

PHiMech

ANNUAL REPORT 2012

At Full Throttle
to Modernize
the Agricultural Sector



Department of Agriculture
Philippine Center for Postharvest Development and Mechanization

PHilMech ANNUAL REPORT

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**PHILIPPINE CENTER FOR POSTHARVEST
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FOREWORD

The year 2012 marked another milestone in the history of PHilMech. For one, there was a change of leadership at the helm where the Department of Agriculture Secretary has appointed me as the new director for PHilMech. Also, there was a marked progress in the implementation of the rice mechanization program, a bold step to modernize the agriculture sector through the provision of rice farming equipment, machinery and systems. All these developments boil down to the agency's vision and mission to modernize and make more efficient and productive the agriculture sector. As such, this year marked our initial momentum to modernize the Philippine agricultural landscape at full throttle.



Correspondingly, there were new thrusts and directions emanating from the change in leadership. A new approach and paradigm in doing research and development (R&D) has shifted from the traditional approach. This requires adjustment to cope with the nuances of the new approach of "short duration high impact" R&D work. As such, there are new projects conceptualized and mainstreamed in the pipe line adapting to this new approach.

Despite this shift, a wide kaleidoscope of R&D results were churned out by PHilMech coupled with a wide range of extension support, education and training services.

For the R&D Cluster, PHilMech has developed new technologies from the Agricultural Mechanization Division and Bio-Process Engineering Division to include improved village corn mill for white corn, drying systems for granulated cassava, machine vision systems for white corn and rice, and the use of mango peels for pectin production,

to name a few.

In addition to this, the ESETS Cluster continued its effort to effectively disseminate R&D results through its various modalities of technology management; training; Information, Education and Communication design and development; enterprise development and technology demonstrations. For this year, ESETS Cluster has expanded its networks and linkages to enhance extension delivery system through the state colleges and universities (SCUs), the *Techno Gabay* Program and the private sector.

This year's highlights of accomplishments will be PHilMech's contribution to the bright prospects of modernizing the Philippine agricultural landscape. The new shift of approach in R&D work in postharvest and mechanization will surely boost the momentum to modernize the agriculture and fishery sectors.

"This year marked our initial momentum to modernize the Philippine agricultural landscape at full throttle"


REX L. BINGABING
Director IV

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AGENCY PROFILE

The **Philippine Center for Postharvest Development and Mechanization (PHilMech)** was formerly known as the Bureau of Postharvest Research and Extension (BPRE). It was created on May 24, 1978 through Presidential Decree 1380 to spearhead the development of the country's postharvest industry. It was known then as the National Postharvest Institute for Research and Extension (NAPHIRE).

As a subsidiary of the National Grains Authority (NGA) in 1980, PHilMech's powers and functions were expanded in line with the conversion of NGA to the National Food Authority.

In 1986, PHilMech moved to its new home at the Central Luzon State University compound in Muñoz, Nueva Ecija. The agency was transformed from a government corporation into a regular agency through Executive Order 494 in 1992. It was renamed as the Bureau of Postharvest Research and Extension (BPRE).

Then, pursuant to Executive Order 366 or the government's rationalization plan, BPRE became the Philippine Center for Postharvest Development and Mechanization (PHilMech).

For years now, PHilMech is engaged in both postharvest research, development, and extension activities.



Current Thrusts and Programs

1. Research and development
2. Extension support, education and training programs
3. Postharvest and other infrastructure development services

Major Frontline Services

1. Quick R&D services
2. Food quality and safety services
3. Licensing agreement with agricultural machinery manufacturing sector
4. Accreditation of agricultural machinery manufacturers for the industrial promotion program
5. Postharvest and mechanization scientific literature service
6. Extension support, education and training services
7. Farm and business advisory
8. Technical assistance on postharvest and mechanization

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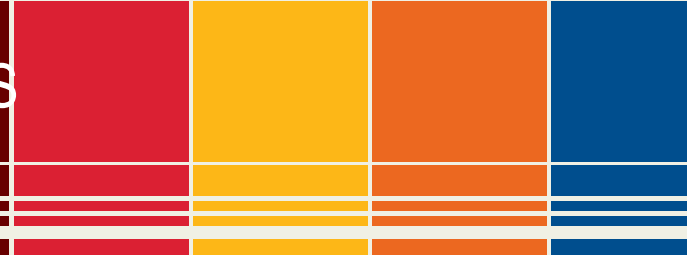
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OUR 2012 ACCOMPLISHMENTS



RD&E HIGHLIGHTS OF ACCOMPLISHMENTS

Efficient Drying and Dehydration

■ PHilMech has started developing drying systems for granulated cassava for animal feed ingredient. It involved establishment of some physical properties and drying rates of cassava from three methods of granulation, re-calibration of SHEGA III and IRRI moisture meters for granulated cassava, development of high-capacity belt dryer with biomass furnace and adaptation of flatbed dryer for granulated cassava. Laboratory drying experiments showed that granulated cassava could be dried at 50°C to 80°C without gelatinization of the outer portion of cassava particle. Calibration experiments showed that the two moisture meters were relatively suitable for estimating the moisture content of granulated cassava, with correlation coefficient of >0.90 and manually chopped error estimate of <1.0.

at the retailer's level should be designed at 104 kg per hour with cost of Php18,500 per unit. The computed IRR under this set condition is 44.40 percent.



Appropriate handling, storage and processing techniques

■ PHilMech is improving the design and performance of the existing village-type corn mill to meet the standards of the Philippine Agricultural Engineering Standards (PAES). In a study conducted by Agricultural Machinery Testing and Evaluation Center, all village type corn mills available in the country failed to meet the minimum quality standard particularly the degerminator efficiency and the product recovery. The project reengineered already the degerming and milling mechanisms of the white corn mill.

■ A survey among current brown rice consumers, retailers and millers across the country was conducted to assess the potential of the just-in-time hulling technology (JITHT). Results revealed that the proposed brown rice JITHT could well fit the business operations and requirements of 'regular rice retailers'. The capacity and price of the proposed JITHT

■ PHilMech is also developing production systems for off-season onion with the use of protective structures – a combination of rain shelter, raised beds and drainage system. On-farm trials were initially conducted in Nueva Ecija, Pangasinan and Nueva Vizcaya on experimental scale. Preliminary results revealed that bulb onion can be successfully produced even during rainy months using protective structures.

■ PHilMech developed a mechanical onion sorting table to address the technical issues concerning the quality of onions after mechanical sorting process. Studies show that size is just only one of the critical factors in onion sorting. Others include quality elements such as freshness, no damage, and form. Also, quality classification can only be done through ocular inspection and manual touch. The design features a motorized 12-meter rubber belt conveyor which serves as a sorting table. This allowed faster and easier sorting and inspection of onions.

■ The refrigerated van distributed to farmers associations can now accommodate commodities that require storage temperature above zero or ranging from 15 to 35 °C for short period of time. The original refrigeration system of these facilities has a temperature of -10 to 0 °C. Trials on tomatoes and onion are on-going.

■ Adlai (*Coix lachrymal-jobi L*) is one of the identified substitute food crops under the food self-sufficiency program of the government. To preserve the quality of Adlai in storage, three different storage containers are being studied at PHilMech. These storage containers include hermetic bag, tin can and ordinary sack. Initial results after 1.5 months storage of unmilled Adlai showed decreased fungal infection, microbial infection and insect infestation particularly in the hermetic bag storage.



■ Postharvest and processing systems for soybeans are being pilot-tested by PHilMech in CARAGA, a major producer of soybean in the country. The postharvest center is being operated for custom-servicing by Anahao Bag-o Farmers Association in Tago, Surigao del Sur. Another community-based processing center which processes soybean into milk, tokwa and taho is operated by the SCI Multi-purpose Cooperative. Both centers will provide PHilMech information about financial viability and social acceptability of the soybean technologies for evaluation.



■ An analysis of the supply chain towards the development of an integrated bulk handling system for corn from Mindanao to Manila and Cebu is being done at PHilMech. Initial results showed that farmers using traditional system are doing majority of the activities along the chain. Out of the total costs incurred by the chain from Mindanao to Manila and Cebu, farmers spent the highest; the rest of the costs are spread almost equal among the other actors such as trader, processor, shipper and consignee/distributor. Results also showed that farmers and processors received the highest income among the rest of the chain actors.

■ PHilMech conducted literature survey in several universities and research centers nationwide to formulate the list of existing thermophysical data of selected Philippine agricultural products and to identify the gaps based on the evaluation or synthesis of the data gathered. Results revealed that thermophysical property data of Philippine agricultural products are very limited or inadequate. In most cases, data were measured only on one specific variety in the fresh state at a narrow range of moisture content and temperature.

Mycotoxin, Pests and Diseases Prevention and Control

■ Pest resistance to phosphine, a widely known fumigant in controlling insect pests, has been threatening the food and feed industry.

Thus, PHilMech aims to assess the magnitude of phosphine resistance among different storage pests and establish effective concentrations of phosphine against insect pest. Results showed that *Tribolium castaneum*, *Rhizopertha dominica*, *Cryptolestes ferrugineum*, *Oryzaephilus surinamensis* and psocids exhibited phosphine resistance. *Sitophilus spp* are still susceptible to phosphine.



■ The use of botanical pesticides is being studied at PHilMech as alternative to the synthetic pesticides which have side effects both to humans and the environment. Among the eight botanicals tested, only Betel (*Piper betel*), known locally as *ikmo*, showed potential as botanical pesticide as it passed all the assays with significant effect on the mortality and growth of adult insect and fungal pathogens.

■ A digestive enzyme in the storage pest, cigarette beetle (*Lasioderma serricorne*), is being investigated at PHilMech through molecular biology techniques. Specific ribonucleic acids (RNA) of the enzyme are extracted and studied to analyze the enzyme's structures and action on several substrates. The idea of the study is to find the substances common and safe in human diet but have negative influence on the insect's digestion.

■ PHilMech is into the formulation of *Trichoderma harzianum* DGA02, a biocontrol agent, for

the control of crown rot disease of banana. It is hoped that the formulated strain DGA02 will be low of cost compared to the commercially available *Trichoderma*.

Agricultural waste and by-product utilization

■ To address the environmental hazard that could be brought by the residues of PHilMech rice hull-fed furnace, PHilMech is studying the conversion of carbonized rice hull into briquettes. Currently, various formulations are undergoing analysis in terms of physical and mechanical properties.

■ A PHilMech study revealed that the Philippine Carabao mango peels is a potential source of pharmaceutical grade pectin. The extracted product is in conformity to the United States Pharmacopia (USP) standards. It has a high galacturonic acid content and high degree of esterification.

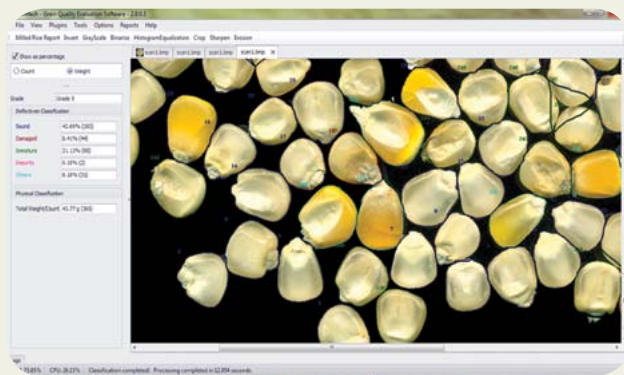


Appropriate Mechanization Technologies

■ PHilMech explored the computer vision system (CVS) for physical quality analysis of white corn. The system uses an artificial neural network (ANN) in

the quality classifications of white corn such as sound grains, damaged, immature/shrivelled, impurities and other color grains. Initial findings reveal that the PHilMech-developed CVS for white corn can analyze a 100-gram sample in less than 5 minutes at an accuracy of more than 95percent. Manual method consumes 30 to 60 minutes of analysis.

Subsequent to the development of computer vision system (CVS) for quality analysis of rice and yellow corn, PHilMech is conducting a field validation and acceptability test prior to its commercialization. This is being conducted at the National Food Authority and Agricultural and Mechanization Testing and Evaluation Center. The CVS addresses the problem on the tedious and subjective manual method of analysis. The CVS can evaluate the quality of grains in less than 10 minutes compared to 30- 60 minutes in manual method.



