PHILIPPINE CARABAO CENTER

Annual Report 2013

GENETIC IMPROVEMENT PROGRAM

Purebred Dairy Buffaloes

National Gene Pool. The PCC's National Gene Pool (NGP), essentially operates as an "open nucleus herd", i.e., it allows entry of breeding stocks into a herd of purebred (riverine) dairy buffaloes where systematic breeding, selection, and genetic evaluation procedures are being carried out. The purpose of which is to eventually produce an elite herd of dairy buffaloes that would be sources of superior germplasm for future generations. The NGP is nestled on a two-hectare facility and is supported by around nine hectares of improved forage. As of December 2013, the facility maintains 609 purebred dairy buffaloes (422 Bulgarian and 187 Brazilian) for the purpose. Some 327 of these are female breeders with average conception rate of 61.8%, average calving interval of 15 months, and calving rate of 76.5%.

A total of 41 elite bulls were also selected based on their estimated breeding values and were brought to the National Bull Farm for appropriate training as semen donors for the nationwide AI program.

Regional Centers. Institutional herds of purebred riverine buffaloes numbering to 1,168 (15 Murrah, 971 Bulgarian, 99 American, and 83 Brazilian) are also maintained at the PCC's 13 regional centers. Performance or production data from these buffaloes are also registered in the PCC-wide recording system for genetic evaluation and selection.

Quarantine Site in Tayabo, San Jose. A total of 1,252 heads of Italian Mediterranean Buffaloes arrived on November 10, 2013 as part of the agency's infusion strategy for genetic improvement program and implementation of the Dairy Fast Track. The buffaloes are currently quarantined and maintained at the PCC's facilities in Sitio Lomboy, Tayabo, San Jose City. They will be distributed to select PCC regional centers and farmer-cooperators in various parts of Luzon next year.

National and Regional Impact Zones. Purebred dairy buffaloes were also entrusted to farmer-cooperators in various cities and municipalities in Nueva Ecija, dubbed as the "National Impact Zone" or NIZ for dairy buffalo development, and in the "Regional Impact Zones" (RIZs) being stewarded by the PCC's regional centers. Current inventory of purebred dairy buffaloes in these impact areas is 4,891 (Table 1), which represents an increase of around 20% from the previous year.

Table 1 Purebred dairy buffalo inventory in the NIZ and RIZs.

Location/Particulars	Breeds				
	Bulgarian	Brazilian	American	Murrah	Total
A. National Impact Zone					
Pregnant	47	169			216
Nonpregnant	454	1,369			1,823
Female Calves	75	179			254
Male Calves	83	158			241
Junior/Adult Bulls	138	312			450
Subtotal	***797***	***2,187***			***2,984***
B. Regional Impact Zones					
Pregnant	256	1	27	0	284
Non Pregnant	884	50	62	4	1,000
Female Calves	160	5	17	0	182
Male Calves	122	10	18	0	150
Junior/Adult bulls	278	6	7	0	291
Subtotal	***1,700***	***72***	***131***	***4***	***1,907***
TOTAL	**2,497**	**2,259**	**131**	**4**	**4,891**

In the NIZ, milk production, %fat, and %protein of 1,095 buffalo cows were also determined based on a monthly milk test-day for a complete lactation period of about 10 months (adjusted to 305 days). Some 7,500 samples of milk were collected from participating farmer-cooperatives for the purpose.

Philippine Native (Swamp) Buffaloes

The PCC's regional centers also raise and maintain Philippine native carabaos in their institutional facilities (ex situ) for purpose of conservation, propagation, and selection within breed. In particular, PCC at Cagayan State University (PCC at CSU) in Piat, Cagayan and PCC at Ubay Stock Farm (PCC at USF) in Ubay, Bohol have maintained the most numbers of these animals on-station. As of December 2013, total carabao inventories reached 96 and 120 for PCC at CSU and PCC at USF, respectively (Table 2). These two regional centers, along with PCC at Central Luzon State University (PCC at CLSU) and PCC at La Carlota Stock Farm

(PCC at LCSF) have also engaged with farmers and/or other institutions in their coverage areas for similar or related purposes.

Table 2 Inventory of native carabaos in select PCC regional centers, farmer-cooperators, and other institution

Location/Particulars	No. of Head					Total
	Male Calf	Female Calf	Heifer	Cow	Bull	
A. PCC at CSU						
a. Ex situ (Cagayan State University, Piat, Cagayan)	11	14	14	41	16	96
b. Ex situ (Isabela State University, Echague, Isabela)	7	8	2	40	7	64
c. In situ (Tinglayan, Kalinga)				28	1	29
d. In situ (various municipalities in Nueva Viscaya)				24		24
B. PCC at USF						
a. Ex situ (Ubay Stock Farm, Ubay, Bohol)	10	13	13	54	30	120
b. In situ (Carlos P. Garcia)				533	191	724
C. PCC at CLSU						
a. Ex situ (Science City of Munoz, Nueva Ecija)	2			12	2	16
b. In situ (Bamban, Nueva Ecija)				14		14
D. PCC at LCSF						
a. Ex situ (La Granja, La Carlota City, Negros Occidental)		2	3	3	2	10
b. In situ (Balabag, La Carlota City, Negros Occidental)	2	1	1	11	8	23
c. In situ (Nato, La Castellana, Negros Occidental)	4	2	2	11	7	26
d. In situ (Robles, La Castellana, Negros Occidental)	1			5		6
e. In situ (Antipolo, Pontevedra, Negros Occidental)	2	1		8	2	13
TOTAL	**39**	**41**	**35**	**784**	**266**	**1,165**

National Crossbreeding Program

The aim of the PCC's crossbreeding program is to ultimately develop a Philippine dairy breed adaptable under local conditions. The production of crossbred buffaloes is done in two ways: (1) artificial insemination (AI), and (2) natural mating through the Bull Loan Program.

Artificial Insemination (AI). A total of 71,273 AI services in 53,455 female carabaos were carried out covering 6,524 barangays in 860 municipalities and cities in 73 provinces of the 16 regions of the country. These AI services were provided by 932 AI technicians, subdivided as follows: Village-based AI Technicians (n=428), LGU AI Technicians (n=433), NDA AI Technicians (n=4) and PCC AI Technicians (n=67).

An additional 174 AI technicians (VBAIT and LGU) were also trained in 2013 in the five PCC Training Centers (PCC at CLSU, PCC at CMU, PCC at CSU, PCC at UPLB, and PCC at USF), which added to the pool of trained AI Technicians in the country.

As of December 2013 report, there were 13,475 calves on the ground monitored based on the 2012 AI services.

Frozen semen production and distribution. The semen processing facilities at the PCC at CLSU and PCC at UPLB have produced 367,495 doses of frozen semen, which were deposited in the PCC's semen bank. Of this total, 213,259 doses were distributed to the PCC regional centers and other partner-agencies and individuals for the conduct of nationwide AI for water buffaloes. The remaining doses were stored for reference or for future research work.

To maintain the quality and viability of the frozen semen for AI, the PCC has also distributed a total of 1,581 dewars of liquid nitrogen to its regional centers and partner-entities nationwide.

Natural Mating via Bull Loan Program. This program complements AI services. In principle, in areas where AI service is not accessible, farmers avail of the bull loan program. As of December 2013, a total of 171 bulls were loaned out to farmer-bull handers. At the same time, there were 961 existing Murrah breeding bulls in the villages around the country. Of these bulls, 244 have records of active breeding service, which in 2013 totaled to 2,167 and benefitted more than 1,705 carabao raisers (owners of female carabaos naturally serviced and bull handlers).

A total of 1,336 calves on the ground were monitored in 2013 as a result of 2012 breeding services of the active bulls.

Infrastructure and Other Relevant Support to the AI Program. The year also saw the establishment or renovation of three AI bull farms and semen laboratories, two of which have been completed, i.e., facilities at the PCC at CLSU in Digdig Ranch, Carranglan, Nueva Ecija and those at the PCC at UPLB in Los Baños, Laguna. One is still undergoing construction at the PCC at CMU in Musuan, Maramag, Bukidnon.

Twenty L200 vans were also procured and released to the 13 PCC regional centers and operating units of the PCC National Headquarters in support of the extension services, particularly AI program in the villages. Likewise, 40 motorcycles and 240 mother tanks were also procured and due for release to the regional centers for similar activities.

International Genetic Improvement Conference and Workshop

The PCC spearheaded and hosted an international conference on November 28-29, which discussed the possibility of establishing an international semen exchange program for easier identification and exchange of the best buffalo genetics among cooperating countries. The vision is to have a program that will be patterned after Interbull, a worldwide committee which makes accurate genetic evaluations among cattle, both within and across countries.

In order to establish the semen exchange program, participating countries need to agree to be a part of the International Committee for Animal Recording (ICAR), a "worldwide organization for the standardization of animal recording and productivity evaluation" under which the Interbull is a sub-committee. From this, the group will be able to collect accurate data to be sent to ICAR for evaluation.

Aside from the Philippines, the other countries represented in the conference were India, Pakistan, Brazil, Italy, China and Australia. An ICAR representative, who served as a consultant, also attended the gathering. A follow-up activity was suggested to be held in Pakistan in March 2014 in preparation for the participation of key players from the buffalo group in the ICAR conference in Germany in May 2014.

CARABAO-BASED ENTERPRISE DEVELOPMENT (CBED)

Newly created carabao-based modules

In order to expand the development reach of the carabao-based enterprises, the PCC mobilized and helped organized more carabao owners particularly, the owners of crossbred buffaloes produced out of AI and bull loan programs in the regional impact zones. The CBED aims at creating more income-generating opportunities for the smallholder-carabao raisers. There were 13 newly organized cooperatives/associations in 12 regions of the country.

Grow-out areas were created to cater to the dairy carabao/buffalo payment of the loaned out dairy modules to cooperatives and families that can no longer be accommodated by the farmer trustees and the PCC farms. Also, it served as rehabilitation areas for retrieved dairy animals from errant farmer trustees. Thirty-four smallholder farmers were organized and engaged into the implementation of the buffalo grow-out project in Sampaloc and Cambitala, Pantabangan, Nueva Ecija.

