on the establishment and operationalization of the testing centres.
- 6. To upgrade the AMTEC and to establish one (1) testing center in Visayas and one (1) testing center in Mindanao, the DA shall likewise set aside funds from the Agricultural Competitiveness Enhancement Fund (ACEF) for grants.

VI. The Agricultural Mechanization Development Program (AMDP)

Mission, Vision and Objectives

ESCAP CSAM

The AMDP of IAE-CEAT, UPLB for almost 36 years had been actively contributing to the three (3) major functions of the UPLB in instruction, research and extension/public service. Since AMDP¢s establishment in 1979, it had produced and promoted farm machineries to farmers and clients, conducted technology & information dissemination through exhibits, pilot testing, demonstration of machines, publication of extension materials (bulletin, refereed and non-refereed journals, and leaflets, AUTOCAD drawings etc.) and conducted training for various beneficiaries (e.g. farmers and women-farmers, local manufacturers/fabricators, machine operators, cooperative enterprises).

AMDP continues to develop more technologies, provide technical assistance, promote farm technologies to improve farm operations and technical efficiencies of machines, reduce farmersø drudgery, provide value-added to farmersø crops, and provide technical assistance to establish agro-industrial enterprises.

AMDPøs vision centers on excellence in Research, Development and Extension (RDE) committed to agri-fisheries and biosystems mechanization in the Philippines responsive to the challenges of food security, energy sustainability, environmental protection, climate change and globalization.

Its mission is to provide innovative agri-fisheries and biosystems mechanization technologies through cutting edge research, strategic extension delivery methods, synergistic networking, and responsive policy advocacies towards environment-friendly, gender sensitive, and sustainable agri-fisheries and biosystems modernization.

The general objective of the AMDP is to deliver mechanization RDE solutions to address the needs of agri-fisheries sector pertaining to food and nutrition security, energy security/sustainability, integrated natural resources/environmental protection, and climate change towards a modernized Philippine agriculture. Specifically, it aims to:

- 1. Consolidate its role as an academic-based RD&E institution for agri-fisheries and biosystems mechanization;
- 2. Expand its functions and capabilities, as mandated by law, to participate in the national mechanization programs by leading and coordinating the agri-fisheries and biosystems mechanization RDE of all academic institutions in the country;
- 3. Improve the production and post production operations of the agro-fisheries sector;
- 4. Improve the local manufacturing system and forge linkages with foreign counterparts;
- 5. Develop agri-fisheries business enterprises through value adding to farm products;
- 6. Develop specialized technology packages for agri-aqua production and postproduction mechanization;
- 7. Increase adoption of agri-fisheries mechanization technologies;
- 8. Increase generation and adoption of renewable and other alternative sources of energy;



- 9. Strengthen RD&E capabilities through partnerships and collaborative undertakings with stakeholders of agricultural and fisheries mechanization; and
- 10. Improve agri-fisheries and biosystems support system through appropriate policy recommendations.

RDE Thrusts

Currently, the RDE thrusts of AMDP focus on food security, energy sustainability, environmental protection and climate change. Major RDE sub-programs of AMDP are corn, high-value crops, and renewable energy (Table 4).

| RDE THRUSTS | SPECIFIC RDE AREAS |
|--------------------------|--|
| Food Security | Crop, livestock and fisheries production mechanization |
| | technologies |
| | Aquaculture engineering |
| | Alternative food sources mechanization Postharvest |
| | mechanization |
| | Food and feed processing technology |
| | Precision agriculture and smart farming |
| | Contiguous farming system |
| Energy Sustainability | Energy-efficient technologies |
| | Renewable energy technology |
| Environmental Protection | Agro-waste management and utilization |
| | GIS for Mechanization (Agricultural Mechanization Planning |
| | and Monitoring) |
| | Soil and water conservation technologies |
| Climate Change | Land and water resources engineering |
| | Climate change mitigation and adaptation |

Table 4.RDE thrusts of AMDP

Strategies for implementation

The following key strategies are being implemented by AMDP in RDE project implementation:

- a. Conduct of collaborative applied research and extension projects in collaboration with industry partners (e.g. private entrepreneurs, manufacturers, LGUs, SCUs, enterprising farmers, etc.).
- b. Generation and development technologies and technology packages towards establishment of enterprises for the benefit of technology adopters.
- c. Utilization of participatory approaches in RDE projects such that project beneficiaries are involved in all phases of the research methodology/process to ensure technology needs and adopters.
- d. Collection of baseline information collection for every project and conduct of socioeconomic and impact studies