To assess the level of mechanization and the factors influencing mechanization of rice and corn farms in the country, a one-shot cross-section survey and interview of farmers were conducted in major production areas. Preliminary analysis of Region 2 data showed that rice farm operations in Isabela such as tillage and threshing are already mechanized with 78, 87 and 95 percent of the respondents mechanizing plowing, harrowing and threshing operations, respectively. Mechanical harvesting using combine harvester is gaining popularity with 10 percent of the respondents adopting the technology.

Empowered Stakeholders Towards Profitable Entrepreneurship

The enterprise capability of cashew processors in Nueva Ecija, Zambales and Occidental Mindoro were enhanced by PHilMech through training courses, assistance in the preparation of business plans for expansion and design conceptualization of product labels of cashew products. Last year, cashew processors purchased 24 PHilMech cashew nut shellers and 2 charcoal fired-ovens.

The establishment of the Multi-Commodity Solar Tunnel Dryer (MCSTD)-Based Enterprises is being accelerated by PHilMech through technical briefings and visits to MCSTD sites and social laboratory area. For those who underwent training on processing, the following started their MCSTD-based enterprises in 2011: (1) Sula RIC, Vinzons, Camarines Norte (2) Gonzaga, Cagayan,(3) San Ramon Gabi Producers, Nabun, Camarines Sur, and (4) Castilo Fish processors in Cabusao, Camarines Sur. To date, there are already 16 existing MCSTD-based enterprises and 16 more units will be established.

PHilMech is providing technical assistance for postharvest enterprise development. In 2012, PHilMech prepared feasibility studies on the establishment of mango processing center in Puerto Princesa City, Palawan; establishment of cold storage for red creole onions in Umingan, Pangasinan; application of irradiation technology for the preservation of food and non-food commodities. Feasibility studies related to the establishment of RPC being implemented by the Agri-Pinoy Rice Mechanization Program at Zamboanga del Sur and Pangasinan.

In 2012 under its applied communication program, PHilMech packaged and disseminated 54 kinds of postharvest and mechanization information materials. This consisted of 26 publications, 14 news and features, 15 audio-visual materials, and broadcast interviews. All in all, PHilMech produced a total of 95,188 Information, Education and Communication (IEC) materials. Meanwhile, PHilMech assisted

2, 227 Scientific Literature Services (SLS) users, briefed 83 batches or 3,005 visitors, and participated in 19 agricultural trade fairs and exhibits during the year.



To maintain a dynamic pool of postharvest experts in the country, PHilMech continuously trains intermediaries on postharvest and mechanization through its regular training, special training and technical capability enhancement courses. In addition to these activities, a national technical conference and technical symposium on postharvest and mechanization were conducted with 439 participants from the DA-Regional Field Units, provincial local government units, farmer-leaders and technical staff from other agencies. For its special projects, PHilMech trained the would-be management team of the Rice Processing Complexes in Pangasinan, Iloilo, Bohol and Davao.



PHilMech established 17 strategic pilot technology demonstration sites nationwide to showcase the benefits of the biomass-fed furnace retrofitted to mechanical dryers. This is aimed at boosting utilization of mechanical dryers because of reduced losses and cost of drying. As an off-shoot of the aggressive promotion of the project, about 300 purchases of biomass furnace were reported by PHilMech-icensed manufacturers nationwide as of December 2012.

Under the PHilMech Industrial Promotion Program, local manufacturers are being tapped in the fabrication and commercialization of postharvest technologies. A technology licensing protocol was developed to maintain a systematic and uniform procedures for the transfer and commercialization of any technology developed by PHilMech. Two licenses to manufacture were granted to Design 360° Engineering and Advertising of Nueva Ecija and Agustin Engineering Services of North Cotabato. Renewal of license to manufacture was also issued to Suki Trading Corporation in Central Visayas. Technical assistance was also provided to five manufacturers in 2012 to ensure strict compliance with the specifications during the prototyping of the technology.

PHilMech spearheads the implementation of the Rice Mechanization and Postharvest Program of the Department of Agriculture. Series of roadshow, technical workshops, and skills training on the technical evaluation of the machinery were conducted in 2012.

This year, a total of 16 agricultural tramline units were installed serving 1,280 HVCC farmers nationwide. This facility is being used to transport agricultural inputs, and farm produce from and to isolated areas due to ravines, rivers, and thick vegetations. Additional 30 units have been started for implementation. There are expected to be finished in the middle of 2013.

Onion hanger technology, a storage facility, is established in major onion producing areas to aid the farmers in the handling and temporary storage

of their produce, shielding them from very low farm gate prices. PHilMech leads the implementation of this project and is funded by the Department of Agriculture-High Value Crops Development Program. Farmers in Ilocos Sur, Nueva Ecija, Nueva Vizcaya, and Occidental Mindoro are the farmer-partners in this project.

■ The cold chain project of the Department of Agriculture and PHilMech aims to establish link between the producers and potential markets through the provision of postharvest and marketing infrastructure. In 2012, the project has finished the distribution of the remaining cold chain facilities and continued the monitoring and provision of technical assistance to project cooperators.

■ There were two Rice Processing Complexes inaugurated in 2012. This facility enables sequential postharvest operations such as drying, temporary storage and milling using state-of-the-art technologies. PHilMech is spearheading the establishment of this KOICA-assisted project. This year, the RPC Pangasinan, on its second year of operation, has procured 1, 762 MT of paddy from farmers' organizations and individual farmers. Meanwhile, the RPC Davao del Sur is expected to be completed in the 1st quarter of 2013.



■ The formulation of postharvest and mechanization research, development and extension agenda for key commodity concern of the agency is one of the major activities conducted by PHilMech through its Planning, Management and Information Technology Division (PMITD). Focus group discussions, rapid rural appraisals, key informant interviews and literature search are being adopted as means of gathering benchmark information that serves as inputs in the crafting of the agenda.

■ PHilMech regularly monitors and evaluates its programs, projects and activities to assess its performance and achieve desired results. Monitoring and evaluation results serve as a management tool in making necessary decisions for the improvement of project implementation. In 2012, PHilMech conducted monitoring and evaluation activities like the annual agency in-house research and development review, midstream agency performance and budget review and other activities like program monitoring and on-site monitoring or field validation for both on-going and completed projects.

■ At the forefront of the latest information technology, system development and geomatics, PHilMech also taps the huge potential of internet by bringing information systems online. These information systems developed by PHilMech include vehicle information monitoring system, project monitoring system, postharvest facilities information system and postharvest infrastructure system.



RESEARCH AND DEVELOPMENT

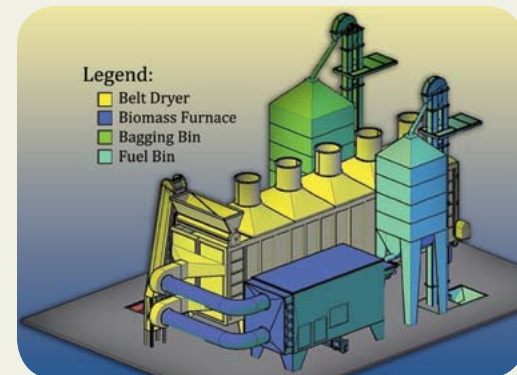
Development of Drying Systems for Granulated Cassava as Animal Feed Ingredient

The project was conducted to develop systems of drying granulated cassava for animal feed ingredient. It involved establishment of some physical properties and drying rates of cassava from three methods of granulation, re-calibration of SHEGA III and IRRI moisture meters for granulated cassava, development of high-capacity belt dryer with biomass furnace and adaptation of flatbed dryer for granulated cassava.

Results of laboratory experiments showed that bulk density of freshly granulated cassava ranged from 598 to 633 kg/m³. Particle size distribution showed that existing granulating machines produced large variation in particle size and large amount (24 to 35 %) of undesirable small particles (<6 mm). Resistance to airflow experiments showed very low pressure drop values of not more than 1 mm at superficial air velocity of 0.3 m/s and bed depth of up to 0.2 m. Laboratory drying experiments showed that granulated cassava could be dried at 50°C up to 80°C without gelatinization of the outer portion of cassava particle. At 80°C and 0.05 m bed depth, drying granulated cassava from initial moisture content of 60 percent to final moisture content of 13 percent would take two hours to five hours depending on particle sizes.

Manually chopped cassava with relatively large particle sizes tended to dry slower than cassava from granulator with relatively smaller particle sizes. Calibration experiments showed that the re-calibration curves for SHEGA III Moisture Meter (originally developed for paddy and corn) and the IRRI Moisture Meter (originally developed for paddy) were relatively suitable for estimating the moisture content of granulated cassava, with correlation coefficient of >0.90 and manually chopped error estimate of <1.0.

A pilot scale belt dryer with biomass furnace was developed, designed to dry granulated cassava from initial moisture content of 60 percent to 13 percent final moisture content at the rate of 500 kg/h,



Isometric View of the Cassava Belt Conveyor Dryer



Prototype mixer for drying granulated cassava in flatbed dryer.

drying temperature of 80 °C and drying residence time of 2.5 hours. The pilot-scale dryer was tested and results served as basis for the design and development of a full-scale belt dryer with input capacity of 400 kg/h.

Results of tests showed that the full-scale belt dryer with biomass furnace had great potential for drying granulated cassava. Finally, results showed that retrofitting a mixer to a flatbed dryer would reduce drying time from 16 hours to 12 hours when drying 2.5 tons of granulated cassava at 45 °C. The developed mixer had great potential in reducing drying cost.

Development of Improved Village-Type Corn Mill for White Corn



Prototype village type corn mill

Different designs and kinds of existing village-type cornmill for white corn have been tested and evaluated in different areas of the country in order to determine the technical performance, weaknesses and strengths of each design. The result of testing and evaluation have been used as one of the basis in coming up with an improved design to meet performance standard set by the Philippine Agricultural Engineering Standards (PAES).

Based on the result of performance tests conducted by the Agricultural Machinery Testing and Evaluation Center (AMTEC), all village type cornmills available in the country failed to meet the minimum quality standard for cornmill particularly the minimum degerminator efficiency and the product recovery of

64 percent and 80 percent, respectively. In relation to this, the project aimed to develop an improved village type cornmill for white corn.

This project already came up with appropriate design for the degerming and milling mechanisms of the village type corn mill. The degerming mechanism is the process of removing the hull of the corn grain while the milling mechanism is the process of reducing and grading into different sizes of corn grits (Grit # 10, 12, 14, 16 & 18).

The project is being implemented in support to the government's thrust of ensuring the availability of good quality corn grits even in the remote areas.

Ex-ante Analysis for the Development of Brown Rice Just-In-Time Hulling Technology



The potential of the proposed just-in-time hulling technology (JITHT) has been analyzed using 174 respondents among current brown rice consumers, retailers and millers across the country. The process and findings that emerged in this research helped resolve the management decision problem and the marketing research problems of whether PHiMech shall proceed in the development of household type brown rice huller; and if there are potential buyers, what are the basic features of the proposed JITHT that the target buyers prefer.

The result of the survey revealed that one out of two consumers and retailer- respondents have shown interest on the proposed JITHT. By applying both the qualitative and quantitative analysis suggested by the World Bank and other international institutions in evaluating investments in research and extension projects, this research has successfully established technical and financial parameters to enable the proposed JITHT to become acceptable and viable to the target end-users.

Given the current low level of household consumption of 2.80 kg per week, the proposed JITHT is highly feasible at 12 kg per hour at a price of Php8,500 per unit at the consumer's level. The computed IRR

under this set condition is 57.72 percent. Likewise, the research has successfully segmented the type of current rice retailers in order to identify the most potential buyers of the proposed JITHT at the retailer's level. The result revealed that the proposed brown rice JITHT could well fit the business operations and requirements of 'regular rice retailers'. This group of rice retailers is basically those stores in the ordinary market that packaged brown rice as healthy or organic rice. The capacity and price of the proposed JITHT at the retailer's level should be designed at 104 kg per hour with cost of Php18,500 per unit. The computed IRR under this set condition is 44.40 percent. Using Probit regression analysis, the research has established the socio-economic factors that may influence the potential adoption of the proposed technology both at the consumers' and retailers' levels.