Existing carabao-based modules

There are 157 existing cooperatives/associations of 5,458 carabao owners engaged in carabao-based enterprises, which are mostly located in Luzon and the Visayas Regional Impact Zones (RIZ). The most notable dairy cooperatives particularly based in Cavite, Laguna, Rizal, Bulacan, Pampanga, Pangasinan, Cagayan, Ilocos Norte, Cebu, and Bohol contributed 441,960.16 kg of milk to the local dairy industry.

At the National Impact Zone (NIZ) in Nueva Ecija, there are 54 existing dairy cooperatives consisting of 1,084 smallhold farmer members handling a total population of 2,187 Brazilian buffaloes, 797 Bulgarian buffaloes and five CB buffaloes (see Table 1). Majority of these cooperatives are members of the Nueva Ecija Federation of Dairy Carabao Cooperatives (NEFEDCCO). The NEFEDCCO supplied a total of 487,302.06 kg of raw milk to the milk pool and portion of which was sold to the local processors while the rest was sold as processed milk products (basically, pastillas, *kesong puti* and flavored milk) to the local market. In addition, 8.70% or 42,401.45 kg of total raw milk produced from NEFEDCCO was sold to the Centralized Milk Processing Plant at the PCC National Headquarters for processing and selling to its Milka Krem product outlet.

Post-Production Support

At the NIZ (Nueva Ecija), the PCC has facilitated the release of Php3 million-worth of milk processing equipment, which were distributed to eight partner-cooperatives in the province (Table 3).

Table 3 Milk processing facility and equipment received by farmer-cooperatives in Nueva Ecija

Name and Location of Cooperative	Type of Equipment Received
NEFEDCCO, Talavera	Retort machine, cooling facility
Parista Barangay Defense MPC, Lupao	Two stainless tables for processing
Eastern PMPC, San Jose City	Two upright freezers
SIPBUMPC, San Jose City	Two milking machines with two buckets and five milk cans with 40 li capacity
Dimasalang Sur MPC, Talavera	-do-
Casile DPC, Llanera	-do-
San Vicente DPC, Llanera	-do-
Bagong Pag-asa ng Bagong Talavera MPC, Talavera	-do-

In addition, the PCC has assisted the Korea International Cooperation Agency (KOICA) in the release of additional milk processing equipment for NEFEDCCO worth Php1.5 million, which included a refrigerated van, 50 pieces of stainless milk cans (20-li capacity) and equipment for milk quality testing.

Likewise, four village-based milk collection centers were established from the 2KR (Kennedy Round 2) funds. The buildings are now fully constructed and ready for turn-over to the partner-cooperatives in Nueva Ecija particularly in General Natividad, Sto. Domingo, LLanera, and Guimba.

The agency has also procured and distributed 61 units of aluminum milk cooler, 125 units of milk cylinder (30-liter capacity), and 158 units of milk pails (15-liter capacity) to all regional network centers in support of the CBED program.

Capability Building and Strengthening Support to the Farmer-Clients

The PCC National Headquarters (NHQ) and regional centers conducted 59 types of trainings in support of the assisted cooperatives, associations, and individual farmers. A total of 1,693 participants from Luzon, Visayas, and Mindanao participated in these trainings (Appendix 1).

The NIZ unit also conducted 12 types of trainings for the farmer-trustees of cooperatives and associations assisted by PCC within the Province of Nueva Ecija (Appendix 2). Two of the trainings conducted were in compliance to the 14 mandatory trainings prescribed by Cooperative Development Authority (CDA).

RESEARCH AND DEVELOPMENT

Basic and Applied (Operations) Researches

The PCC has continued conducting basic and applied researches in various disciplines and particular thematic areas as determined under the agency's R&D Agenda. Many of the basic researches have applied the concepts and methodologies in biotechnology. This is in keeping with the designation of PCC by the Department of Agriculture as its lead agency for livestock biotechnology R&D. The latter is complemented by relevant researches that explore and address problems or issues that are being encountered in the course of the agency's implementation of the Carabao Development Program.

In 2013, 44 researches (43 basic and 1 applied) were completed while another 44 (40 basic and 4 applied) were still being conducted (Tables 4a and 4b and Appendices 3a and 3b). These researches were also presented in the agency's Annual R&D In-House Review held on May 29, 2013 at the PCC National Headquarters.

Table 4a Type, numbers, and status of Basic Researches

Field	Completed	Ongoing
Animal Nutrition	7	5
Animal Health	17	13
Molecular Genetics	5	3
Reproductive Biotechnology	5	10
Reproductive Physiology	-	1
Socio-Economics	9	8
TOTAL	**43**	**40**

Table 4b Type, numbers, and status of Applied (Operations) Researches

Thematic Area	Completed	Ongoing
Increasing calf production/reducing calf mortality	1	-
Increasing forage productivity	-	3
Increasing milk production	-	1
TOTAL	**1**	**4**

Appendix 4 presents highlights of some completed researches in 2013.

Research "for" Development

At the latter part of the year, the PCC has also begun drumbeating the concept of Research for Development (R4D) as opposed to the traditional "R&D". While the latter places "research" and "development" on equal footing, R4D places emphasis on "development" or practical applications or relevance of research efforts to the livestock industry in general and to the farmer-clients in particular. With the new research paradigm, the PCC has also revisited its Carabao Development Program (CDP) and in the process has redesigned its structure, priority programs, and directions in the long term. The agency plans to formalize its "R4D Agenda" and specific priority areas in early 2014.

R&D In-House Review and CLAARDEC R&D Symposium

The PCC's Annual R & D In-House Review is a tool to evaluate both the completed and on-going research activities as to their merits, problems, limitations, and opportunities for improvement. It serves as a venue for sharing research results with the R&D community and as a motivating tool for researchers to strengthen their interest in conducting pertinent researches in line with the agency's mandate. It is also aimed at giving due recognition to those individuals who excelled in their research endeavors.

There were 32 research studies presented during the 2013 in-house review, 20 of which are completed while 12 are still on-going. Completed researches, which also included undergraduate student thesis, delved in the areas of animal health and nutrition, reproductive biotechnology, molecular genetics, socio-economics, and production management.

Three professors/researchers, namely, Dr. Fe L. Porciuncula, Professor VI and Director of Ramon Magsaysay Center for Agricultural Resources and Environment Studies (RM-CARES) at the Central Luzon State University (CLSU), Dr. Virginia M. Venturina, Professor in Veterinary Parasitology College of Veterinary Science and Medicine-CLSU, and Dr. Jose Arceo N. Bautista, University Extension Specialist III of the Animal and Dairy Sciences Cluster at the University of the Philippines Los Baños, served as panel of external evaluators during the review.

Out of 32 research studies presented, a completed study titled "Buffalo and Bovine Embryo Development from In-vitro Matured Oocytes Derived from Slaughter House through Intracytoplasmic Sperm Injection Technique (ICSI)" presented by Dr. Prudencio B. Pedro, along with his team members Dr. Eufrocina P. Atabay, Dr. Edwin C. Atabay, Dr. Flocerfida P. Aquino, Dr. Lerma C. Ocampo, Ms. Excel Rio S. Maylem and Dr. Libertado C. Cruz won the best paper award. Dr. Prudencio B. Pedro also garnered the best presenter award. Meanwhile, the study titled "Effectiveness of Computer Game in Improving Elementary School Pupil's Intake of Fresh Buffalo Milk", won the award for best undergraduate student research. It was presented by Mr. Ian Kim P. Gahoy under the supervision of Mr. Rotacio S. Gravoso from the Visayas State University.

On December 5, 2013, the PCC also hosted the 24th Regional Symposium on R&D Highlights by the Central Luzon Agricultural Resources Research and Development Consortium (CLARRDEC).

Conference Presentations and Journal Publications

Consistent with the norm of sharing R&D outputs to wider research and scientific communities, the PCC researchers have actively participated in local and international scientific conferences (see portion of Appendix 5). Likewise, 25 papers were published in refereed journals (Appendix 6).

Technical Seminars Conducted and/or Facilitated

The PCC has also conducted or facilitated a series of Technical Seminars at its National Headquarters on various topics related to animal health, animal nutrition, rumen biotechnology, advance techniques on reproductive biotechnology, and other fields (Table 5). The aim is to improve and sustain awareness of PCC staff and other invited researchers and students from the academe and government institutions on technical matters and issues relevant to the livestock industry in general and PCC operations in particular.