- e. Publication of RDE results in AMDPs journals the Philippine Agricultural Mechanization Journal (PAMJ) and the Philippine Journal of Agricultural and Biosystems Engineering (PJABE) for information dissemination.
- f. Adoption of other RDE principles of Department of Agriculture (food security, responsiveness to global free trade, environmental protection), UN-APCAEM (poverty alleviation, increased agricultural productivity, economic growth sustainability); and Millennium Development Goals (eradication of poverty and hunger, gender equality & women empowerment, environmental sustainability, global partnership for development) as guiding principles in conducting its developmental activities.
- g. Continue collaboration and strengthen ties with government partner institutions with Commission on Higher Education, Other UPLB collaborators, Department of Agriculture through the Philippine Council for Agriculture and Fisheries (DA-PCAF), DA-Bureau of Agricultural Research (DAB-BAR), DA-PHilMech, Department of Science and Technology (DOST), Center for Sustainable Agricultural Mechanization (CSAM) and other research government or private institutions to avoid duplication of efforts in RD&E

VII. Conclusion and Recommendations

Agricultural laws and policies are important instruments to modernize the agricultural state of the country. This has been demonstrated by the countryøs Asian counterparts like Korea, Japan, Taiwan and Thailand, which had implemented agricultural policies to modernize agriculture through land consolidation and mechanization.

Government efforts for the agricultural and fisheries sector have been truly demonstrated in the enactment of the law on promoting agricultural and fisheries mechanization development in the country or the Agricultural and Fisheries Mechanization Law of 2013 (R.A. 10601). The AFMech law focuses on the promotion of agricultural mechanization technologies for food security, increase farmersø income, improvement of the local assembly and manufacturing industry, development and enforcement of standards testing and evaluation, and registration of A/F machineries to ensure their quality and safety; and accreditation of suppliers, assemblers and manufacturers for their compliance to quality standards; improvement and strengthening of integrated support services for farmers and stake-holders for the successful operation and management of A/F mechanization projects.

The AMDP and AMTEC as academic-based institutions in UPLB have significant roles in the implementation of R.A. 10601. The UPLB-AMDP has an important function in the formulation of the National Agricultural and Fisheries Mechanization Plan (NAFMP) and leading and coordinating academic institutions in the formulation of the A/F RDE agenda. The past and current activities of AMDP on the development and promotion of mechanization technologies are evidence of its continuing efforts for the promotion of mechanization. UPLB-AMTEC also plays major function in the conduct of test and evaluation, and enforcement and development of standards for agricultural and fisheries mechanization technologies.

The Philippines has passed many laws supporting land consolidation/ contiguous farming and agricultural modernization. However, these past policies/laws need to be reviewed to learn from its successes and failures. Thus, these current laws and lessons learned from past



policies will set the direction and will aid in the attainment of the countryøs agricultural development.

Successful implementation of a national agricultural and fisheries mechanization program and the AFMech Law will involve the contributions of various stakeholders comprising of the farmer-fisherfolks and their associations or cooperatives, local agricultural machinery manufacturer/industry sector, local assemblers, machinery operators, R&D institutions, academic institutions, government and private institutions, extension workers, local government units. There should also be proper needs assessment and proper social preparation of farmer-beneficiaries for the introduction of appropriate mechanization for specific locations as key strategies of the mechanization program. Capability building for all stakeholders concerned should be done

In the end, political will, genuine concern for agricultural development of the country, and coordinated contributions of stakeholders are key factors for the successful and sustainable agricultural and fisheries mechanization development plans and programs.

The following recommendations are hereby forwarded:

- 1. There is a need to review past policies on contiguous farming and agricultural mechanization policies to evaluate and assess their impacts and learn from past mistakes.
- 2. There is a need to integrate all agricultural mechanization policies to implement an unified National Agricultural and Fisheries Mechanization Plan (NAFMP) as mandated by R.A. 10601. As such concerned agencies need to coordinate to implement the NAFMP. The current move of the government on -converging@efforts of line agencies is
- 3. The roles and functions of all stakeholders in government agricultural and fisheries programs should be clearly inculcated to parties involved to assure program success.
- 4. Monitoring and evaluation of the agricultural and fisheries mechanization plan should be regularly conducted to mitigate problems and strengthen positive outcomes during implementation.
- 5. Implementation of stricter rules, close monitoring of funds, and impact assessment schemes should be in placed to prevent wastage of government investments in agricultural development.

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CSAM, Centre for Sustainable Agricultural Mechanization, is a regional institution of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), based in Beijing, China. CSAM started operations in 2004, built on the achievements of the Regional Network for Agricultural Machinery (RNAM) established in 1977 with support of UNDP, FAO and UNIDO, and the United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery (UNAPCAEM). CSAM serves the 62 members and associate members of UNESCAP.

The vision of CSAM is to achieve production gains, improved rural livelihood and poverty alleviation through sustainable agricultural mechanization for a more resilient, inclusive and sustainable Asia and the Pacific.

CSAM's objectives are to enhance technical cooperation among the members and associate members of UNESCAP as well as other interested member States of the United Nations, through extensive exchange of information and sharing of knowledge, and promotion of research and development and agro-business development in the area of sustainable agricultural mechanization and technology transfer for the attainment of the internationally agreed development goals including the Millennium Development Goals in the Asia-Pacific region.

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