Clearly, the development and the eventual commercialization of the proposed JITHT shall be aggressively pursued by the government to promote wider adoption of brown rice in the country. This policy program and direction shall be embraced by the government as one of the enabling mechanisms to collectively achieve and sustain food-self sufficiency in the country in the future.

Technology Development and Commercialization for the Production of Year-Round Supply of Bulb Onion

The project was motivated by the effort of the Department of Agriculture to push for the local production of onion during off-season to augment domestic supply and gradually cut down importation.

The project intends to develop production systems for off-season onion with the use of protective structure which is a combination of rain shelter, raised beds and drainage system. The rain shelter is built on bamboo hoops and purlins covered with UV-stabilized plastic for simplicity of construction and cost effectiveness

On-farm trials were initially conducted in the provinces of Nueva Ecija, Pangasinan and Nueva

Vizcaya on experimental scale. Preliminary results revealed that bulb onion can be successfully produced even during rainy months using protective structure. Direct seeded onion in rows showed better results in terms of bulb size, mortality rate and early maturity compared to transplants. While production trials were conducted in experimental scale, the project attained a yield of 875 kg if projected in an area of 1,000 m². With a farm gate price of P75/kg, which was the prevailing price during the time of harvest, gross revenue was P65,625. Deducting the cost of inputs, labor and the cost of protective structure, there was a net income of P34,210 for an area of 1,000 m². The cost of putting up the protective structure was estimated at P9,710 to cover an area of 1,000 m².



Experimental set-up using a protective structure



The cooperators showing his harvest of white onion variety

Modification and Field Testing of Mechanized Onion Sorter



A motorized continuous rubber belt conveyor was used in the onion sorting table. Adjustable bridges were installed perpendicular to the path of the conveyor movement to allow sorting of sizes. These bridges are adjustable to provide variable clearances depending on the required size of onions.

Test results of new design showed no damages in the sorted onions. For yellow granex variety, the rated capacity was at an average of 19.61 kg/min of yellow granex onions projected at 11,675.70 kg/day for a 10-hr/day operation and is equivalent to 471 sacks of yellow granex onions per day. While for the red creole onions, the rated capacity was 734.95 kg/hr projected at an average 7,349.46 kg/day for a 10-hour operation which is equivalent to 294 sacks of red creole onions at 25 kg per sack. Under in-house testing, no spillage of samples was encountered and no onion was stuck in any part of the machine compared to the first three modifications. Usage of the conveyor type allowed removal of deteriorated and reject onions.

Mechanical onion sorting table was developed to address the technical issues concerning quality of onions after mechanical sorting. These include (1) high mechanical damage due to slicing, (2) mechanically damage/sliced onions mixed with the good ones, (3) large proportion of fallen good onions during testing from the unloading section, (4) use of equipment requiring additional laborer to separate the damaged onions before bagging and, (5) non-removal of soil attached to the onion bulbs.

Studies show that size is just one of the critical factors in onion sorting. Other quality aspects include freshness, no or minimal damage, and form. These three aspects of quality can only be achieved by using a conveyor type as it allows manual sorting of onions with variable quantifications. Also, quality classification can only be done through ocular inspection and manual handling.

Profitability of using the machine is to be tested by commissioning the machine at a trading level. Onion damages from mechanical sorting were effectively avoided. Further improvement can still be done to minimize human intervention in sorting.

Technology Support to the National Cold Chain Program

The Philippine Center for Postharvest Development and Mechanization (PHilMech) had distributed several units of refrigerated van from 2007 to 2011 to farmers' associations/ cooperatives through the Department of Agriculture Cold Chain Program. The van is equipped with refrigeration system capable to maintain a storage temperature ranging from -10 to 0 °C. This type of facility was found very useful in storing and extending the shelf-life of selected agri-fishery and livestock products, which requires storage temperatures below zero (e.g. meat, fish and onion) for long term storage (6-9 months). To maximize its utilization, the refrigeration system of the existing 20 footer ref van was retrofitted with a 2.5-hp air-

condition unit. The new system can accommodate other commodities that require storage temperatures above zero or ranging from 15 to 25 °C, such as tomatoes and onion for short term storage (2-3 months).

Currently, the project is undergoing storage experiment for tomatoes (Diamante and F1 var.) and onion (Yellow granex) using ref van (16 ± 1 °C) and ambient condition (30 ± 2°C). Initial results showed that the tomatoes stored in ref van have better quality in terms color, firmness and texture compared to samples stored in ambient condition. Storage experiment for onion is on-going.

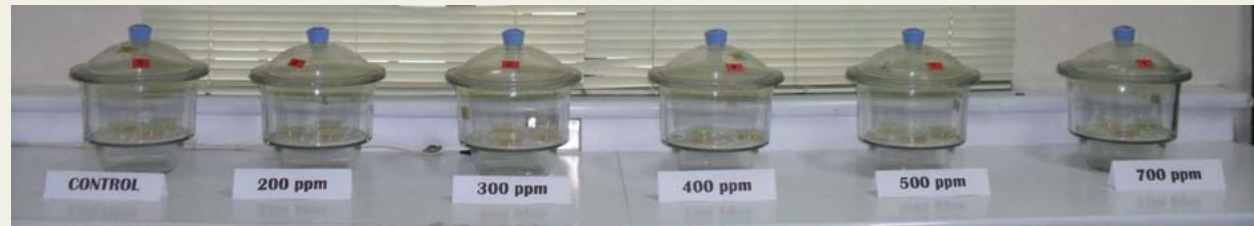


Cold storage facility



Experiment set-up for tomatoes

Resistance of Storage Insect Pests to Phosphine



Pest infestation continues to be the most serious constraint in the safe storage of grains. In the food and feed industry, fumigation is a pest control strategy used to disinfest stored products. However, the occurrence of phosphine resistance in major storage pests like the lesser grain borer, and the sporadic reports of its ineffectiveness against other pests like mites and psocids threaten the industry.

This study aims to assess the magnitude of phosphine resistance in different storage pests and establish effective concentrations against the adults and the developmental stages of insect pests to phosphine.

Insects were collected from Ilocos Norte, Ilocos Sur, La Union, Pangasinan, Isabela, Nueva Vizcaya, Quirino, Nueva Ecija, Tarlac, Pampanga, NCR, Cavite, Misamis Occidental, Misamis Oriental, Iligan City and Bukidnon. Insect species collected were *Rhyzopertha dominica*, *Sitophilus spp.*, *Tribolium castaneum*, *Cryptolestes ferrugineus*, *Oryzaephilus surinamensis*, *Liposcelis bostrychophilus*, *Lasioderma serricorne* and *Latheticus oryzae*. Mites species collected were identified as *Suidasia pontifica*, *Cheletus malacensis* and *Blattisocius keegani*.

Adult insects were tested for resistance using the recommended discriminating dose test of the Food and Agriculture Organization of the United Nations. Results showed that phosphine resistance is present in *Tribolium castaneum*, *Rhyzopertha dominica*, *Cryptolestes ferrugineus*, *Oryzaephilus surinamensis* and psocids. These strains were collected

from public and private warehouses in Regions I, II, III and NCR. On the other hand, all strains of *Sitophilus spp* tested were still susceptible to phosphine. The susceptible strains of *Sitophilus spp.* were collected from Regions II, III and NCR.

Full assay tests will be conducted to establish resistance levels and effective phosphine concentrations for adults and all insect developmental stages.



Storage of Adlai

Adlai (*Coix lachryma-jobi L.*), also known as coix or Job's Tears is a minor grain crop grown in Asia that belongs to family Poaceae or the grasses, the same family that wheat, corn, and rice belong. Identified as one of the substitute food crops under the food self-sufficiency program of the government, Adlai is considered a priority crop of the Department of Agriculture (DA), under its High Value Crops Development Program (HVCDP).

The objective of the study is to evaluate the interventions that can be used to preserve the quality of Adlai in storage.

Adlai in unmilled form were stored at three different storage containers such as hermetic bag, tin can and ordinary sack and stored at ambient condition for six months.

In order to determine the effect of moisture content on the safe storage, Adlai at two different levels of moisture content will be evaluated. Periodic sampling of the grains in a monthly interval will be carried out. Efficacy of the storage containers in preserving the quality of Adlai and protecting the seeds from insect infestation, and fungal infection as well as maintaining the germinability of seeds were evaluated.

Initial results showed that Adlai seeds with 10 percent moisture content have an initial fungal infection of 74 percent before the start of storage test. After 1.5 months of storage in hermetic bag, fungal infection was reduced to 32 percent, while adlai seeds stored at tin cans and polyethylene bag were found to be infected with fungi at 72 and 34 percent, respectively. On the other hand, initial 83 percent fungal infection was recorded in Adlai seeds having 12 percent moisture content before the start of storage. Microbial infection after 1.5 months decreased to 70, 84 and 49 percent using hermetic bag, tin can and polyethylene bag, respectively.

In terms of insect infestation, Adlai seeds with 10 percent moisture content and stored in hermetic bag have slight infestation (1 alive insect/1.5 kg) after 1.5 months of storage compared to Adlai seeds stored in tin can and polyethylene bag with significantly higher infestation (2-10 insects/1.5 kg). Meanwhile, Adlai seeds with 12 percent moisture content stored in said test containers were found highly infested (2-25 insects/1.5 kg). Evaluation of the efficacy of test containers will continue for six months.



Pilot Testing of Postharvest and Processing Systems for Soybeans

The Department of Agriculture (DA) through the High Value Crops Development Program (HVCDP) identified soybeans as one of the banner commodities for development. For its share in the development of the soybean industry, PHilMech was tasked to look into the development of appropriate postharvest technologies.

For the year 2012, PHilMech implemented the project entitled, "Pilot Testing of Postharvest and Processing Systems for Soybeans in CARAGA" which aims to establish community-based postharvest and processing centers from where information on the financial viability and social acceptability of the technologies will be evaluated. CARAGA was chosen as the pilot area because it is the major producer of soybean in the country. The postharvest center is equipped with double drum multi-crop thresher, PHilMech-designed sorter/grader, all weather dryer and moisture meter. These were operated for custom servicing in August 2012 by Anahao Bag-o Farmers Association based in Tago, Surigao del Sur.

On the other hand, a community-based processing center which process soybean into milk, tokwa and taho was established in Tandag, Surigao del Sur last October 2012. The cooperator of the project is SCI Multi-purpose Cooperative. Processing operations started in February this year. The initial processing operation is implemented by the project team until such time that commercial operation has stabilized. Thereafter, the cooperator takes full control of the processing operations.



Testing of soybean threshers

Value Chain Analysis Towards the Development of an Integrated Bulk Handling System for Corn from Mindanao to Manila and Cebu

One of the government projects that addresses the processing and marketing inefficiencies of the Philippine corn industry is the Corn Processing and Trading Center (CPTC) implemented by the National Agribusiness Corporation (NABCOR). The CPTC partially adopts bulk grain handling technology which requires greater coordination among farmers, processors, retailers and other key stakeholders. The shift in concentration to processing, trading, and marketing practices pose greater challenges to the chain actors.

The results of the initial operations of the CPTC must be understood in order to formulate policy directions and strategies aimed at improving the performance and competitiveness of key stakeholders in the corn grain supply towards an integrated bulk handling system.

Initial results of the study showed that farmers using traditional system were doing majority of the activities along the chain. Out of the total costs incurred by the chain from Mindanao to Manila and Cebu, farmers spent the highest while the rest of the costs were spread almost equally among the other actors such as (trader, processor, shipper and

consignee/distributor). Moreover, results showed that farmers and processors received the highest income among the rest of the chain actors. With bulk handling system, the cost of handling corn from farm to end users could be reduced by 29 percent and income could be increased by 48 percent. With the new system, the bulk of the costs as well as the income are shared by the farmers and processors.