Table 5 Titles of technical seminars conducted or facilitated for CY 2013

Date (2013)	Title and/or Topic Presented	Resource Speaker/Affiliation
22 January	PCC's Projects and Activities in Addressing Climate Change	Dr. Eric Palacpac, KRMD-PCC
1 March	Role of Inhibitory Molecules in Bovine Chronic Infectious Diseases and as Target for Therapy	Dr. Satoru Konnai, Hokkaido University
1 March	Investigation of immunoinhibitory receptors as novel therapeutic targets for multiple infectious diseases in cattle	Dr. Tomohiro Okagawa, Hokkaido University
5 March	PCAARRD-PCC Community Based S&T Based Farm (CBSTBF) and Technomart Projects on Dairy Buffaloes	Dr. Daniel Aquino, ANU-PCC; Dr. Eric Palacpac, KRMD-PCC
May	Preliminary Results of Impact Assessment of CDP	Dr. Maria Excelsis Orden et al., CLSU
6 June	Zoonosis Control in Animals	Dr. Marvin Villanueva Dr. Junki Maruyama
20 June	Nutrigenomics: Helping us understand the relationship between diet, genes, function and health with Alltech Dairy Advance M1000 Solutions Program to Improve production, fertility and health of dairy animals	Mr. John Campbell, Ruminant Manager, Alltech SE Asia
29 July	Philippine Genetic Improvement Program	Dr. Ken Phillips
8 August	PCAARRD Pantas/Tanglaw Awards Consultation Meeting	Mr. Andre Acedera and Dr. Edwin Villar, PCAARRD
3 September	A Short Talk on Ethical Standards for Researchers and Scientist	Acd. Evelyn Mae Tecson-Mendoza, NAST
6 September	Echo Seminar on Genomics and Bioinformatics Training in Italy	Dr. Rommel Herrera, PCC at UPLB
17 September	Echo Seminar on Rural Development Training in Japan	Mr. Ericson Dela Cruz, CBED-PCC
20 September	Presentation of Output: " A Case Study on the Bull Loan Program in the Select PCC Regional Centres PCC at CSU, CLSU and UPLB"	Mr. Gian Bumanlag and Ms. Melanie Tolentino, CLSU

Awards and Recogntions

The PCC staff members continued to gain recognition from various award-giving bodies in 2013. No less than the PCC executive director, Dr. Libertado C. Cruz, was cited as the 2013 lecture series honoree of the 50th Scientific Seminar and Annual Convention of the Philippine Society of Animal Scientists (PSAS) held on October 22-25 in Tagaytay City, Cavite. His significant contributions to the Philippine animal industry, including his advocacy on the use of biotechnology in veterinary and animal science as well as his more than two decades of heading the PCC, made him a unanimous choice for the honors, PSAS stated. Table 6a presents the complete list of PCC awardees in 2013. Several PCC researchers were also cited in their paper or poster presentations in scientific conferences (Table 6b).

Table 6a Recognitions received by PCC staff members.

Awardee	Title of Recognition	Award-Giving Body
Dr. Libertado C. Cruz	2013 Lecture Series Honoree	Philippine Society of Animal Science
Dr. Eufrocina D. Atabay	Distinguished Researcher in Veterinary Science	PSAS-Bounty Agro-Venture, Inc.
Mr. Jose Canaria	Outstanding Professional in Veterinary/Animal Science Extension	PSAS-Equalivet, Inc.
Ms. Rowena G. Bumanlag	Professional Media Award (Print Category)	Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development

Table 6b Citations for PCC staff members who presented papers or posters in scientific conferences.

Title of Citation	Title of Paper/Poster	Awardees	Title of Scientific Conference
Best Paper (Biotechnology Category)	Buffalo and Bovine Embryo Development from In-Vitro Matured Oocytes derived from Slaughterhouse through Intracytoplasmic Sperm Injection (ICSI) Technique	P. Pedro, et al.	50th Philippine Society of Animal Science Annual Convention and Scientific Conference
Best Paper (Applied Research Category)	Reducing Calf Morbidity and Mortality through Improved Housing Management and Early Introduction of Concentrates and Forage Grasses	C. Dabalos, et al.	50th Philippine Society of Animal Science Annual Convention and Scientific Conference
4th Place (Best Poster) Certificate of Recognition	In Vitro Embryo Production and Transfer of Bubaline Embryos Using Oocytes Derived from Transvaginal Ultrasound-Guided Follicular Aspiration	F. Aquino, et al.	10th World Buffalo Congress and 7th Asian Buffalo Congress
8th Place (Best Poster) Certificate of Recognition	Ensuring the Quality of Bovine Embryos produced In-Vitro through the Inner Cell Mass and Trophectoderm Ratio	E. Maylem, et al.	10th Asian Reproductive Biotechnology Society Convention
Finalist	Hypoosmotic Swelling Test to Check the Functional Integrity of Plasma Membrane of Water Buffalo Spermatozoa	D. Duran, et al.	25th DA-BAR National Research Symposium

KNOWLEDGE RESOURCE MANAGEMENT

Production and Distribution of Information, Education, and Communication (IEC) Materials

Recent undertakings emanating from the PCC's R&D activities, including scientific collaborations and other related events, were made available to the public thru sustained efforts of information dissemination. These materials were packaged by the Applied Communication Section (ACS) of the Knowledge Resource Management Division and complemented by other mixed media approaches.

Consistent with its goal of image-building and program promotion, the ACS has also endeavored in using another media approach thru production of audio-visual materials in delivering the agency's accomplishments in narrative and creative content.

Publications and Productions

A new material, the "NIZ Balitaan" was produced. It is written in Filipino, and utilizes the tabloid format, produced and released monthly focusing on the PCC's National Impact Zone with farmers as the specific intended readers. This publication presents significant news and feature stories about people and technologies involved in buffalo-raising by smallhold dairy farmers in Nueva Ecija and NIZ-related undertakings of PCC. It seeks to inspire and empower dairy farmers as well as current and future program partners, and ultimately contribute to the improvement of the Philippine dairy industry.

Moreover, the PCC Anniversary Bulletin was produced and disseminated as part of the PCC's 20th anniversary. The bulletin paid tribute to the pillars and pioneers of the carabao development, in recognition of their significant contributions to the development of the local carabao industry and the institutionalization of the National Carabao Development Program. The publication also highlighted the activities during the anniversary and significant undertakings of the agency.

One issue of the PCC Newsletter was produced in 2013. The other regular publications that were circulated to the general public were two issues of the PCC Balita and one issue of R&D Highlights. Four other publications were produced, namely the PCC Annual Report 2012, updated corporate primer, Anniversary souvenir program and "Mapa-Wow Sa Kabuhayang Mula sa Kalabaw" translated into four dialects; Cebuano, Hiligaynon, Ilonggo and Ilocano.

A total of 60, 760 copies of these IEC materials were distributed to PCC stakeholders, visitors, and partner institutions, among others.

The ACS was able to produce six AVPs, three of which were launched during the PCC's 20th anniversary, the PCC National Anthem, PCC Prayer and PCC Pillars and Pioneers. Three other productions highlighted the project accomplishments made by PCC in collaboration with different industry partners and international linkages. These were presented during the KOICA visit, DA-BAR project review and 2KR performance assessment.

Benefitting from other Media Forms

The PCC gained better media mileage thru seven television and radio interviews and guesting this year. Major TV networks such as ABS-CBN, Net25 and TV5 covered various activities of PCC that highlighted PCC's dairy products. Guesting in radio stations were also monitored in Dagupan's Sunshine Radio Station, Bombo Radyo, and RPN DZRL.

The agency also gained exposure through regular news releases in the Cabanatuan-based local newspaper Cabanatuan Herald and Pampanga-based local newspaper Punto Central Luzon.

In the internet, press releases of the PCC program were regularly uploaded to its official website www.pcc.gov.ph. Released publications and corporate materials were also uploaded in the website for easy access of clients, interested individuals, and institutions.

Regular placements of PCC advertorials in souvenir programs of various entities were published in 10 advertisements. The PCC online and print press releases monitored totaled 117 this year.

Aside from the use of the traditional and digital media, the PCC co-sponsored several trade fairs and exhibits that served as venues for program and product promotion. Such were the Dairy Congress and Expo 2013 in Baguio City, Science City of Muñoz Centennial Celebration, CLSU Fair 2013, Katigbawan Festival, Aggao Nac Expo 2013, Araw ng Lala Trade Fair and Livestock Show, UP CVM Student Council Veterinary Medicine Week, Livestock Expo 2013, World Food Day 2013, and the DA-Biotech Exhibit in House of the Representatives and Mehan Garden.

Prioritizing Customers' Satisfaction

A total of 4, 891 scheduled and walked-in visitors were received, oriented, and toured to the PCC facilities in 2013 following the standards of the Integrated Management Systems. A majority of the visitors were students and farmers. The others were either government officials or employees and researchers.

With the purpose of continually improving its systems in receiving visitors, the ACS conducts a Visitors' Satisfaction Survey quarterly. In 2013, the Visitors' Bureau, which is composed of the ACS staff members and security guards, were able to sustain its good rating. The bureau earned a satisfaction rating of 4.76 (very good to excellent), which is above the agency's Quality Management Systems (QMS) target rating of 4.25 percent.

Scientific Library Services

The PCC's Knowledge Resources Management Center (KRMC) or Library is continuously strengthening its collection of scientific publications on Animal Science and other related subject areas like Livestock Biotechnology, Cryopreservation, Genomics, Animal Health and Nutrition, Reproductive Biotechnology and Bioinformatics. The library in-charge is proactively encouraging the participation of the agency's scientists and researchers to recommend/inform the library management for titles of books/references, international refereed journals/articles, and multimedia materials that they use often in the course of their research. This helped strengthen the selection and acquisition function of the library. Currently, the KRMC/Library has a total collection of 3,789 bibliographic entries of books, e-books, journals, thesis, and multimedia on its web-based Electronic Integrated Library System (EILS) and linkages with 10 external journal databases that can be accessed through an Online Public Access Catalog (OPAC) for ease of locating and retrieving the needed library materials.

The KRMC has continuously facilitated the publication of papers by the PCC's researchers and scientists in various scientific journals and also assisted them in registering or renewing their membership in various international scientific societies and associations.

The KRMC has likewise managed and maintained continuously the International Buffalo Knowledge Resource Service (IBKRS), an online database of published researches in buffalo. To date, the IBKRS has total of 8,993 e-journal articles in full-text and abstract forms from different refereed journals and is accessible through the URL: www.ibkrs.net.

Information Management System

The Information and Communication Technologies Section (ICTS) enhanced, upgraded and installed new Central Processing Unit (CPU) and laptops to PCC operating units/section and PCC regional centers. The upgrading has ensured making workstations up-to-date and high-end. Maintenance and patch upgrading of Windows Server Enterprise 2008 R2 edition Operating System, and Microsoft Forefront Threat Management Gateway 2010 was also achieved making a secure web gateway that provides comprehensive protection against web-based threats and allows users to safely and productively use the internet for research without worrying about malware and other threats.

Complementing its major activities, regular maintenance, troubleshooting, repair, and upgrading of Windows 7 32 and 64 bit Operating System and Microsoft Office 2010, as well as regular updating of Symantec End Point Protection-Server base and Client base anti-virus were conducted.