Problems identified by the farmers include unfavorable weather condition, lack of finances and laborers, unpaved farm to market roads, high transport costs, low and fluctuating price and lack of price information. On the other hand, traders, processors, distributors and feedmillers identified the following problems: low quality corn, supply shortage and high price of corn. The problem of the shippers is the lack of infrastructure at the port.

Compendium of Thermophysical Properties of Selected Philippine Foods and Agricultural Materials (Phase 1)

A literature survey was conducted in several universities and research centers nationwide to formulate the list of existing thermophysical data of selected Philippine agricultural products and to identify the gaps based on the evaluation or synthesis of the data gathered.

Results revealed that thermophysical property data of Philippine agricultural products are very limited or inadequate. In most cases, data were measured only on one specific variety in the fresh state at a narrow range of moisture content and temperature. Philippine agricultural products with available thermophysical data are carabao mango, cassava chips, eggplant, ginger, soya meal, bamboo shoot, jathropa seeds, black pepper, carabeef, and seaweeds.

Extensive data on experimental values of thermal and physical properties of foods have been reported in literature but no local researches were conducted to determine the thermophysical properties of Philippine varieties of coffee, cacao, cassava, rice, corn, legumes (peanut and soybean), onion, garlic, tomato, carrots, banana- saba cultivar and calamansi. Published data are mostly results of measurements conducted in other countries. However, these data are variable, scattered and information about the origin (variety or cultivar), chemical composition and structure of the product, processing conditions and error in measurement are often not reported and not sufficient for the data to be useful to other users.



Screening and Evaluation of Botanical Pesticides



Bio-assay using piper betel extract

As biological relationships between food and pests are being explored to discover long lasting solutions, new alternatives for pest control need to be developed. One of the possible alternatives which most developing countries recognize is the use of botanical pesticides because these are safe to the environment, mammals and non-target arthropods. Their local availability can also reduce cost of production.

The study explored eight botanical plants which include Betel (Filipino, ikmo; sn, *Piper betel*), Fish Poison Tree (Filipino, bituon; sn, *Barringtonia asiatica*), Stink Grass (Filipino, kantutay; sn, *Lantana camara*), Anobrang (Filipino, anobrang; sn, *Callicarpa cana*), Devil Weed (Filipino, hagonoy; sn, *Chromolaena odorata*), Bayating (Filipino, bayating; sn, *Tinomisium philippinense*), Jatropha (Filipino, tubang-bakod; sn, *Jatropha curcas*), and Acacia (Filipino, acacia; sn, *Samanea saman*). The botanical plants were assayed against stored product insect pests (maize weevil, *Sitophilus zeamais*; rice weevil, *Sitophilus oryzae*; red flour beetle, *Tribolium castaneum*; and

lesser grain borer, *Rhyzopertha dominica*) and fungal plant pathogens (*Aspergillus flavus*, *Lasiodiplodia theobromae*, *Fusarium verticilloides*, and *Colletotrichum gloeosporioides*).

Among the eight botanicals, only Betel passed all the assays with significant effect on the mortality of insect adults and growth of fungal pathogens.

A Midgut Trypsin-Like Enzyme in the Cigarette Beetle (*Lasioderma serricorne* Fab): Molecular Cloning and Biochemical Studies

The desire of both producers and consumers for quality food production and storage prompted intensive and extensive control measures against arthropod pests. So far, the most useful measure includes the application of synthetic pesticides, but it has caused side-effects that can endanger human health and the environment. These possible threats drive researches back to the relationship between food and pests to further examine underlying physiological connections in order to gain understanding and design long lasting control measures.

An area of exploration is the close relationship between the arthropod diet and its digestive enzymes. An arthropod surviving on a diet can mean that it has digestive enzymes able to render the ingested food useful to its body processes. Similarly, if the food has dormant toxic substances against it, it has no enzyme efficient enough to activate such substances and thus enabling it to survive on the diet. This relationship means that any measure exploiting the close connection of digestive enzymes and their substrates can influence the growth and survival of insects. A potential idea is to find substances common and safe in human diet but can influence negatively insect digestion by enzymes. Understanding such relationships may contribute to finding long lasting control safe to human health and the environment.

The study seeks to investigate a digestive enzyme in the cigarette beetle, *Lasioderma serricorne*, a stored product pest, through molecular biology techniques, by extracting and studying specific ribonucleic acids (RNAs) used in making the enzyme in the insect gut. The enzyme is termed trypsin-like enzyme, and information of the full sequence of its RNA can facilitate the investigation of the enzyme's structure and action on several substrates. Three different partial fragments, representing RNAs suspected to be those of the enzyme and its variants,

were obtained from Rapid Amplification of cDNA-Ends (RACE), a method that allows investigation by reproducing fragments to detectable levels. The study will further conduct another form of RACE to get the full sequence of the RNAs. Once the full sequences are obtained, these will be used to express the protein enzymes in a laboratory experiment, and substrate assays will be conducted to characterize their specific actions.



Image: <http://old.padil.gov.au>

Formulation of *Trichoderma harzianum* DGA02 for the Control of Crown Rot Disease of Banana

Genus *Trichoderma* is considered an effective antagonistic fungus to many plant pathogenic fungi and soil borne fungi. For this biocontrol agent, commercial formulations are available as wettable powder, granular formulations, pelleted formulation, and liquid formulation. These formulations are developed and available in Australia, Canada, Denmark, Germany, Italy Mexico, Netherlands, Spain, Sweden, and USA. In the Philippines, local formulation is not yet available. Previously though, PHilMech isolated strain DGA02 of *Trichoderma harzianum* that was effective against banana crown rot-causing pathogens.

the formulated product against major postharvest pathogens of banana fruit.

It also aims to formulate strain DGA02 at a much lower cost compared to commercially *Trichoderma* biocontrol material. With the development of this sustainable product, a great economic advantage, and healthy and safe agricultural produce will be derived, thus benefiting the consumers.

This study aims to develop and formulate the strain DGA02 of *T. harzianum* and test the efficacy of



Various liquid formulations of DGA02 under laboratory and field evaluations against crown rot causing pathogens

Utilization of Biomass Furnace By-products as Fuel Briquettes

The PHilMech rice hull-fed furnace system was developed to solve the problems of high cost of heating fuel such as oil, kerosene, Liquefied Petroleum Gas and other fossil-based fuels. The developed furnace system also produces carbonized materials. Briquetting or conversion of the carbonized material into a densified form helps to solve the problem of residue disposal, increases the net calorific value per unit volume, provides easy transport and storage, and produces uniform fuel in size and quality.

Currently the project team has developed/ prepared 18 formulations in producing fuel briquettes derived from biomass by-products using piston and screw type briquetting machines. Determination and analysis of physical and mechanical properties of the fuel briquettes at different treatments is on-going.



Laboratory testing of different carbonized rice hull briquette formulations



Utilization of Mango Peels as Source of Pectin



USP Grade Apple Pectin and the Mango Peel Pectin



Philippine Carabao Mango Peels



Pectin powder extracted from mango peels

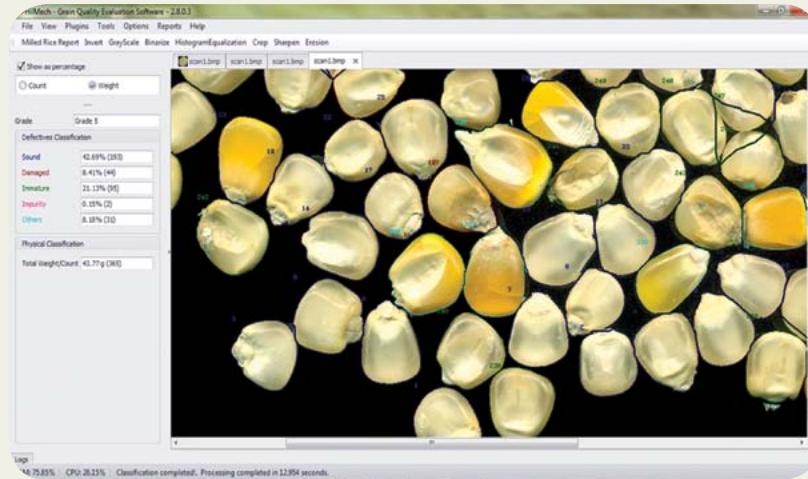
The potential of Philippine Carabao mango (*Mangifera indica*) peels as source of pectin was investigated in line with the country's total dependence on imported pectin. This research successfully established an extraction process that produced pectin from Carabao mango peels which conformed to United States Pharmacopeia (USP) standards.

Results of the study showed that dried Carabao mango peels yielded 21.65 percent pharmaceutical grade pectin. The product was characterized as high methoxyl pectin because of its high galacturonic acid content (92.82% - 98.65%). It is applicable for food formulation because of its high degree of esterification (76-79). The total dietary fiber

and sugar contents were 77.4 percent and 4.8 percent, respectively, indicating usefulness for better digestive functions. Its gelling properties were comparable with the analytical grade pectin. The produced pectin was also free from chemical and microbial contaminants.

Cost analysis revealed that the production cost for pectin from mango peels under laboratory scale amounting to Php5,667.51/kg was cheaper than the average landed cost of imported pectin (Php27,122.56/kg). Local production of pectin from mango peels has great potential in creating business and job opportunities, helping save the country's dollar reserves through less or non-importation of pectin, and saving the environment from depletion through solid wastes utilization.

Quality Analysis of White Corn Using Computer Vision System



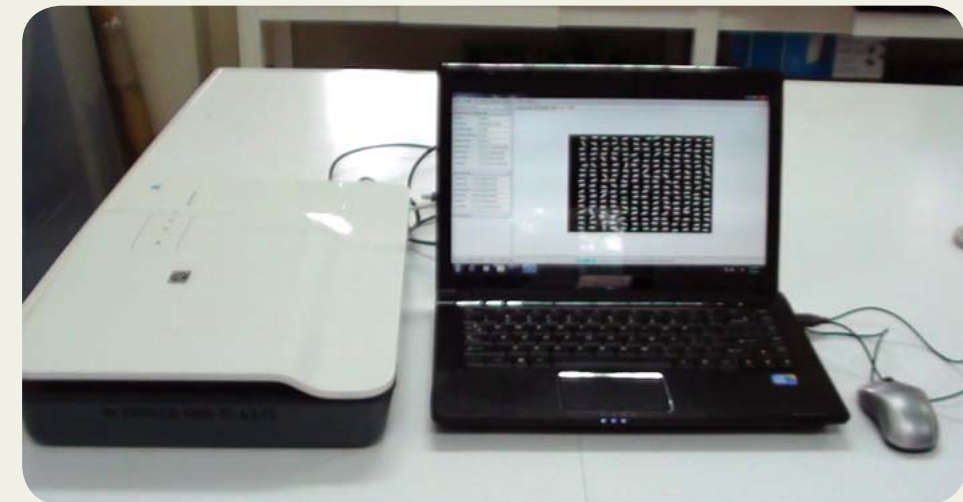
Screen shot of the classification process of the CVS

An in-house computer vision system (CVS) originally developed by PHilMech for quality analysis of rice and yellow corn was adapted for physical quality analysis of white corn. The system is composed of an image acquisition device, a computer, and image processing software. The PHilMech system uses an ordinary document scanner (HP Scanjet G3110) as the image acquisition device instead of the conventional, more expensive machine vision cameras used in high-end systems. The PHilMech-developed image processing software (PHilMech Integrated Grain Quality Analysis) captures the scanned images of white corn and extracts the 24 color-related features of each white corn grain. An artificial neural network (ANN) is trained to correlate these color features to the quality

classification it belongs. The quality classifications are sound grains, damaged, immature/shrivelled, impurities and other color grains.

Initial findings reveal that the PHilMech-developed CVS for white corn can analyze a 100-gram sample in less than five minutes at an accuracy of more than 95 percent. To complete the system, an attempt to develop an algorithm that will estimate the weight of each grain and computes the percentage weight of the grain in each classification is being done. Philippine grain quality standards determine the grade of grains based on percentage weight of each quality classification.

Performance Verification of PHilMech Computer Vision System (CVS) for Quality Analysis of Rice and Corn



CVS set-up

Annually, the Philippine government through the National Food Authority imports an average of 20 cargos containing 600,000 metric tons of milled rice to supply the country's rice deficit. Out of the yearly imports, around 27 million rice kernels undergo quality laboratory analysis. The physical analysis for each specific quality parameters (e.g. head rice, broken kernels, sound kernels, discolored, immature, etc.) costs P50.00 complete analysis per sample costs P400.00. The process takes 30 to 60 minutes per sample depending on the skills of the classifier, physical condition of the samples and working environment. The Agricultural and Mechanization Testing and Evaluation Center (AMTEC) also reported one hour for complete manual analysis each for brown rice and milled rice following the procedures prescribed by the Philippine Agricultural Engineering Standards (PAES). Manual method of analysis is subjective, tedious, expensive and prone to errors.

To address this situation, PHilMech developed a low-cost computer vision system (CVS) applicable for rice and corn. The CVS uses an ordinary scanner as the image acquisition device. Using a computer model, the acquired image is processed to extract shape and color

features which can correlate at varying classifications. The CVS can analyze the standard quality parameters of brown rice, milled rice and corn in less than 10 minutes with high accuracy and repeatability. The CVS method of analysis is rapid, cost effective and more efficient than manual method. The NFA and AMTEC, which are the major clients of the CVS are currently undergoing field validation and acceptability test prior to its commercialization.

The performance of the CVS was compared to the traditional manual method being adopted by the National Food Authority (NFA) and the Agricultural Machinery Testing and Evaluation Center (AMTEC). The performance testing and evaluation showed that the accuracy of obtaining the results in classifying rice and corn using the CVS was comparable to the manual method of analysis. But, the processing time to complete the analysis using the CVS technology (6-7 minutes) was 5-8 times faster compared to the manual method (30-60 minutes). The developed CVS will automate the existing practice in determining the milling quality of brown rice, milled rice and yellow corn and minimize the tedious and subjective manual method of evaluation.

Assessing the Level of and Factors Driving Mechanization of Rice and Corn Farms in the Philippines

Relevant and timely information serves as important guide in policy formulation process and provides bases in crafting RD&E programs. To formulate appropriate and sustainable program for mechanization, an assessment on the status of agricultural mechanization is needed.

Employing one shot cross-section survey design, rice and corn farmers in major production areas of the country were interviewed. The conduct of survey in 12 regions was already completed while inputting of the gathered data is still in progress. Initial data processing and analysis were also done to determine some data gaps and to harmonize analysis procedures with project collaborators.

Preliminary analysis of Region II data shows that rice farm operations in Isabela such as tillage (plowing, harrowing/levelling) and threshing are already mechanized, with 78, 87 and 95 percent of the respondents mechanizing plowing, harrowing and threshing operations, respectively. Meanwhile, mechanical harvesting using combine harvester is gaining popularity in the area, as adopted by 10 percent of the respondents.

Remaining project activities include conduct of survey in Regions IV and VII, data editing and encoding, processing and analysis of data.



Corn sheller



Rice combine harvester



EXTENSION SUPPORT, EDUCATION AND TRAINING SERVICES

Accelerating the Establishment of Multi-Commodity Solar Tunnel Dryer (MCSTD)-Based Enterprises in the Philippines



The project has two studies, namely (1) Strengthening the Role of Kababaihang Masigla ng Nueva Ecija (KMNE) as Social Laboratory on MCSTD and (2) Establishment of MCSTD- Based Enterprises. Generally, the objective of the project is to encourage establishment of new MCSTD enterprise through an active partnership with KMNE as MCSTD Social Laboratory.

In 2012, the project conducted 36 technical briefings attended by 345 people from various places. These people visited and observed the actual operation of the MCSTD and also bought processed dried products displayed at the Social Laboratory. These contributed to the sales increment of the KMNE from P1,166,240.68 in 2011 to P1,215,367 in 2012 or 4.21 percent.

Moreover, six groups acquired training on the processing of selected crops abundant in their respective areas. About 11 percent from the technically briefed groups already started their

MCSTD-based enterprises during the year. These are (1) Sula RIC, Vinzons, Camarines Norte, (2) Gonzaga, Cagayan; (3) San Ramon Gabi Producers, Nabua, Camarines Sur, and (4) Castillo Fish Processors, Cabusao, Camarines Sur. These enterprises have existing economic activity already and will just improve the quality of their products by using the MCSTD.

Other MCSTD-based enterprises located in Bulacan, Pampanga, Nueva Vizcaya, Camarines Norte and Batangas are continuously operating and have already established market outlets for their products. On the other hand, the MCSTD unit in Marinduque State College used in the production of breadfruit flour will be strengthened to become viable enterprise and will serve as a Social Laboratory in the area.

Before the year ended, 16 MCSTD-based enterprises were established and 16 more will be added to the list.

Enterprise Capability Enhancement of Cashew Processors in Selected Areas

The sites of the project, "Enterprise Capability Enhancement of Cashew Processors in Selected Areas" are Nueva Ecija, Zambales and Paluan and San Jose, Occidental Mindoro. Generally, the project aimed to enhance the entrepreneurial capability of cashew processors in the selected areas.

In 2012, a total of 24 cashew nut shellers and two charcoal-fired ovens were purchased by cashew processors. Four batches of training on the use of the cashew nut sheller as well cashew apples and nut processing were conducted. These were attended by about 70 participants. They were also taught how to prepare roasted nut, brittle and coated cashew nuts, and vinegar and wine from cashew apples. The trained RIC also served as speaker in one of the cashew trainings conducted in the area.

Business plans for capital expansion were provided to an association in Nueva Ecija and to Rural Improvement Club (RIC) Castillejos, Zambales which was chosen as 2011 Regional Gawad Saka Awardee (RIC Category).

The project also conceptualized design of the product's label and improved the packaging style of the cashew products of two cooperators (N. Ecija and Paluan, Occ. Mindoro).

Meetings with the DA III Regional Director, Zambales Provincial Officers and Cerana Farms representative were undertaken during the year. A plan was crafted to develop better quality cashew products and to sustain the cashew industry in Zambales.



Provision of Technical Assistance for Postharvest Enterprise Development Project

This is a continuing activity of the Enterprise Development Division. The project aims to provide the needed assistance to clients who seek to start or expand an enterprise that employs mechanization, postharvest and agro-processing technologies. Specifically, the project aims to help investors in assessing their business, resources and capability as decision guides for the enterprise; to assist investors in preparing a feasibility study as requirement for funding assistance and as a general guide and decision tool in developing the enterprise; to assist investors in crafting action plans and critical start-up plans as guides in establishing the enterprise; assist investors in linking with and/or accessing other support/assistance from other government and non-government service providers; and to monitor and document the enterprise provided with technical

assistance for compilation of enterprise development stories and models.

In 2012, the project was able to prepare the following feasibility studies: establishment of mango processing center in Puerto Princesa City, Palawan; establishment of cold storage for red creole onions in Umingan, Pangasinan; application of irradiation technology for the preservation of food and non-food commodities. The project also prepared feasibility studies related to establishment of rice processing centers being implemented by the Agri-Pinoy Rice Mechanization Program at Zamboanga del Sur and Pangasinan. Linkaging of clients to facility providers for cold storage and rice milling facilities was also conducted.



Applied Communication Program



Postharvest and mechanization must be translated to understandable information accessible to the target audience. The Applied Communication Division of PHiMech sees to it that this is fulfilled through its two sections—the Science and Technology Information Packaging Section (STIPS) and the Science and Technology Information Dissemination Section (STIDS).

The Science and Technology Information Packaging Section (STIPS) of the Applied Communication Division implements four communication projects, namely (1) Creating Awareness on Postharvest and Mechanization through the Print Media and the Website; (2) Publishing Postharvest Journals and Other Technical Publications; (3) Process Documentation, Packaging and Dissemination of PHiMech Success Stories and (4) Developing Easy-to-Access IEC Materials on Postharvest.

Under the said projects, ACD-STIPS published 10 kinds of publications both popular and technical, released 14 news and features in agricultural magazines, and produced 5 kinds of audio-visual materials in 2012 (Table 1). The PHiMech Website

was also updated in terms of design, general content, website news and features. Answered queries at the website totaled 23.

In collaboration with the DA-Agricultural Training Institute, E-learning modules on rice and corn postharvest were completed. These modules were launched during the PHiMech Anniversary and can be accessed at the ATI website.

The ACD-STIPS also provided communication services to PHiMech personnel, partners and other stakeholders in the industry. These services include editing and writing services, graphics design, event planning and management.

Meanwhile, the Science and Technology Information Dissemination Section (STIDS) continuously implements communication campaigns and services to build awareness on the agency's program and projects using different communication channels.

For 2012, the section conducted five communication projects. Its public awareness campaign participated in 19 agricultural trade fairs

Table 1. IEC materials developed by ACD-STIPS

Section Projects	IEC Materials/ Communication Events	No. of Copies/ Production	Target Audience
Creating Awareness on Postharvest and Mechanization Through Print Media and the PHilMech Website	PHilMech Newsletter	12,000	PH Specialists Network, SCUs, regional information officers, PHilMech visitors and exhibit viewers
	1st Q issue	(3,000 copies per issue)	
	2nd Q issue		
	3rd Q issue		
	4th Q issue		
	Annual Report 2011	1000	
	PHilMech leaflet	2000	
	PHilMech infokit	1000	
	News and Features	14	
	PHilMech Website		
	News updates	12	
	Answered queries	23	
Publishing Postharvest Journals and Other Technical Publications	Technical Bulletin 3 (Devt. Of Computer Vision system for Milled Rice Quality Analysis)	1000	SCU librarians, Researchers and students
	Technical Bulletin 4 (Biomass Utilization as Biofiller for Biocomposite Materials Development)	1000	
	Information Bulletin 1	1000	
	PHilMech Journal (Socio-Economics and Policy Research)	1000	
Process Documentation, Packaging and Dissemination of PHilMech Success Stories	Gintong Ani Comics (Mga Bunga ng Tagumpay)	3000	Farmers and groups, micro-entrepreneurs, Information officers and media, PHilMech visitors and exhibit viewers
	Video documentaries	1 prodn	
	Broadcast plugs	1 prodn	
	IEC materials (PHilMech songs and songbook)	100	
Developing Easy-to-Access IEC Materials on Postharvest	Postharvest Notes	1,300	Farmers Information and Training Service Center (FITS), information officers, internet users
	Digitized IEC materials uploaded at the web	12	
	Digitized IEC materials distributed to FITS center/ LGUs/ SCUs	700	
	E-Learning Modules	2	

Table 2. IEC materials developed and disseminated by ACD-STIDS

Section Projects	IEC Materials/ COmmunication Events	No. of Copies/ Production	Target Audience
DSC for Postharvest/ Mechanization Technologies	Technology Leaflet		Farmers, trainers and extension workers
	Farmer-based Arabica Green	2,000	
	Coffee Bean Processing System		
	Evaporative Cooler	2,000	
	Technology Brochure		
	Corn Mechanization and Postharvest Technologies	3,000	
	Technology Q&A		
	Coco Peat and its Drying System	1,500	
	Technology Primer		
	Guide on Postharvest Handling of Onion	1,000	
	Techno Briefers		
	Cashew Nut Sheller		
	Coffee Pulper	1	
Biomass-fed Furnace	1		
Multi Commodity Solar Tunnery Dryer	1		
Advertisements	1		
Communication Support for Establishment of Modern Integrated Rice Processing Complexes in the Philippines	Technology Poster Calendar (Rice Production and Post Production System)	4,000	RPC users/ clients, trainers
	RPC Poster	1,000	
	RPC Primer	3,000	
	RPC Q&A	2,000	
	Information Kit Holder	1,000	
	RPC Fan	1,000	
	Advertisements	1	
Communication Support for Rice Mechanization Program	Technology Brochure		Farmers and groups, micro-entrepreneurs, Information officers and media, PHilMech visitors and exhibit viewers
	Rice Mechanization On-Farm Technology	5,000	
	Rice Mechanization Off-Farm Technology	5,000	
	Program Primer	5,000	
	Rice Mechanization Program		
	Rice Mechanization Bulletin Angat Ani (6 issues; 5,000 copies per issue)	30,000	
	Technology Catalogue Series		
	Series 1	1,000	
Series 2	1,000		
Advertisements	9		
Technology Desk Calendar	1,500		
Public Awareness for Postharvest and Mechanization Technologies	Billboard	4	SCUs, exhibit viewers, visitors
	Exhibit Materials	5	

and exhibits to showcase PHilMech technologies, accomplishments and on-going researches and projects. Among the campaign crowd-drawers were during the National Science and Technology Week, BAR @25 exhibit, Agri-Tourism Expo, Makina Saka, Agri-Link and Kabisig. Through this strategy, the agency receives inquiries, requests for assistance and feedbacks that include appreciations and criticisms.