Subscription to internet services from PLDT MyDSL and Globe Communications with speed of 2 Mbps was provided to the PCC personnel in line with their research and collaborative activities with international and local agencies. The ICTS also maintains wireless internet connectivity at the PCC Hostel, Training Halls, Gene Pool, dairy processing plant, Milka Krem, and Main and Annex buildings.

Consistently following a support system to ensure a virus-free Local Area Network (LAN), the ICTS renewed its Symantec Endpoint Protection Anti-Virus. This ensures protection to all units joined in the LAN from any fortuitous computer bug infection. It also maintained and backed up existing Information System of the Electronic National Government Accounting System (e-NGAS), Human Resource Management System (HRMIS), Document Tracking System, Attendance Management System (DTR), and Biometric Scanner System. Likewise, it performed regular maintenance and check-up of PCC and IBKRS websites connection to ensure they are online 24/7 online and secured.

The ICTS also installed and configured Mail Server or E-mail System for having standard and secured email address (ex; juandelacruz@pcc.gov.ph).

Recognizing the need of other operating units, additional 50 ports for Local Area Network (LAN) connections in PCC main building, 15 LAN connections to DHI-NIZ office, and 4 LAN connections for Milking Machine at Gene Pool were likewise configured and installed.

To capacitate its staff in terms of knowledge and applications on IT, one ICTS staff member is undergoing a Graduate Program Study on Service Management Engineering. Other ICTS

staff members also attended the Training Seminar Workshop of the Department of Agriculture-Information Technology Center for Agriculture and Fisheries (DA-ITCAF) Information Technology Round In Agriculture's Communication focusing on Data Security and Policy Enhancement and Generation within Agencies and the creation of a framework for the DA's "Matuwid na Daan" Website.

INSTITUTIONAL DEVELOPMENT

Performance Monitoring, Information and Reporting Systems

The PCC has complied with the requirements set forth by the Department of Budget and Management (DBM)'s Administrative Order 25 which seeks to: (a) eestablish a unified and integrated Results-Based Performance Management System (RBPMS) relative to national leadership's agenda; and (b) use RBPMS as basis for determining entitlement to performance-based allowances, incentives, or compensation of personnel.

Through its Planning and Special Projects Division, the PCC has cascaded to all its operating units the context of RBPMS towards a unified perspective on Priority Program Accountability Report Card (PARC) and compliance to the agency's Major Final Output (MFO) and Management Accountability Report Card (MARC I and MARC II). Likewise, the Strategic Performance Management System (SPMS) was complementarily adapted, as spearheaded by the PCC's Human Resource Development Section.

The result led to a web-based transparency seal (www.pcc.gov.ph) and citizen's charter that publicly presents updated reports on the agency's accomplishment, financial transparency, and continual services to its clients.

Redesign of the Carabao Development Program (CDP)

The approval of the agency's Rationalization Plan effectively led to a series of writeshop session towards the redesign of the CDP that will re-orient implementation into a more reflexive Research for Development (R4D) framework aligned with the Strategic Plan crafted earlier in 2011.

Institutional Linkages

The PCC has established new partnerships and collaborations during the year while maintaining existing ones with various institutions for purposes of research, development, technical cooperation, and capability building (Table 7).

Likewise, the PCC has sustained its partnerships with state colleges and institutions that host its regional centers and with the local government units, farmer-cooperatives, and private entities nationwide for the sustained implementation of the CDP.

Table 7 List of partner-institutions, CY 2013

Partner Institution	Nature of Linkage
NEW	
International Committee for Animal Recording (ICAR), Italy	R&D and Technical cooperation
Laboratory of Plant and Animal Science Experimental Farm, Meijo University, Japan	R&D and Technical Cooperation
BUDHI ng Pilipinas Foundation, Inc.; Tulong Dairy Farmers Association (Tulong DFA); SHAHANI GATAS ng KALABAW Products Inc. (SGKP)	Capability building
EXISTING	
Laboratory of Infectious Diseases, School of Veterinary Medicine, Hokkaido University, Japan	R&D and Technical Cooperation
Hokkaido University Research Center for Zoonosis Control, Japan	R&D and Technical Cooperation
Consortium for Japanese Veterinary Medicinal Products Manufacturers, Japan	R&D
Korea International Cooperation Agency	Technical Cooperation
Sunchon National University, South Korea	Capability Building
Hankyong National University, South Korea	Capability Building
Korea Institute for Animal Products Quality Evaluation, South Korea	R&D and Technical Cooperation
Japan International Cooperation Agency, Japan	Capability Building
Rajamangala University of Technology Thanyaburi, Thailand	Technical Cooperation
Rajamangala University of Technology Tawan-ok, Thailand	Capability building
Colorado State University, USA	Capability Building
Department of Veterinary and Animal Science, University of Massachusetts, USA	Capability Building
University of Wisconsin, USA	Capability Building
Manila Economic and Cultural Office-Taiwan Economic and Cultural Office	Technical Cooperation
Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development-Department of Science and Technology	R&D; Technology commercialization
National Academy of Science and Technology	R&D
Research Institute for Tropical Medicine-Department of Health	R&D
Central Luzon State University-College of Veterinary Science and Medicine	R&D
Central Luzon State University-Small Ruminants Center	R&D
Department of Biology-University of the Philippines Manila	R&D
Department of Biology-College of Science-University of the Philippines Baguio	R&D
Molecular Protozoology Laboratory, Natural Sciences Research Institute, University of the Philippines Diliman	R&D
National Institute of Molecular Biology and Biotechnology, University of the Philippines Diliman	R&D
Bureau of Animal Industry	R&D
Bureau of Agricultural Research	R&D
Department of Agriculture Biotech Program	R&D
Department of Agriculture-National Agricultural and Fishery Council	R&D
Accredited Swine Breeders Association of the Philippines	R&D
Livestock Development Council	R&D
Public Law (PL) 480	R&D and Capability Building
Kennedy Round (KR) 2	Development

Intergrated Management Sytem

The PCC through its Integrated Management Audit Section (IMAS) ensured that the established Integrated Management Systems (IMS) that have been certified to ISO 9001 (Quality Management System); ISO 14001 (Environmental Management System); and BS OHSAS 18001 (Occupational Health and Safety Management System) are maintained and effectively carried out. During the first quarter of 2013, a combined surveillance audit was conducted by TUV SUD. The activity culminated with the confirmation of the continuing validity of the IMS Certification for the PCC National Headquarters and Gene Pool.

To ensure sustained implementation of the IMS, three batches of Internal Audit covering all areas at the National Headquarters and gene pool were conducted. The audits were done purposely to check on the operating units' compliance not only to the requirements of the three standards, but to applicable legal, regulatory and other requirements.

With this, the IMAS maintains an updated matrix of legal, regulatory and other requirements that are released by government agencies mandated to regulate implementation of orders pertaining to environmental protection and assurance of health and safety among employees.

Apart from overseeing the maintenance of IMS at the National Headquarters, the IMAS also assisted the regional centers in both their quests for certification and maintenance of certification. In 2013, the following were accomplished:

- Assisted the conduct of surveillance audits to maintain ISO 9001:2008 certification of PCC at Mariano Marcos State University; PCC at University of the Philippines Los Baños; and PCC at Ubay Stock Farm
- Assisted the certification of two more centers, namely, PCC at Cagayan State University and PCC at University of Southern Mindanao
- Conducted QMS Documentation and Internal Quality Auditing Trainings at the PCC at CSU, PCC at USF, PCC at UPLB, and PCC at CLSU

Human Resources Management

During the year, the PCC's Human Resource Management Section (HRMS) with its two units, the Human Resource and Development Unit (HRDU) and the Personnel Unit (PU) sustained performing a high level of commitment in facilitating and ensuring that the competency requirements on human resource of a premiere Research and Development institution are provided. The HRMS focused on maintaining highly motivated and competent employees through a pro-active HRM system consisting of recruiting, developing, rewarding, motivating, and retaining employees who are contributing concrete results relative to the effective implementation of the agency's programs, projects, and flagship priorities.

Accordingly, the HRMS launched an approach briefly described by the slogan "RISE!", which stands for Reach out, Inspire, Serve and Empower. The section was able to promote and express its respect and recognition on the capability of the individuals and of teams. It encourages the development and improvement of the general well-being as well as the competence of the workforce.

Eventually, the PCC envisions having a contented and highly motivated workforce that succeeds in their work and reaches greater fulfillment with highly competitive advantage in livestock biotechnology and enterprise development.

Recruitment, Selection, and Staffing

During the year, the HRMS performed the following:

- Evaluated 83 application documents with various fields of discipline;
- Administered proficiency tests to 56 qualified applicants based on the pre-evaluation process for various available positions; and
- Conducted interview to 44 prospects that passed the proficiency test for 25 available Job Order positions.
- Eventually facilitated the hiring of 25 Job Order-staff members for the different Division/Section/Units.

As of December 31, 2013, the agency has a total workforce of 431 personnel (including job order) (Tables 8a and 8b).

Table 8a. Distribution of PCC Plantilla Personnel, CY 2013

Office/Center	Technical Staff	Non-Technical Support Staff	Administrative Staff	Total
Office of the Executive Director	22	11	16	49
PCC at CLSU	23		2	25
PCC at UPLB	24		2	26
PCC at CSU	13		1	14
PCC at MMSU	4	5	1	10
PCC at DMMMSU	7		1	8
PCC at USF	10		1	11
PCC at VSU	8		2	10
PCC at WVSU	8		1	9
PCC at LCSF	6	1	1	8
PCC at CMU	9		4	13
PCC at USM	7		1	8
PCC at MSU	8		1	9
PCC at MLPC	8		1	9
Total	**157**	**17**	**35**	**209**

Table 8b. Distribution of PCC Contractual (Job Order) Personnel, CY 2013

Particulars	Technical Staff	Non-Technical Support Staff	Administrative Staff	Total
Office of the Executive Director	24	30	21	75
PCC at CLSU	9		21	30
PCC at UPLB	1	12	1	14
PCC at CSU	2	2	3	7
PCC at MMSU	1	9		10
PCC at DMMMSU		2		2
PCC at USF	6	4	7	17
PCC at VSU	1	10		11
PCC at WVSU	8			8
PCC at LCSF		6	3	9
PCC at CMU	2			2
PCC at USM	1	14		15
PCC at MSU		4	2	6
PCC at MLPC		13	3	16
Total	**55**	**106**	**61**	**222**

Budget and Finance Management

The PCC has continued to improve its compliance to all mandatory financial accountability reports as prescribed by regulating and coordinating agencies such as the Commission on Audit, Department of Budget and Management, and the Department of Agriculture. Budgetary requirements of the operating units of the center were provided on time and in accordance with the approved plans.

Likewise, a more responsive process flow was adopted to address activities/emergencies not included in the approved work plans. Coordination among units involves in the process flow of property accountability and procurement was strengthened, appropriate process flow to institute regular coordination was revised and implemented. This resulted to increased number of dropped property accountabilities at the NIZ, Gene Pool, and Lomboy areas. An aggressive housekeeping of records and properties are on-going.

Appropriate administrative policies, procedures and processes were also issued and implemented to enhance transparency of operation and minimize lead time in processing financial claims and administrative services.

Highlights of FY 2013 Budgetary Expenditures

The PCC's FY 2013 budgetary expenditures are anchored on the RUMINANT ROAD MAP 2011-2034, a recently approved program that placed a unifying umbrella to the on-going and long-term program for ruminants in the country. Dairy development based on buffalo is an important component. The PCC Strategic Plan for 2013-2025 is anchored on the ruminant road map specifically focusing the next 15 years of producing at least 2.0 million calves directly affecting 1.5 million families. Consistent with a well-coordinated push jointly undertaken by the government and private sector within the framework of comprehensive long-term scheme of the ruminant road map, the PCC's budgetary expenditures for FY 2013 budget is focused on three areas:

a. **Herd Development and Productivity Improvement thru Expanded AI Program.** Artificial Insemination (AI) is a frontline service of the government for enhancing herd build-up and for the development of *genetically superior dairy buffaloes.* In 2013, expenditures were focused on the training and activation of private, village-based AI technicians to cover wide number of breedable females in impact areas. There were also sustained support to liquid nitrogen supply for AI, wider and efficient implementation of the Bull Loan Program in various barangays where carabao population is high and AI is not possible, and highly organized frozen semen distribution and utilization system.

b. **Small-holders Enterprise Development**. In 2013, organizational and entrepreneurial strengthening development programs were undertaken for the smallhold-producer cooperatives nationwide. These included activities which involved full private sector participation in providing critical services and support enterprises from farm to consumers. An aggressive move was also undertaken to mobilize smallholder farmers, private sector and LGU in various segments of the ruminant animal industry.

c. **Harnessing Biotechnology R&D and Cryobanking of Animal Genetic Resources.** In 2013, PCC sustained and expanded the implementation of Biotechnology R&D accross major ruminant commodities along with cryobanking of animal genetic resources. R&D efforts were also focused on reproductive biotechnology as a component technology (In Vitro Maturation/In Vitro Fertilization, Ovum Pick Up, Embryo Transfer, cloning) in enhancing propagation of superior dairy animals.

Sources and Usage of Funds

The agency's main sources of funds to support its operations are provided by the national government through the General Appropriations Act (GAA). Table 9 presents the details of allotment and utilization.

Table 9 PCC Sources and Utilization of Funds as of December 31, 2013 (Php Million)

Fund Source	Authorized Allotment	Usage	%Utilization
GAA-Current & Continuing	**621.97**	**606.49**	**98%**
Personnel Services	80.19	79.92	100%
Maintenance & Other Operating Expenses	267.80	264.82	99%
Capital Outlay	273.98	261.76	96%
Agri-Pinoy Livestock - Current & Continuing	**170.00**	**40.23**	**99%**
Maintenance & Other Operating Expenses	162.00	152.00	94%
Capital Outlay	8.00	8.00	100%
Revolving Fund- Dairy Business Module	**68.59**	**49.36**	**72%**
Foreign Assisted Projects	**48.00**	**18.00**	**38%**
TOTAL	**908.56**	**714.08**	**79%**

Special projects fund represents the research funds from various government agencies and institutions. Project funds utilization is mainly on the maintenance and operating requirements of particular projects.

PCC's Financial Condition

Table 10 presents the PCC's Statement of Financial Condition at the end of FY 2013.

The PCC's total assets as of December 31, 2013 are valued at Php2,572.82 million comprising mainly of the agency Property, Plant & Equipment (PPE) and Breeding stocks or Other Assets. The significant change in other assets or breeding stocks represents the booking of the cost of 1,203 heads of imported Italian buffaloes.

Total liabilities posted Php171.55 million and total equity reached Php2,401.27 million. Significant decrease in liabilities represents the payment for the imported buffaloes. Likewise, increase in equity is attributed to the investment of the government for the infusion of dairy buffaloes.

Table 10 Statement of Financial Condition as of December 31, 2013 (Php Million)

Particulars	FY 2013	FY 2012	% Change
Assets			
Current Assets	752.59	868.92	-13%
Property, Plant & Equipment	919.92	798.69	15%
Other Assets (Breeding Stocks)	900.31	541.95	66%
Total Assets	**2,572.82**	**2,209.55**	**16%**
Liabilities	171.55	584.82	-71%
Government Equity	2,401.27	1,624.74	48%
Total Liabilities & Government Equity	**2,572.82**	**2,209.55**	**16%**

Table 11 presents the PCC's Statement of Income and Expenses for the year end of 2013. The PCC's total income for the year reached Php913.08 million comprising mainly of the subsidy from the national government. The business income represents the sales of milk, meat, live animals, and other by-products as a consequence of the operation of the institutional dairy business module of the regional centers.

Personnel services expenses posted Php86.30 million, while total maintenance and other operating expenses including non-cash expenses for the depreciation is Php277.16 million giving a net income or surplus from operation of Php492.35 million. The decrease in net income for FY 2013 is attributed to the decrease in subsidy from the national government.

Table 11 Statement of Income and Expenses for the period ending December 31, 2013 (PhpM)

Particulars	FY 2013	FY 2012	% Change
Income			
Subsidy Income	844.19	877.11	-4%
Business Income	68.59	53.16	29%
Other Income	0.31	32.44	-99%
Total Income	**913.08**	**962.71**	**-5%**
Expenses			
Personnel Services	86.30	81.50	6%
Maintenance & Operating Expenses	277.16	248.97	11%
Non-cash expenses - Depreciation	57.27	41.24	39%
Total Expenses	**420.73**	**371.70**	**13%**
Net Income	**492.35**	**591.01**	**-17%**

Appendix 1. CY 2013 Trainings Conducted by PCC and Number of Participants

No.	Types of Training Conducted	No. of Participants	Month (2013)	Center
1	On the Job Training on Dairy Farm Operation	22	January	CLSU
2	Preparatory Training on Basic AI, PD and Paravet	7	January	VSU
3	Preparatory Training on Basic AI, PD and Paravet	9	February	VSU
4	Trainers Training on Forage Pasture and Development	37	February	CSU
5	Training Course on Buffalo Management	21	February	CSU
6	On-site Training Program on Animal Management, Milking and Milk Handling/Lecture Series on Dairy Buffalo Production and Management/ Seminar on Animal Health Management	179	February	MSU, WVSU
7	Training on Milk Handling, Processing, Testing and Product Launching	159	February	DMMMSU, MSU, UPLB
8	On the Job Training on Dairy Farm Operation and Food Processing	10	February	CLSU
9	Preparatory Training on Basic AI, PD and Paravet	12	March	VSU
10	Practical Training on Processing of White Cheese, Pastillas, Yoghurt and Chocomilk	1	March	UPLB
11	Skills Training on Cultural Management Practices for Commercial Cassava Production	33	March	USF
12	On the Job Training on Dairy Farm Operation	9	March	CLSU, UPLB
13	Social Preparation Training on the Entrustment of Dairy Buffalo	32	April	MLPC
14	Technical Training on Dairy Production and Management	33	April	UPLB
15	Preparatory Training on Basic AI, PD and Paravet	7	April	VSU
16	On the Job Training on Dairy Farm Operation	22	April	UPLB, WVSU
17	Milk Handling and Processing Training	36	May	CMU
18	Hands-on Refresher Training on Dairy Processing	2	May	UPLB
19	Training on Advancement in Animal Health Management for Large Ruminants	10	May	UPLB
20	Preparatory Training on Basic AI, PD and Paravet	6	May	VSU
21	Bull Management Training	82	June	CLSU, UPLB
22	Pangangalaga ng Sariwang Gatas	21	June	UPLB
23	Preparation of Urea-Treated Rice Straw	22	June	NHQ
24	Corn Silage Production	14	June	NHQ
25	Pangangasiwa ng Gatasang Kalabaw at Pangangalaga ng Sariwang Gatas	24	June	UPLB
26	Pasture Management Training	26	June	LCSF
27	Practical Training on Forage Development and Management	1	June	UPLB