Another key effort to drumbeat public awareness for the year was the Visitors' Bureau. Last year, PHilMech briefed 83 batches or 3,005 farmers, foreigners, policy makers and students. It presented documentary videos, miniature models, actual prototypes of machinery and briefings from the researchers or program implementers.

To support the awareness phase of PHilMech's new postharvest technologies, the Rice Mechanization Program and the Establishment of Rice Processing complexes in the country, three communication support campaigns were conducted to produce 28 various IEC materials. These IEC materials were given

to the program implementers and recipients during training, briefings, exhibits and visits.

The agency as well implemented publicity efforts to tailor research results on postharvest and mechanization into press releases for national dailies, community newspapers, radio/TV and the web.

To assist postharvest researchers, the agency last year updated its holding of books and subscriptions for its scientific literature services. For the year, SLS added 135 books to its 3,773 holdings and subscribed to 11 journals/magazines. SLS also assisted 2, 227 users for their researches or for their information inquiries.

In 2012, the Applied Communication Division produced a total of 95,188 IEC materials for its various target audiences.

Table 3. Visitors of PHilMech in 2012

Batches	Total No. of Visitors	Type of Visitors				
		Farmers/ Fisherfolk	Faculty and Students	LGU Officials/ staff	Private/ NGO	Foreigners
83	3,005	1,615/48	743/11	348/15	7/2	102/8

Industry Manpower Development Program

To maintain a dynamic pool of postharvest experts in the country, the Training Section of the Technology Management and Training Division led in the implementation of the Industry Manpower Development Program of PHilMech through its three major projects, namely: (1) Regular projects, (2) Enhancing the technical capability of the industry stakeholders in postharvest and mechanization, and (3) Special projects.

Regular Projects

The Training Section developed and packaged four training designs tailor-fitted to the needs of the program implementers of the Department of Agriculture-Regional Field Units (DA-RFUs) and Provincial Local Government Units (PLGUs). Instructional/lecture materials were also developed, updated and packaged and these served as information bulletins for the participants.

Another major regular activity of the Training Section is the provision of technical assistance requested by other agencies on training-related matters. There were nine technical assistance

through provision of resource speakers and training management staff on postharvest and mechanization trainings organized and sponsored by other agencies. These assistance were requested by the following group/agencies: All Asian Countertrade Inc. (officials and technical staff), Central Luzon State University-assisted Korean Students, Grain Pro Phils (executives and staff), University of the Philippines- Los Baños students, and Agricultural Training Institute (Laguna, Davao, and Aklan).

In addition to these major regular activities a national technical conference and a technical symposium on postharvest and mechanization were conducted with a total of 439 participants from DA-RFUs, PLGUs, farmer-leaders and technical staff from other agencies.

Enhancing the Technical Capability Enhancement of the Industry Stakeholders on Postharvest and Mechanization

There were six training courses conducted for this year with a total of 193 participants nationwide.





The participants were program implementers of DA-RFUs, PLGUs and other technical staff from other agencies. The training courses conducted include the Seminar-Workshop on Postharvest and Mechanization of High Value Crops (1 batch), Training Course on Rice Mechanization (3 batches), Skills Training on the Technical Evaluation of Selected Agricultural Machineries (1 batch), and Technical Symposium on Biomass Fed Furnace (1 batch).

Special Project

Under the project, "Establishment of Modern Integrated Rice Processing Complexes (RPC) in the Philippines," four KOICA-assisted RPC in the Philippines were established in Pangasinan, Iloilo, Bohol and Davao del Sur through the assistance of the Korea International Cooperation Agency (KOICA). To ensure the successful implementation of the project, it is imperative to equip the would-be RPC Management Team with the technical knowledge and skills in the operation and management of the facility to maximize the available resources and to generate profit in order to provide better services to its stakeholders particularly the farmer-beneficiaries.

During the year, one batch of Stakeholders Orientation Seminar was conducted in Digos, Davao del Sur on Sept. 19, 2012 with a total of 221 farmer leaders of Irrigators' Associations, farmer cooperatives, technical staff from MLGU, PLGU and DA-RFU XI as participants. The last two batches of month-long "Training on the Operation and Management of the KOICA-assisted RPC" were also conducted. The participants were the potential members of management team of the Bohol-RPC and the Davao-RPC. These were conducted on February 28-March 27, 2012 and November 20-December 18, 2012. There were 22 participants who successfully completed the course and were already endorsed to the concerned RPC project managers.



Promotion of Biomass-fed Furnace Retrofitted to Mechanical Dryers



To cushion the effect of the rising cost of fuel, reduce the cost and losses of drying operation and encourage utilization of mechanical dryers, PHilMech implemented the project, "Promotion of Biomass Furnace Retrofitted to Mechanical Dryers". The project established strategic pilot technology demonstration sites nationwide to showcase the benefits of the retrofitting system that would eventually boost the utilization of mechanical dryers which are underutilized because of high drying cost.

Information, extension and communication (IEC) materials were designed, developed and disseminated to create awareness and heighten interest among prospective users of the technology. Also, seminars, workshops and technical symposium on the biomass furnace technology for extension workers, farmer-cooperatives, manufacturers, traders/processors, government officials and policy makers were conducted.

At present, 17 technology demonstration sites of PHilMech biomass-fed furnace retrofitting system were established in major rice and corn producing areas in the country. These serve as demonstration and showcase centers for interested adopters and manufacturers of the technology.

Technical symposium and technology demonstration activities were also conducted to promote and enhance the awareness level of stakeholders on the features and benefits of adopting the technology. These activities were attended by Postharvest Specialist Network from the Provincial Local Government Units (PLGUs) and DA Regional Field Units (DA-RFUs), Municipal Agriculturists and Municipal Planning Officers. The activity also enabled the participants to come-up with action plans and replicate similar retrofitting projects in their respective areas. Technology demonstrations were conducted, as well, to familiarize and orient stakeholders on the

proper drying operation and maintenance of the biomass-fed furnace technology and encourage possible partnership with the local manufacturer in the area.

As an offshoot of the aggressive promotion of the project, the manufacturers, techno-demo cooperators, collaborators, farmers, traders and private millers recognized the importance of having the biomass-fed furnace retrofitted to their mechanical dryers. As of December 2012, around 300 biomass furnace purchases were reported by PHilMech licensed manufacturers nationwide. The Rice Mechanization Program of the Department of Agriculture has also recognized the potential of the technology and has incorporated the biomass furnace retrofitting as a component of the program in promoting mechanical drying to the countryside.

To establish the impact of the intervention, process documentation activities were conducted among the project cooperators. The utilization and drying fees collected for two cropping seasons were also monitored. Data collected reveal significant increase in utilization (number of bags dried) and decrease in drying fees collected (peso per bag). Utilization level of the mechanical dryer tripled in terms of number of bags dried. This is attributed to the decrease in drying fees collected by almost 50 percent.

Also, findings show that the sustained utilization of biomass fed furnace is hinged on the collaborative efforts of both public and private entities. The local machinery manufacturers have a big role in the commercialization of technologies developed by Research and Development institutions like PHilMech since it has no mandate in mass fabricating its developed technologies.



PHilMech Industrial Promotion Program

Local manufacturers are being tapped in the fabrication and commercialization of postharvest technologies under the PHilMech Industrial Promotion Program (PIPP) to hasten technology transfer of postharvest machinery to end-users. This is in line with the thrust of the government towards public private partnership to attract more investors into agricultural mechanization.

A Technology Licensing Protocol was developed to maintain a systematic and uniform procedure for the transfer and commercialization of any technology developed by PHilMech. The said protocol involves the following: (1) Orientation workshop and manufacturers forum, (2) Plant evaluation/assessment, (3) Issuance of technical plans, (4) Fabrication of prototype/provision of technical assistance, and (5) Issuance of license (good for three years).

For the year 2012, three orientation workshops were conducted for specific geographical locations in Central Visayas, Western Visayas and CALABARZON regions. Two technology demonstrations of the PHilMech technologies were also conducted during the orientation workshops in Western Visayas and CALABARZON regions.

The fabrication/manufacturing plant of three manufacturers who applied for license to manufacture were evaluated and assessed. These include the Grand Innovation Industries of Iloilo, Vircap Light Industries of Bohol and JVV Precision Machine Shop of Cavite. This assessment will determine the manufacturers technical and financial capabilities to fabricate the technology.

Once the manufacturer has satisfied all requirement for the License to Manufacture, technical plans and drawings will be issued. Together with this is the signed Affidavit of Undertaking by the manufacturer that they will keep the technical plans with utmost confidentiality.

Three prototypes were tested and inspected. The performance testing and inspection of a multi-commodity solar tunnel dryer (MCSTD) prototype fabricated by Tropics Agro-Industries Incorporated was conducted in Camarines Norte. The performance testing and inspection of a cashew nut sheller prototype fabricated by Design 360° Engineering and Advertising was also conducted at PHilMech, Science City of Muñoz, Nueva Ecija. The performance testing and inspection of a coffee depulper prototype fabricated by Agustin General Engineering and Services was conducted in North Cotabato.

Provision of technical assistance was also a part of PIPP, particularly during the fabrication of the prototype and the installation of the generated technology. This activity ensures the strict compliance with the specifications during the prototyping of the technology and the assurance that the technology fabricated will perform as intended. For 2012, technical assistance was provided to five manufacturers.

Two License to Manufacture certificates were issued to manufacturers and/or fabricators who have complied with the requirements under the PHilMech Licensing Protocol. These manufacturers are Design 360° Engineering and Advertising of Nueva Ecija and Agustin General Engineering Services of North Cotabato. Renewal of a license to manufacture of PHilMech technologies was also issued to Suki Trading Corporation which is based in the Central Visayas.

Finally, to strengthen linkage with other government agencies, a memorandum of understanding (MOU) was signed between PHilMech and the Technical Education and Skills Development Authority (TESDA) of the Department of Science and Technology (DOST) for technical cooperation on building capabilities of selected TESDA Technology Institutions (TTI's) through the conduct of trainings for the fabrication of selected PHilMech generated technologies.



POSTHARVEST DEVELOPMENT
AND MECHANIZATION SERVICES

Rice Mechanization and Postharvest Program



President Benigno S. Aquino during the Makina Saka at the World Trade Center in Pasay City



The mechanical rice transplanter received by the Amucao Seed Grower Agro Industrial Cooperative in Tarlac City

The Philippine Center for Postharvest Development and Mechanization (PHilMech) spearheads the implementation of the DA Rice Mechanization and Postharvest Program together with the DA-Regional Field Units (DA-RFUs), National Irrigation Administration (NIA), Local Government Units (LGUs), and other agencies, with strong partnership with the private sector and farmer's organizations. The program aims to: (1) enable rice farmers increase their access and use of appropriate production and postproduction systems as mitigation for climate change and (2) realize added income for farmers of at least 15 percent from efficient production activities, drying and milling operations.