28	Preparatory Training on Basic AI, PD and Paravet	8	June	VSU
29	Training on Preparation of Yoghurt Starter	4	June	UPLB
30	Training on Yoghurt Ice Cream Mix	4	June	UPLB
31	On the Job Training on Dairy Farm Operation	84	June	CLSU
32	Basic Training Course on Dairy Buffalo Management, Milk Collection and Processing	23	July	CLSU
33	Preparatory Training on Basic AI, PD and Paravet	23	July	VSU
34	Training for the Preparation of Frozen Yoghurt Mix	2	July	UPLB
35	On the Job Training on Product Development Processing and Marketing	3	July	CLSU
36	Pagsasanay sa Paggawa ng Produkto mula sa Gatas ng Kalabaw	2	August	UPLB
37	Pagsasanay sa Pagsusuri ng Kalidad ng Gatas ng Kalabaw	2	August	UPLB
38	Preparatory Training on Basic AI, PD and Paravet	6	August	VSU
39	Training on Milk Pasteurization and Processing	54	August	MMSU
40	On the Job Training on Dairy Farm Operation	29	August	MMSU, CLSU
41	Bull Management Training	62	September	CLSU, CSU,
42	Training on Baking Milk-Based Bakery Products	21	September	USF
43	Training on Recording and GMP	41	September	UPLB
44	On the Job Training on Dairy Farm Operation	11	September	UPLB
45	Training on Care and Management of Carabao	55	October	USM
46	Dairy Carabao Production and Management Training	49	October	DMMMSU
47	On the Job Training on Dairy Farm Operation	3	October	UPLB
48	Basic and Advance Leadership and Organizational Management Training	34	November	CSU
49	On the Job Training on Dairy Production and Management, Milk Handling and Processing	7	November	MMSU
50	Pagsasanay sa Paggawa ng Yoghurt Drink at Yoghurt Ice Cream	2	November	UPLB
51	Social Preparation Training	104	November	CSU, UPLB
52	On the Job Training on Dairy Farm Operation	17	November	UPLB, CLSU
53	Training on Advancement in Animal Health Management for Large Ruminants	11	December	UPLB
54	Training on Dairy Buffalo Production and Management	18	December	DMMMSU
55	On the Job Training on Dairy Farm Operation	7	December	UPLB, CLSU
56	On the Job Training on Dairy Production and Management, Milk Handling and Processing	12	December	MMSU
57	Social Preparation Training for Entrustment of Dairy Buffalo	79	December	UPLB
58	Technical Training for Dairy Buffalo Entrustment	78	December	UPLB
59	Training on Milk Quality Testing and Processing	1	December	MMSU
Total		**1,693**		

Appendix 2. CY 2013 Trainings Conducted for the National Impact Zone (Nueva Ecija).

No.	Title	No. of Participants	Date (2013)
1	Vision, Mission, Goals and Strategies, Policies Systems and Procedures	104	February 13-March 15
2	Bull Management Training	27	May 24-25
3	Values Formation	34	August 14-15
4	Pioneering Spirit Training	23	November 24-26 and December 11-13
5	Strategic Planning	60	November 19-21
6	Social Preparation	43	November 11-12
7	Conflict Management	43	November 13-14
8	Basic Dairy Buffalo Management and Production	39	November 18-19
9	Estrus detection	23	November 22
10	Animal Health Care and Management	18	November 27-29
11	Animal Recording	46	December 9-10
12	Entrepreneurial and Business Management	64	December 16-19
Total		**524**	

APPENDIX 3a List of Completed Researches, CY 2013

Research Area	Title	Researchers
Animal Health		
	Undergraduate Thesis	
	1. Raw, Boiled and DNA-Extracted Synovial Fluid and Milk Samples Subjected to Loop-Mediated Isothermal Amplification (LAMP) for Caprine Arthritis Encephalitis Virus (CAEV) Detection	K.D.J. Beronio, R.M. Dela Cruz, C.Y.J. Domingo & C.N. Mingala
	2. Synovial Fluid Subjected to Single Polymerase Chain Reaction Using F3, B3 from CAE Lamp Primers and Nested Polymerase Chain Reaction for Detecting Caprine Arthritis-Encephalitis	Jan Nathaniel B. Austria And Maria Theresa T. Oriente
	3. Detection of Respiratory Bacterial Pathogens in Large and Small Ruminants	H. Bautista, R.B. Reyes, G. Ordonez G.G. Garcia, L. Belotindos & C.N. Mingala
	4. Evaluation of Treatment Alternatives Against Respiratory Bacterial Pathogens of Small and Large Ruminants	R.A. Del Pilar , G.V. Marcelo, J.G. Tolentino, G.G. Garcia, L. Belotindos & C.N. Mingala
	5. Comparison of Flotac and Centrifugal Fecal Flotation Techniques in Detecting Gastrointestinal Parasites of Buffaloes (*Bubalus bubalis*) of PCC-assisted Dairy Cooperatives in Nueva Ecija	A.M. Ruba, R.P. Abalos, R.T. Salvador, C.N. Mingala, E.J.Y. Balagan,
	6. Evaluation of a Portable Somatic Cell Counter in the Diagnosis of Bubaline Subclinical Mastitis	R.L. Soliven, R.T. Salvador, N.S. Abes & E.J.Y. Balagan
	7. Genetic Testing for Porcine Stress Syndrome in Petines Farm, Sillawit, Cauayan City, Isabela using MS-PCR	D.F.L. Gamboa, J.G. Manalaysay, & R.P. Alili
Animal Nutrition	1. Augment Feeding with By-Passed Amino Acids and Slow-Release Non-Protein Nitrogen (NPN) Supplements in Dairy Buffaloes	D.L. Aquino, K.F. Vergara, & M.V. Del Rosario
	2. Isolation, Characterization, and Preservation of Rumen Microbes Associated with Hydrolysis Intended for Cellulose Ethanol Production	P.C. Florendo, S.P. Bangit & F.L. Mamuad
	Undergraduate Thesis	
	1. Use of Effective Microorganisms for Enhancing the Mycelial Performance of *Pleurotus florida* on Unsterilized Rice Straw	K.M. Mapanao, E.V. Abella, S.P. Kalaw, R.M. Cabanting & D.L. Aquino

Reproductive Biotechnology	1. Buffalo and Bovine Embryo Development from In-vitro Matured Oocytes Derived from Slaughter House through Intracytoplasmic Sperm Injection Technique	P.B. Ocampo, E.P. Atabay, E.C. Atabay, F.P. Aquino, L.C. Ocampo, E.R.S. Maylem, & L.C. Cruz
	2. Hypoosmotic Swelling Test to Assess the Functional Membrane Integrity of Frozen-Thawed Water Buffalo Spermatozoa	D.H. Duran and P.G. Duran
	Undergraduate Thesis	
	1. Viability of Extended Goat Semen Stored at Refrigerated Condition	K.G. Vergara, E.P. Atabay, F.P. Aquino, & L.C. Ocampo
	2. Goat Semen Cryopreservation: Effect of Varying Sperm Concentration on the Post-thaw Livability of Frozen Goat Semen	E.J. Valete, E.P. Atabay, F.P. Aquino, L.C. Ocampo
	3. Comparison of Two Sugar-Salt Solutions for Hypo-osmotic Swelling Test of Frozen-Thawed Water Buffalo Spermatozoa	R.P. Mallari, D.H. Duran, and P.G. Duran
Social Research and Socio-Economics	1. Marketing System and Slaughter Rate of Carabaos Traded at the Urdaneta City Livestock Auction Market	K.B. Turaja, D.A. Waguey and G.M. Dela Cruz
	2. Profitability Assessment of PCC at USF Institutional Dairy Processing and Marketing Center	G. Abay-abay, C.B. Salces, and R. Nopalla
	Undergraduate Thesis	
	1. Effectiveness of Computer Game in Improving Elementary School Pupil's Intake of Fresh Buffalo's Milk	I.K.P. Gahoy and R.S. Gravoso
Production Management	1. Development of Management Protocol for Dairy Production under Ranch Production System. Project 6. Development of Management Protocol for Waste Management and Organic Production under Dairy Ranch Production System	C.B. Salces, G.P. Bajenting, & E.J. Escala
Reducing Calf Mortality	1. Reducing Calf Mortality Through Improved Health and Management Schemes	C.P. Davalos, G.M. Recta, and J.C. Donato

APPENDIX 3b List of Ongoing Researches

Research Area	Title	Researchers
Animal Health	1. Development of RT-LAMP Assay and Quick Test Kit for Viral Gastro Intestinal Infections (PED and TGE) of Swine	E.P. Atabay, R.P. Alili, M.M. Balbin, A.C. Tangonan and C.J. Domingo
	2. Application of Loop Mediated Isothermal Amplification (LAMP) in the Screening of Caprine Arthritis Encephalitis Virus (CAEV) and Molecular Characterization of CAE-V Species present in the Philippines	M.M. Balbin, L.P. Belotindos, and C.N. Mingala
	Undergraduate Thesis	
	1. Comparison of Transformation Efficiency of In-House and Commercial Bacterial Competent Cells Using Heat Shock and Electroporation	R.B. Padiernos, A. Parungao, and C.N. Mingala
	2. Microscopic and PCR Detection of *Fasciola gigantica* among Field-Collected Gastropods in Philippine Carabao Center Assisted Dairy Cooperatives in Nueva Ecija	L.C. Miano, J.V. Lazaro and C.N. Mingala
Breeding and Genetics	1. Growth Performance of Swamp Buffalo on Grazing Management Condition with Supplementation	F.T. Rellin, R. Piñera, M. Wandagan
Reproductive Biotechnology	**Undergraduate Thesis**	
	1. Developmental Competence of Bovine Oocytes matured In-vitro with L- Carnitine Supplementation	P.V. Manzano and M.B. Ocampo
	2. Effect of 2-Deoxyadenosine Monohydrate on the Quality of Frozen-Thawed Water Buffalo (*Bubalus bubalis*) Spermatozoa	D.P. Suba, D.H. Duran and P.G. Duran
	3. Vitrification of In-Vitro Matured Goat (*Capra hircus*) Oocytes using Cryotop Method	G.P. Dimaya and E.P. Atabay

	Optimized with Cytochalasin-B 4. Cryopreservation of Boar Semen from Locally Raised Boar Studs using LEY Freezing Extender	M.P. Granadozin, Jr., F.P. Aquino and L.C. Ocampo
Social Research and Socio-Economics	1. Development of the School-based Dairy Marketing System in Bohol Province	C.B. Salces, G.B. Abay-Abay and R. Nopalla
Product Development	1. Development of Chilled Coffee Flavored Buffalo Milk Based Drink	L.M. Parungao, T.L. Canaria and R.M. Lapitan
Forage and Pasture	1. The Use of Day in-Day out in Assessing the Pasture Quality and the Performance of Grazing Buffaloes under PCC-CSU Condition	M.B. Wandagan and R. Marcos
	2. Establishment of *Brachiaria humidicola* as Feed Source and a Biological Control of Obnoxious Weeds in Native Pasture	W.B. Wandagan and J. Lucob

Appendix 4 Highlights of some completed researches (CY 2013)

Field/ Thematic Area	Title of research/Lead Researchers	Summary of Findings
Reproductive Biotechnology	Buffalo and bovine embryo development from in vitro matured oocytes derived from slaughter house through ICSI technique by *Pedro et al.*	• Higher success rate of injection for 10% solution of PVP (polyvinylpyrolidone) group (82%) compared with 4% PVP group (79%) • Ca ionophore vs ethanol as activation agents; Higher pronuclear formation rate (in bovine oocytes) for ethanol-treated (50%) vs. Ca ionophore-treated (33%) oocytes • For cattle and buffalo, the rates of cleavage, morula and blastocyst development of sperm-injected oocytes treated with combination of alcohol and CHX (cycloheximide) were higher than after activation alone with ethanol and with non-treated groups
Animal Health	Evaluation of treatment alternatives against respiratory bacterial pathogens of small and large ruminants by *del Pilar et al.*	• Sensitivity of five bacterial isolates from small and large ruminants with respiratory infections to synthetic and herbal-based anti-infectives was evaluated in-vitro • *S. sciuri, B. pumilus*, and *P. aeruginosai* are susceptible to benzyl penicillin at 1 IU/ml • *B. pumilus* was receptive to erythromycin at 10 ug/ml • *A. schindleri* was sensitive to Chloramphenicol at 25 ug/ml • *P. aeruginosa* was susceptible to 50 ug/ml Chloramphenicol • *A. schindleri* was responsive to anti-bacterial effect of 10 ug/ml tetracycline • *P. aeruginosa* was receptive to 25 ug/ml tetracycline • *S. sciuri* and *E. pumilus* were susceptible to Ascof commercial lagundi at 10% concentration • *B. pumilus* was sensitive to Lagundi leaf extract at 10% concentration
	Evaluation of a portable somatic cell counter (PortaSCC) in the diagnosis of bubaline subclinical mastitis by *Soliven et al.*	• PortaSCC has 66.67% sensitivity and 98.21% specificity • Computed positive predictive value (PPV) was 94% while negative predictive value (NPV) was 87.3% (N=80) • PortaSCC is only intended for the estimation of somatic cell count, it is not a lab reference method; should not be used in milk samples from animals with clinical mastitis
	Detection of respiratory bacterial pathogens in large and small ruminants by *Bautista et al.*	• Using the universal primers (NF/NR) in PCR, the DNA samples from 6 isolates were typical of a bacterium • Four gram positive organisms (*Staphylococcus spp.*, two *Staphylococcus sciuri*, and *Bacillus pumilus*) and two gram negative organisms (*Acinetobacter schindleri* and *Psudomonas aeruginosa*) were confirmed using the primer pairs (P2F/NR) and (NF/N6R)
Animal Nutrition and Herd Management	Reducing calf mortality thru improved health and management schemes (Early introduction of Concentrates and Forage Grasses to Dairy	The study determined the effects of improved systems of housing management (i.e., use of elevated pens with wooden slats as flooring; rice straw bedding changed

	Calves Raised in Elevated Pens) *by Dabalos et al.*	three times a week from birth up to three months; removal of manure daily) and feeding management (i.e., colostrum feeding via feeding bottle 1-2 hours after birth; milk feeding (via pail): adlib up to five days; 4 liters/d for the first two months; 2 li/d on the 3rd month; 100g/d up to 2 kg/d calf starter; and 50g/d napier grass as early as 6th day of age increased to adlib at 2 months of age). These practices have reduced morbidity and mortality and increased the average daily gain of calves from 393g to 707g.
	Development of management protocol for dairy production under ranch production system (Development of management protocol for waste management and organic fertilizer production under dairy ranch production system) *by Salces et al.*	• **Study 1** used rice hulls as bedding materials for its confined buffaloes. Results showed that a majority (80%-90%) of the animals stayed in areas covered with rice hull. Partially decomposed rice hull beddings were also found ideal and better substrate for vermiculture. • **Study 2** compared two watering systems for worm production (intended for vermicomposting). Sprinkler watering system favored faster growth of worms with less casting days than traditional watering system using garden hose. The former system also resulted in longer harvest periods (3-4 months), higher volumes of juvenile worms harvested (as a starter population for another bins), and higher volumes of substrates casted.
	Augmented feeding with bypass amino acid (BPAA) and slow-release nonprotein nitrogen (SRNPN) supplements for dairy buffaloes by *Aquino et al.*	• 25 pregnant and primiparous Brazilian buffalos subjected to five dietary treatments: without AF (T1), with AF (T2), with AF plus supplementary BPAA (T3), AF plus slow-released NPN (T4), and combination of AF + BPAA+ SRNPN (T5) • Using AF alone or with BPAA and SRNPN supplements gave: significantly higher ADG, 305 adjusted milk production, milk fat, protein and total solids; significantly higher Ca and P intake, higher DM and protein digestibility, but no significant difference on daily DM and protein intake; T5 had significantly higher net revenues compared to other treatment groups • AF with or without BPAA and SRNPN can be adopted by farmers
Socio-Economics	Effectiveness of computer game in improving elementary school children's intake of fresh buffalo's milk by *Gahoy and Gravoso*	• Highly significant difference between the control (motivational posters) and experimental (computer game Isko) groups in terms of incremental scores on perceived behavioral control and intake of fresh buffalo's milk • Computer game Isko was effective in encouraging intake of fresh buffalo's milk
	Marketing system and slaughter rate of carabaos traded at the Urdaneta City Livestock Auction market (UCLAM): Its implication to the development and sustainability of the carabao industry by *Turaja & Waguey*	• 79% of carabaos traded at UCLAM are native, 15% crossbreds, and 6% purebreds • 62% of carabaos traded are males • 6.2% of carabaos traded are female crossbreds and purebreds • Marketing channels: assemblers, wholesalers, retailers

Appendix 5 Conferences, Seminars, Symposia, and Trainings Participated in by PCC Personnel, CY 2013.

Title	Venue	Date (2013)	No. of PCC Participants
INTERNATIONAL (ABROAD)			
Second International Conference on Integration of Science and Technology for Sustainable Development	Bangkok, Thailand	November 27-29	1
Advance Qualitative Methodologies	Nova Scotia, Canada	October 27-November 2	1
Training on Blood Perfusion for Schistosomiasis Infected Water Buffaloes	Shanghai, China	September 25-29	1
31st World Veterinary Congress and 150th Anniversary of the World Veterinary Association	Prague, Czech Republic	September 17-20	1
10th Asian Reproductive Biotechnology Society Convention	Mui Ne, Phat Thiet, Vietnam	August 19-25	6
Rural Development Course	Honshu, Japan	July 22-August 6	2
Seminar on "How to Prepare a Research Proposal"	Bangkok, Thailand	July 19	3
Training on "Livestock Genomics and Bioinformatics"	Lodi, Italy	June 1-July 7	4
Drug Development and Neglected Tropical Infectious Diseases	Pathum Thani, Thailand	May 27-31	1
Observatory Visit on Dairy Production, Processing, and Marketing for Philippine Dairy Government Officials and Delegates	Thailand	May 14-19, 2013	2
10th World Buffalo Congress and 7th Asian Buffalo Congress	Phuket, Thailand	May 6-8	13
NATIONAL			
24th CLARRDEC Regional Symposium on R&D Highlights	PCC National Heagquarters, SCM	December 5	10
Basic Records & Archives Management	Venice Hotel, Baguio City	December 3-5	2
Training Course on Skills in Effective Supervision	Madamba Hall, PCC National Headquarters, SCM	December 3-7	21
WEB Development in PHP: Hands on Training	2nd Floor, Design Mix Bldg., 59 Connecticut St., Greenhill, San Juan M.M.	December 9-13	1
Operation Training of Fiber Extractor, Fat Extractor and Kjeldahl System	PCC Nutrition Laboratory, SCM	December 9-10	2
Hands on Training and Equipment Use	PCC Biotech Laboratory, SCM	December 10	6

of the Computer Assisted Sperm Analyzer "Hamilton Thorne IVOSII"			
Pioneering Spirit Training	Canaan Farmers Training Center, Floridablanca, Pampanga	December 11-13	16
Entrepreneurial Business Management	Eusebio Hall, PCC National Headquarters and Gene Pool, SCM	December 16-19	5
MSC FTI End User Training with Brief Discussion on Fossometric Minor and Milko Scan S50	PCC Animal Health Laboratory, SCM	December 17-19	6
International Genetic Improvement Conference and Workshop (focusing on dairy buffaloes)	Marriot Hotel, Pasay City	November 28-29	17
Property and Supply Management System	Professional Development Center, COA, Commonwealth Avenue, Q.C.	November 5-8	4
Laws and Rules on Government Expenditures	Professional Development Center, COA, Commonwealth Avenue, Q.C.	November 5-8	2
PCC-OED wide Team Building Activity	Fontana Leisure Park, Clark Field, Pampanga	November 7-8	131
Pioneering Spirit Training	Canaan Farmers Training Center, Floridablanca, Pampanga	November 18-20	34
6Th Mini-MBA for Executive Assistants, Secretaries and Admin Professionals	Astoria Plaza, Ortigas, Pasig City	November 26-27	2
Integrated Database Management System	PCC-OED	October 15-19	40
25th National Research Symposium	BAR, Visayas Avenue, Diliman, Quezon City	October 16-17	1
GACPA	Legaspi City, Albay	October 17-19	5
Statistical Analysis Using Stata	SRTC, Diliman Quezon City	October 21-25	2
50th PSAS Scientific Seminar and Annual Convention	Tagaytay International Convention Center, Tagaytay City, Cavite	October 22-25	27
Quality Customer Service	PBCA, Atlanta Tower, Annapolis St., Greenhills, San Juan MM	October 21-24	6
Barista 101	PBCA, Atlanta Tower, Annapolis St., Greenhills, San Juan MM	October 23-26	2
Job Enhancement Skills Training for the Middle Level Managers of the DA Bureaus and Attached Agencies	Fontana, Clark Field, Pampanga	September 23-27	2
Prepress Essentials: Understanding the Digital Production Workflow; Prepress Survival Guide Step by Step	PCCI, Makati City	September 20-22	2
"Pioneering Spirit" Training Mindanao Cluster 1st Batch	PCC at CMU, Maramag, Bukidnon	September 3-4	50
"Pioneering Spirit" Training Mindanao Cluster 2nd Batch	PCC at CMU, Maramag, Bukidnon	September 5-6	47
"Pioneering Spirit" Training Visayas Cluster 1st Batch	Galilea Center for Education and Development, Panglao, Bohol	September 9-10	43
"Pioneering Spirit" Training Visayas	Galilea Center for Education and	September 11-12	50