In 2012, MakinaSaka 2012, an agri-machinery road show conducted by the Department of Agriculture, was held on July 4-7, 2012 at the World Trade Center, Metro Manila. Consultation workshops with the DA-RFUs and DA Rice Program implementers were also done to craft the implementing guidelines of other package of technologies not included in

the approved roadmap. Discussions on the unified guidelines on the procurement system were also made. A National Technical Workshop on the Implementation of the DA Rice Mechanization and Postharvest Program was also held on October 2-3, 2012 in Bacolod City, Negros Occidental with the Regional Agricultural Engineering Division Chiefs and Regional Rice Coordinators of DA-RFUs nationwide, DA Rice Staff, Cluster Heads and Regional Field Coordinators as participants. To enhance the technical evaluation skills of the Regional Engineers of DA-RFUs and Regional Field Coordinators of PHilMech, a Skills Training Course on the Technical Evaluation of Selected Agricultural Machineries was conducted on November 5-14, 2012 at PHilMech in coordination with the Agricultural Machineries Testing and Evaluation Center (AMTEC) and Agricultural Machinery Manufacturers and Distributors Association (AMMDA). PHilMech provided assistance to DA Rice during the conduct of the Farm Service Providers Forum held in Koronadal City on August 8-9, 2012. The Agri-Infra Coordinating Unit (AICU) of PHilMech facilitated

Sustainability Program of the Postharvest Facilities Distributed Nationwide

PHilMech, in partnership with the DA-RFUs and the LGUs undertakes the sustainability program of postharvest facilities to ensure the functionality and utilization of these facilities distributed nationwide.

In 2012, PHilMech conducted 19 batches of assessment meeting and technical orientation with the cooperators/recipients of the Flatbed Dryers (FBDs). The activity aimed to evaluate and assess the operation, maintenance and improvements done by the recipients on the FBDs.

Technical assistance was also provided to about 1,184 FBD project recipients through coaching and mentoring, retooling, repair, and maintenance of their drying facilities.

the workshop on the crafting of the Implementing Guidelines for the Farm Service Providers Program of the Department of Agriculture. Web-based system in monitoring/reporting the status of the mechanization and postharvest program was also debugged and utilized. Coordination with the RFUs in the preparation and consolidation of the 2011 and 2012 Rice Mechanization and Postharvest Program was also done.

PHilMech also provided assistance to the DA Rice Program as member of the national secretariat during the conduct of the National Convention of Food Staple Producers on December 12-14, 2012 at the Manila Hotel. Participation and attendance to Regional Management Committee (RMC) meetings/farmers forum/meeting with collaborators was done. The agency also provided technical assistance to the RFUs in the regional implementation of the Rice Mechanization and Postharvest Program (operation and maintenance training; testing and evaluation; and during procurement).



National Agricultural Tramline Project

Agricultural Tramline System, a hauling facility consisting of steel cables and pulleys, is an alternative transportation system for farmers in isolated areas. It is being used as a transport facility for agricultural inputs and farm produce from the farm to the nearest access road and vice versa. High Value Commercial Crops (HVCC) from the isolated production areas can now be moved with less drudgery, shorter hauling time and minimal postharvest losses, effectively increasing the income of the farmers.

For the year 2012, a total of 16 tramline units have been installed in the major HVCC producing areas nationwide and 330 farmer-beneficiaries were trained on the proper operation and maintenance and management of the tramline facility. These 16 tramline systems have an aggregate service area of approximately 800 hectares and a total of 1,280 farmer-beneficiaries.

A national technical conference was held to further strengthen the technical capabilities of PHilMech partner agencies particularly in the updates on technical design. It was participated by 25 technical staff from DA-RFUs and selected LGUs.

Additional 30 units of tramline projects have been implemented. These are expected to be completed in the middle of 2013.



Agricultural tramlines in Nueva Vizcaya and Camarines Norte

Onion Hanger Project

To address the recurring problems of onion farmers in their postharvest operations, the Department of Agriculture through the High Value Crops Development Program (HVCDP), provided funds for the establishment of hanger storage to be put up in major onion producing provinces in the country. Through the establishment of these storage facilities, the project aims to empower farmers through the establishment of these storage facilities by helping them maintain marketability of their produce at low operating costs. The facility is expected to aid onion farmers in the handling and temporary storage of their produce, and help shield them from very low farm gate prices.

As lead agency in the establishment of the hanger storage facilities, PHilMech provides overall direction in the implementation of the project. It coordinates and monitors project activities with the concerned DA-RFUs, LGUs and farmer organizations.

For the year 2012, PHilMech has conducted technical monitoring on the construction of the onion hangers, with 14 out of the 15 target units in Ilocos Sur (1), Nueva Ecija (9), Nueva Vizcaya (2) and Occidental Mindoro (2) completed within the first semester of the year. Six batches of training seminars were also conducted in the four provinces in collaboration with the respective DA-RFUs. Topics included the production, postharvest handling and marketing of onion in relation to the management and operation of the hanger storage. Members and officers of onion farmer organizations (beneficiaries), agricultural technicians and local government officials attended the training and seminars.



Cold Chain Project

The Cold Chain project of the Department of Agriculture and PHilMech aims to establish an efficient link between the producers and their intended markets through the provision of the necessary postharvest and marketing infrastructure. The interventions are intended to improve marketability of agricultural produce and reduce postharvest losses in support of the DA's main thrust of increasing farmers' productivity and income.

In 2012, the project has finished the distribution of the remaining cold chain facilities and continued the monitoring and provision of technical assistance to project cooperators.

An additional three units of small capacity ice making machines were installed and awarded to local government units in coastal fishing communities in Samar, Masbate and Bohol. Technical assistance was also extended to project recipients in the delivery, pull out/transfer and/or installation of seven cold storage facilities in Malvar, Batangas (1); La Trinidad, Benguet (4); General Santos City (1); and Batac, Ilocos Norte (1). The commodities to be serviced by these cold storages include a wide range of high value fruits and vegetables such as lettuce, broccoli, dragon fruit and asparagus, among others.



Establishment of Modern Integrated Rice Processing Complexes in the Philippines



Operation inside the RPC Pangasinan



Inauguration of the RPC Bohol

The project adopted the concept of integration of modern technologies. Integrating the closely sequential postharvest operations such as drying, temporary storage and milling, and using modern technologies in a complex, can save time, effort and can potentially reduce postharvest losses. It also produces high quality milled rice.

The project provided an initial operating capital worth P20 million for each site.

The project trained and employed professional management team. They were trained on the operation and management of the rice processing complex for one month by PHilMech and on the technical operation, maintenance, repair and adjustments of the facilities and equipment for two weeks by the Korean experts. Employing a professional management team ensures objectivity and professionalism in the management of the Farmers' Organization-run enterprise, thereby

reducing the 'management problem' among FO-run business ventures.

The RPC in Sta. Barbara, Pangasinan is now on its second year of operation. It was initially managed by NABCOR. In 2012, it had already procured 1,762 MT paddy from farmers, farmers-cooperative and irrigators' associations.

The RPC in Pototan, Iloilo was inaugurated on March 16, 2012. It started operation during the wet season. It was also initially managed by NABCOR. RPC-Iloilo has procured 717 MT of paddy mostly from individual farmers.

The RPC in Pilar, Bohol was also inaugurated on December 10, 2012. Its operation will start on the dry season of 2013. While the RPC Davao del Sur is now about 90 percent complete on its construction, it is targeted for completion in the 1st quarter of 2013.



SUPPORT TO RESEARCH,
DEVELOPMENT AND EXTENSION

Postharvest and Mechanization Research, Development and Extension Agenda Formulation

One of the major activities being conducted by the Planning and Project Development Section (PPDS) of the Planning, Management and Information Technology Division (PMITD) is the formulation of postharvest and mechanization research, development and extension agenda for key commodities being addressed by PHilMech. To ensure relevance of the agenda being formulated, various strategies such as focus group discussions, rapid rural appraisals, key informant interviews and literature search are being adopted as means of gathering benchmark information that serve as inputs in the crafting of the agenda.

The priority commodities include rice, corn, onion, fruits and vegetables, mango, soybean, coffee, cashew, cocoa, and cassava. The RDE agenda of key commodities serve as inputs in the preparation of the agency's strategic plan as well as reference of technical divisions in the preparation of specific proposals. These RDE Agenda were also packaged in the form of fact sheets for easier understanding of users. The Commodity RDE Agenda consist of situational analysis, technology gaps, completed researches and proposed interventions for the next three years.

Also, a series of workshops for the formulation of problem tree and objective tree analysis were also conducted to gather the existing problems which could be addressed by the commodity road maps that are being packaged. The commodity roadmaps will serve as guide in the project proposal preparation of the research and extension divisions of the agency. An experts' meeting on bio-process engineering and food protection was also conducted to further harmonize the functions of the different divisions involved in research.

A focus group discussion on postharvest and mechanization concerns of cassava was also held in Tacloban City in coordination with DA-RFU 8. Cassava

farmers, cooperatives and processors together with concerned staff in the region attended the workshop. The farmers actively participated in identifying the necessary technologies that will possibly boost the cassava industry in the region. The Regional Technical Director for Operations of Region 8, Director Arsenio Fortin encouraged the farmers to be more open in sharing their ideas and experiences. The output of the said activity would serve as an important input for the updating of the postharvest and mechanization RDE agenda on cassava which in turn serves as reference in the identification of researchable areas.



Monitoring and Evaluation of Agency Programs, Projects and Activities



Monitoring and Evaluation (M&E) plays a vital role in the efficient and effective implementation of a certain program, project or activity. It aims to measure and assess the performance of a specific program or project to achieve the desired results. Likewise, it serves as a tool of the management in making the necessary decisions that lead to the improvement of project implementation.

The Evaluation and Management Services Section (EMSS) of the Planning, Management and Information Technology Division is tasked to conduct and implement the M&E activities of the agency. Basically, the M&E functions of EMSS include three major activities: (1) the detailed M&E activities; (2) the annual agency in-house research and development review; and (3) the midstream agency performance and budget review.

Detailed M&E activities primarily includes progress monitoring and on-site monitoring/field validation activities of both on-going and completed

projects. This comprises monthly gathering/ collection of accomplishment reports from project implementers, and preparation of M&E reports for submission to the management and other concerned units and agencies of the Department of Agriculture. Reports that are submitted regularly are the agency's Budget Accountability Report/Physical Report of Operations (Quarterly) and Highlights of Accomplishments (Annual, Semestral and Quarterly). Also, on-site monitoring/field validation is being undertaken to ensure that project activities were implemented as planned. This activity usually involves interview of recipients/cooperators and actual observation of on-going activities of the project. For 2012, various projects were monitored in different locations nationwide. There include the Multi-Commodity Solar Tunnel Dryer (MCSTD), Cassava Dryer, Onion Sorter and Hanger, Rice Processing Complex, Agricultural Tramline System and Flatbed Dryer.

In May 2012, the Annual Agency In-House Research and Development Review was conducted.

Information and Communication Technology at PHilMech

This activity specifically aims to evaluate the extent of accomplishments of PHilMech R and D projects, its significant outputs, potential contributions and the manner of project implementation. For the period covered, a total of 19 R and D projects (16 completed and 3 on-going/continuing) were presented and evaluated. The project, "Value Chain Improvement of Robusta and Liberica Coffee" led by Engr. Rodelio G. Idago and "Promotion of Biomass-fed Furnace Retrofitted to Mechanical Dryers" led by Engr. Darius Ramos were adjudged as first place for research and development categories, respectively. Second place was awarded to the project "Utilization of Mango Peel as Source of Pectin" led by Ms. Ma. Cristina B. Gragasin and third place was the project "Development of Drying Systems for Philippine Cocoa Beans" led by Dr. Romualdo C. Martinez.

In line with the policy of the Department of Budget and Management (DBM) on performance-based budgeting, PHilMech conducted the Midstream Agency Performance and Budget Review. This review was undertaken to determine if the project's actual accomplishments (physical and financial) are consistent with the submitted plans/targets. Project accomplishments were presented and assessed per division based on the approved Physical and Financial Plan (PFP). Discussion of issues/ concerns on project implementation and formulation of decisions were also done. The result of this activity serves as the basis of DBM for additional releases and as input in the evaluation of the agency's budget proposal during budget preparation.

PHilMech continues to be at the forefront with the latest information technology, system development and geomatics to answer the needs of its stakeholders in postharvest industry.

Recognizing the huge potential of the internet, the Planning, Management and Information Technology Division of PHilMech through its Information and Communications Technology Section (PMITD-ICTS) is bringing information systems online.