Cluster 2nd Batch	Development, Panglao, Bohol		
Workshop on Study Designing for Result Evaluation of Extension Projects	San Juanico Golf Hotel, Tacloban City, Leyte	August 26-30	2
Training of Trainers	PCC National Headquarter, SCM	July 8-12	35
Training on Extension	PCC National Headquarters, SCM	July 22-26	34
International Standard for Managing Records and Information	Manila	June 24-26	1
PHILGEPS Training for Buyers	Metro Manila	June 20-21	2
6th Annual Summit for Executive Secretaries and Administrative Professionals	Pasay City	May 22-23	3
Executive Forum on the New ASEAN Landscape	SEARCA, UPLB	May 9-10	1
Training on the Use of Agency Procurement compliance and Performance Indicators System on the Procurement Activities of the Department of Agriculture	Tore Vestia, Quezon City	April 24-26	1
"Pioneering Spirit" Training PCC-OED and Luzon Cluster 4th Batch	Canaan Farmers Training Center, Floridablanca, Pampanga	April 24-26	42
Training on Strategic Role of HR in Organization	Quezon City	April 18-19	2
"Pioneering Spirit" Training PCC-OED and Luzon Cluster 3rd Batch	Canaan Farmers Training Center, Floridablanca, Pampanga	April 17-19	29
Training on Workshop Restructuring	CSC, Quezon City	April 17-18	2
Consultation Workshop on Developing a Result based Monitoring and Evaluation for agriculture and Fisheries Extension	Pampanga	April 10-12	1
"Pioneering Spirit" Training PCC-OED and Luzon Cluster 2nd Batch	Canaan Farmers Training Center, Floridablanca, Pampanga	April 10-12	26
Training on Organizational Diagnosis	Quezon city	March 25-27	2
Seminar Workshop on Basic Records Management Processes Pursuant to RA 9470	UPLB, Laguna	January 30-31	2
"Pioneering Spirit" Training PCC-OED and Luzon Cluster 1st Batch	Canaan Farmers Training Center, Floridablanca, Pampanga	January 10-11	30

Appendix 6 Research articles published in refereed journals, CY 2013

Research Title	Author	Journal TItle
1) Cryotop and Solid Surface Vitrification Cryodevices are Suitable for the Cryopreservation of In-Vitro Matured Water Buffalo (*Bubalus bubalis*) Oocytes.	E. P. Atabay, E. C. Atabay, and L. C Cruz	Philipp J Vet Med, 50 (1): 24-33, 2013
2) Optimized Extenders for Cryopreservation of Buck Semen for Artificial Insemination	M.A.G. Beltran, E. P. Atabay, E. C . Atabay., E. M. Cruz, F.P. Aquino, and L.C. Cruz	Philipp J Vet Anim Sci, 39 (1): 1-10 2013
3) Production of Goat Embryos following Maturation and Fertilization In Vitro	E.C. Atabay, E. P. Atabay, and G.P. Lazaro	Animal Husbandry and Agricultural Journal Vol. XLVII No. 1, p. 12, March 2013
4) The Philippine Carabao Center and the Livestock Biotechnology Program	E.P. Atabay and E.C. Atabay	Animal Husbandry and Agricultural Journal Vol. XLVII No. 1, p. 24, March 2013
5) Vitrification of Swamp Buffalo Oocytes	M. B. Ocampo and L. C. Ocampo	Journal of Agricultural Technology 2014 (10): 67-68
6) Isolation, cloning and pathologic analysis of *Trypanosoma evansi* field isolates	M.H. Konnai S, C.N. Mingala, N.S. Abes, C.A. Gutierrez, A.P. Dargantes, W.H. Witola, N. Inoue, M. Onuma, S. Murata, K. Ohashi	Parasitology Research. 112(4):1513-1521
7) In-vivo assessment of the effects of trypanocidal drugs against *Trypanosoma evansi* isolates from Philippine water buffaloes (*Bubalus bubalis*)	B.B. Macaraeg, J.V. Lazaro, N.S. Abes, C.N. Mingala	Veterinarski Arhiv. 83(4):381-392
8) Molecular characterization of *Trypanosoma evansi* isolates from water buffaloes (*Bubalus bubalis*) in the Philippines	M.V. Villareal, C.N. Mingala, W.L. Rivera	Acta Parasitologica. 58(1):6-12
9) Enhanced expression of LAG-3 on lymphocyte subpopulations from persistently lymphocytotic cattle infected with bovine leukemia virus	S. Konnai, S. Suzuki, R. Ikebuchi, T. Okagawa, T. Shirai, Y. Sunden, C.N. Mingala, M. Onuma, S. Murata, and K. Ohashi	Comparative Immunology, Microbiology & Infectious Diseases. 36(1):63-69.
10) Expression analysis of Foxp3 in T-cells from bovine leukemia virus infected cattle	S. Suzuki, S. Konnai, T. Okagawa, R. Ikebuchi, T. Shirai, Y. Sunden, C.N. Mingala, S. Murata, K. Ohashi	Microbiology and Immunology. 57(8):600-604
11) Intramammary teat sealant rather induced sub-clinical mastitis in water buffaloes (*Bubalus bubalis*)	M.B. Villamor, N.P. Medina, N.S. Abes, C.N. Mingala	Large Animal Review. 19:195-198
12) Concordance of competitive ELISA and nested-polymerase chain reaction in the detection of caprine arthritis-encephalitis virus	J.C.V. Gonzales, C.Y.J. Domingo, N.S. Abes, C.A. Gutierrez, M.A. Villanueva, C.N. Mingala	Small Ruminant Research. 115(1-3):134-139
13) Correlation of California mastitis test and somatic cell count on milk of water buffalo cows	R.T. Salvador, A.A.A. Garcia, N.S. Abes, C.N. Mingala	Tropical Agriculture. 90(3): 153-159.
14) Molecular characterization of respiratory bacterial pathogens in large and small ruminants	G.G. Garcia, L.P. Belotindos, C.N. Mingala	Thai Journal of Veterinary Medicine. 43(4): 483-489
15) Changing Faces of Swamp Buffaloes in an Industrializing Asia	L.C. Cruz	Buffalo Bulletin 2013 Vol.32 (Special Issue 1): 32-49

16) Privatization of Artificial Insemination Services under Smallholder Production System	L.C. Cruz, E.P. Palacpac, S.D. Pol, A.S. Sarabia, and F.V. Mamuad	Buffalo Bulletin 2013 Vol.32 (Special Issue 1): 285-292
17) Assessing the Performance of Village-Based Artificial InseminationTechnicians for Water Buffaloes in Nueva Ecija Province, Philippines	E.P. Palacpac, M.G. Honorio, and E.Valiente	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 1222-1225
18) Assessment of Village-based Artificial Insemination Technician (VBAIT) Scheme as a Strategy towards Privatization of Artificial Insemination (AI) Services in Nueva Ecija	S.D. Pol, F.L. Porciuncula, and F.V. Mamuad	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 1212-1217
19) Sustainability of Philippine Carabao Center and Primary Cooperative Partnership in Carabao-Based Enterprise	W.T. del Rosario and D. Vargas	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 1226-1229
20) Contextualizing the GatasngKalabaw Festival in Support to the Carabao-based Enterprise in Nueva Ecija, Philippines	M. Aquino and M. Santos	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 1233-1236
21) Genotyping and molecular characterization of NRAMP1/-2 genes as location of markers for resistance and/or susceptibility to Mycobacterium bovis in swamp and riverine type water buffaloes	C.N. Mingala, L.P. Belotindos, N.S. Abes, L.C. Cruz	Buffalo Bulletin 2013 Vol. 32(Special Issue 2):730-733
22) In Vitro Embryo Production and Transfer of Bubaline Embryos Using Oocytes Derived from Transvaginal Ultrasound-GuideFollicular Aspiration (TUFA)	F. Aquino, E.P. Atabay, E.C. Atabay, M. Ocampo, P.G. Duran, P.B. Pedro, D.H. Duran, R. de Vera and L.C. Cruz	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 545-548
23) Blastocyst Formation after Intracytoplasmic Sperm Injection in Bovine and Buffalo Oocytes Derived from Slaughter House	P.B. Pedro, E.P. Atabay, E.C. Atabay, F.P. Aquino, M.B. Ocampo, E.R. Maylem, and L.C. Cruz	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 552-555
24) Somatic Cell Nuclear Transfer as a Tool for the Multiplication of Genetically Superior Water Buffaloes: The Philippine Initiatives	E.C. Atabay, E.P. Atabay, F.P. Aquino, P.G. Duran, P.B. Pedro, and L.C. Cruz	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 556-559
25) The Carabao Development Program as the Cornerstone of the Livestock Biotechnology Program in the Philippines	E.P. Atabay, E.C. Atabay, and L.C. Cruz	Buffalo Bulletin 2013 Vol.32 (Special Issue 2): 601-603