The information systems reconfigured for web-based platform are Vehicle Information Monitoring System, Project Monitoring System, Postharvest Facilities Information System and Postharvest Infrastructure System. These systems are developed in-house by PMITD-ICTS.

The online Vehicle Monitoring System provides detailed information on the whereabouts of all PHilMech official vehicles including purpose of travel, driver, number and list of passengers, travel period and destinations. Vehicle reservations can be

made easy by booking the desired vehicle in advance through the PHilMech website (www.philmech.gov.ph). The request for vehicle slip, trip tickets, gas slips and other pertinent documents are ready for printing which will then be processed by the dispatcher.

Employee currently on travel who is in need of PHilMech vehicle can check the website to get information on vehicle's route, driver and passengers. The employee can call the driver or any of the passengers if he can be picked up. This saves money, time and effort to ride a public transport and rids off the hassle of reimbursing transportation expenses due to misplaced/lost tickets.

The online Project Monitoring System, Postharvest Facilities Inventory and Postharvest Infrastructure System established a database link to the Department of Agriculture Accountability Network. Updates and additional information on the highlights and project profiles of completed and on-going projects of PHilMech including geographical locations and geotagged images are being undertaken to be



viewed simultaneously on the online systems and on the website.

The system provides the stakeholders a quick view on the status of PHilMech projects completed and being implemented in their area, who to contact with and where can they avail of these services.

In support to these information systems, PHilMech upgraded eight data switches to gigabit speed (1 Gbps) from the old 100 megabit rate (100Mbps) to speed up access of information. PHilMech will be establishing a load balancing scheme of internet access between its two providers, Globe and PLDT. In a previous single provider setup, internet users pass through a single port resulting to congested internet connection at times when internet packets started to build up. With load balancing, the server can automatically switch and pass the load from one provider to another resulting to decongested ports and faster internet access.

The ICTS constantly provides services to other divisions of PHilMech by maintaining the different programs being used for payroll, financial, property and procurement, personnel and daily time records and supports other needs of researchers through the development of simulation models, digital imaging softwares and Geospatial Information Systems Application.

Human Resources

Paramount to the success of any organization is the provision of human resource programs aimed at ensuring productivity, efficiency and job satisfaction among the human capital that runs the organization. On this premise, the Human Resource Management Section of PHilMech never fails to come up with activities that would answer the needs of its employees in their holistic development.

The Manpower Development Program (MDP) of the agency is the focal HR intervention established for the career and personnel growth of employees at all levels. For 2012, the implementation of PHilMech's MDP has gone full swing with almost 13 percent of its total manpower complement pursuing either doctorate program or master's degree program. Close to 50 percent of these scholars will report to work by 2013 and 2014, adding to the roster of PHilMech's doctoral and masteral degree holders.

This year, one Chief Science Research Specialist and one Supervising Science Research Specialist have earned their diploma in Ph.D. in Biological and Agricultural Engineering and Rural Development, respectively. Another Supervising Science Research Specialist has finished a post-doctoral fellowship. Three more staff also graduated with master's degrees in Agricultural Engineering and Agricultural Economics from the Central Luzon State University.

In terms of in-house trainings and employee relations activities, the HRMS, as part of Gender and Development program, spearheaded the conduct of Love Seminar for Couples, Disaster Preparedness Seminar, and a series of Health and Wellness Seminars. Training Courses on Supply Chain Management, Waste Management and Quality Driving and Road Safety for Drivers were also conducted.

International trainings on postharvest technologies, Quality and Food Safety have also been attended by eight of PHilMech R&D officials and

staff. These trainings did not only provide additional technical know-how to our researchers but they also helped build external linkages and networking with other research institutions abroad.

Apart from continuous education, trainings and seminars, the HRMS also annually implements its Program on Awards and Incentives Service Excellence (PRAISE). Under the PRAISE, employees who have shown exemplary public service for the past year are recognized and awarded with a plaque and cash incentive.

Loyal and dedicated employees who have shown commitment to public service are likewise awarded with a plaque and cash incentive every year. The awards are given during the celebration of the agency's anniversary.

Advocating and imparting social awareness has been the culminating activity of the HRMS as the year ends. A fund-raising activity through a Bingo Socials was held in December 2012 for the benefit of the victims of the catastrophic typhoon "Pablo" in Mindanao. Employees also enjoyed a simple celebration of the Yuletide Season while at the same time, showed their benevolence and sympathy to the afflicted.



Financial Resources

In 2012, PHilMech received an aggregate budget of P185.064M from the National Government representing P173.335M in new appropriation and P11.729 as continuing appropriation. It also received P70.104M from other government agencies as trust receipts for the implementation of research and postharvest infrastructure projects. Funding assistance amounting to P419K was also received from the Korean Government for vital collaborative endeavors.

Table 1. Summary of Trust Funds Received in 2012

FUND SOURCES	PROJECT TITLE	AMOUNT
DA-Osec	Establishment of Agricultural Tramlane Systems	P50,000,000.00
	Onion Hanger Storage Facility	840,350.00
	Establishment of Modern Rice Processing Center	8,931,313.95
	Development of Spectral Technique for Rapid Detection of Aflatoxin in White Corn	203,000.00
	Development of Mechanization System for Soybeans	1,500,000.00
	Production of Year –Round Supply of Bulb Onion	800,000.00
	Occurence of Ochratoxin A in Philippine Cacao Beans	2,300,000.00
	Development of PH Technologies for Adlai	1,690,100.00
	Development of Improved Village-Type Corn Mill for White Corn	1,612,350.00
	Pilot Testing of Belt Dryer For Granulated Cassava	1,926,260.00
CLSU	Identification of Bacteria and Yeast	300,000.00
Korean Government	AFACI Pan-Asian Regional Projects	419,005.62
TOTAL		P 70,522,379.57

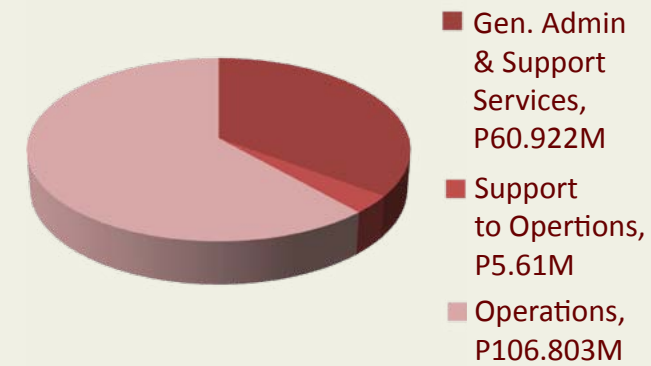


Figure 1 : Distribution / Utilization of funds per Program, Project, Activities (PPA's) of the agency.

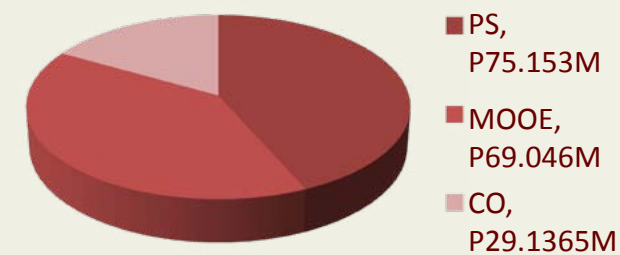


Figure 2 : Distribution / Utilization of funds by allotment class

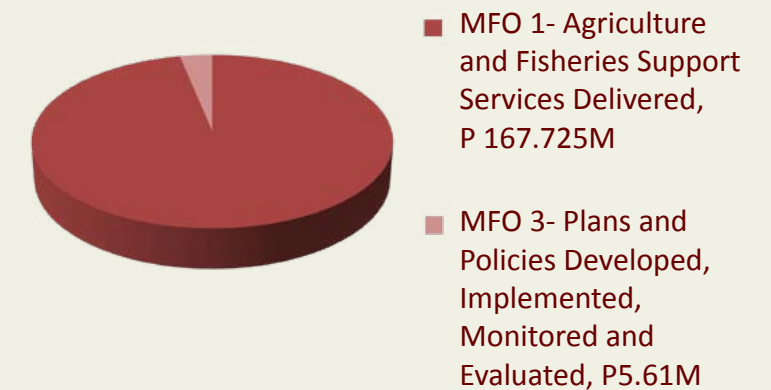


Figure 3 : Distribution / Utilization of funds per Major Final Outputs (MFOs)



LIST OF PROJECT IMPLEMENTERS

Research and Development

Development of Drying Systems for Granulated Cassava as Animal Feed Ingredient
R.C. Martinez, R.J. Pontawe, D.A. Briones, R.P. Gregorio, M.C. Bulaong, R.V. Divinagracia, L.R. Cruzat

Development of Improved Village-Type Corn Mill for White Corn
M.A. Gragasin, R.C. Matinez, M.C. Bulaong

Ex-ante Analysis for the Development of Brown Rice Just-In-Time Hulling Technology
M.A. Gragasin, J. Badua

Modification and Field Testing of Mechanized Onion Sorter
R.J.P. Macaranas, R.C. Nodora Jr., M.E.V. Ramos

Technology Support to the National Cold Chain Program
A.M. Tuates Jr., O.A. Capariño, D.S. Ognayon, S.M.A. Villota

Resistance of Storage Insect Pests to Phosphine
M.A. Acda, V.G. Mesa, M.A.A. Mangoba

Storage of Adlai
M.V. Dela Cruz, M.A. Acda, L.A. Lacanilao

Pilot Testing of Postharvest and Processing Systems for Soybeans
MC.R. Antolin, C.F. Neric Jr., R.S.M. Dela Cruz

Value Chain Analysis towards the Development of an Integrated Bulk Handling System for Corn from Mindanao to Manila and Cebu
G.B. Calica, M.J.P. Paico, R.S.M. Dela Cruz

Screening and Evaluation of Botanical Pesticides
A.A. Dela Fuente, L.A. Lacanilao

A Midgut Trypsin-Like Enzyme in the Cigarette Beetle (*Lasioderma serricorne Fab*):
Molecular Cloning and Biochemical Studies
A.A. Dela Fuente

Formulation of *Trichoderma harzianum* DGA02 for the Control of Crown Rot Disease of Banana
D.G. Alvindia, M.F. De Guzman

Utilization of Biomass Furnace By-products as Fuel Briquettes
A.M. Tuates Jr., A.R. Ligisan, O.A. Capariño

Utilization of Mango Peels as Source of Mango Pectin
MC.B. Gragasin, A.R. Ligisan, R.C. Torres, R. Estrella

Quality Analysis of White Corn Using Computer Vision System
A.C. Joaquin, R.C. Martinez, M.C. Bulaong

Performance Verification of PHilMech Computer Vision System (CVS) for Quality Analysis of Rice and Corn
A.M. Tuates Jr, A.R. Ligisan, S.M.A. Villota, O.A. Capariño, A.C. Joaquin, O. Agustin

Assessing the Level of and the Factors Driving Mechanization of Rice and Corn Farms in the Philippines
H.G. Malanon, R.S.M. Dela Cruz, P.R. Foronda, J.T. Ceynas, Z.L.L. Cabanayan

Technology Development and Commercialization for the Production of Year-Round Supply of Bulb Onion
R.G. Idago, R.S.M. Dela Cruz, D.R. Miranda

Compendium of Thermophysical Properties of Selected Philippine Foods and Agricultural Materials (Phase 1)
L.N. Miranda, J.J.M. Dela Torre, B. G. Jallorina, MC.B. Gragasin

Extension Support, Education and Training Services

Accelerating Establishment of the Multi-Commodity Solar Tunnel Dryer (MCSTD)-Based Enterprises in the Philippines
P.C. Castillo, D.M. Gamalog, G. M. Tolentino

Enterprise Capability Enhancement of Cashew Processors in Selected Areas
P.C. Castillo, D.M. Gamalog, G. M. Tolentino

Provision of Technical Assistance for Postharvest Enterprise Development Project
MR. L. Altamera, G.O. Mallo, K.M. Mercado, G.M. Tolentino

Applied Communication Program
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