



**2022**  
***ANNUAL***  
***REPORT***

DEPARTMENT OF AGRICULTURE  
PHILIPPINE CARABAO CENTER





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Body

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**Ensuring socio-economic empowerment for nation-building**

# ***ABOUT US***

The DA-Philippine Carabao Center (DA-PCC) operates as an attached agency of the Department of Agriculture (DA). DA-PCC is mandated under Republic Act No. 7307 or the Philippine Carabao Act of 1992 to conserve, propagate and promote the carabao as a source of draft animal power, meat, milk and hide to benefit the rural farmers.

Historically, DA-PCC was an offshoot of the significant gains achieved from the United Nations Development Programme/Food and Agriculture Organization (UNDP/FAO)-assisted project called “Strengthening of the Philippine Carabao Research and Development Center (PCRDC) under the umbrella of the Department of Science and Technology-Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (DOST-PCARRD) and which was carried out in two phases covering the period 1982-1992.

Per DA Administrative Order No. 9, series of 2008, DA-PCC likewise is the lead Institution in Livestock Biotechnology research and development.

## ***VISION***

A premier Research and Development institution propelling sustainable growth of the livestock industry.

## ***MISSION***

Improve the general well-being and competitiveness of the livestock industry stakeholders through:

- Animal biotechnology and technology development
- Technology dissemination and knowledge resource management
- Active private sector participation
- Development of livestock enterprises
- Policy reforms to sustain development of livestock enterprises

# POWERS & FUNCTIONS

RA 7307, which was signed on March 27, 1992 and operationalized on April 1, 1993, provides that DA-PCC's powers and functions are:

- Conserve, propagate, and promote the Philippine carabao as a source of draft animal power, meat, milk, and hide;
- Enable the farmers, particularly smallholder-farmers and CARP beneficiaries, to avail themselves of good quality carabao stocks at all times and at reasonable prices through an organized program of production, breeding, training, and dispersal;
- Undertake training programs for farmers, particularly smallholder-farmers and CARP beneficiaries, designed to transfer technology on the proper care and reproduction of the carabao and the processing of its meat and milk;
- Encourage backyard dairy development in rural areas by raising carabaos so as to meet the nutritional needs of the smallholder-farmers and their families and reduce dependence on imported milk by-products;
- Undertake research activities in all disciplines that lead to the improvement of the overall productivity of the Philippine carabao;
- Increase the existing annual population growth of the Philippine carabao to keep pace with human population growth;
- Enter into memoranda of agreement and receive donations through the Department of Agriculture from local and foreign sources. Upon the recommendation of the DA-PCC Advisory Board, the individual carabao centers may enter into agreements directly with funding agencies through their respective board of regents or head of agency.





# GENETIC IMPROVEMENT PROGRAM

## INSTITUTIONAL **HERD**

### **INVENTORY**

**2,172 heads**

{Philippine carabao, purebred, and crossbred in the 12 network centers and the National Gene Pool farm}

{840 cows, 660 heifers, 418 calves, 254 bulls, 81 draft bulls and training animals}

{167 Philippine carabao, 1,754 Murrah (Bulgarian, Brazilian, Indian and US), 199 Italian Mediterranean and 52 crossbred buffaloes}

{367 head lactating dairy buffalo cows; 496 born calves}

### **MILK PRODUCTION**

**564,097.04 kg**

{produced from 367 lactating cows or an average of 4.21 kg of milk per cow}

### **MEAT PRODUCTION**

**PHP6,839,109.29**

{total sales of meat and live animals from the DA-PCC}

### **FORAGE PRODUCTION**

**995 ha**

{forage area maintained by regional centers}

**11.6 ha**

{forage area developed throughout the year}



## **BULL** FARM, **SEMEN** PRODUCTION, & DISTRIBUTION

### **BULL FARM**

{two bull farms are maintained at the DA-PCC Regional Centers, one of which is located at the DA-PCC at CLSU in Carranglan, Nueva Ecija and the other at the DA-PCC at UPLB in Los Baños, Laguna}

{52 head of donor bulls actively contributed to the production of frozen semen, 42 of which from the DA-PCC at CLSU and 10 from the DA-PCC at UPLB bull farms}

### **SEMEN PRODUCTION** **224,880 doses**

{171,555 doses and 53,325 doses of frozen semen, respectively, were produced in the semen processing facilities at the DA-PCC at CLSU and DA-PCC at UPLB and deposited in the DA-PCC's semen bank}

### **SEMEN DISTRIBUTION**

{203,810 doses distributed to the DA-PCC regional centers and other partner agencies and individuals for the conduct of nationwide artificial insemination (AI) of water buffaloes while the remaining doses were stored for reference and/or future research work}

{3,099 dewars of liquid nitrogen were distributed to the agency's regional centers and partner-entities nationwide to maintain the quality and viability of the frozen semen for AI}

### **ARTIFICIAL INSEMINATION**

## **80,860 services**

{25,546 of which were contributed by the LGU's technicians (n=492), 43,476 by the village-based AI technicians or VBAITs (n=450), and 9,317 by the DA-PCC's technicians (n=84)}

## **54,500 clients**

{clients were served across 73 provinces, 879 municipalities, and 7,995 barangays}



# **ARTIFICIAL INSEMINATION**

{The agency facilitated 25 Basic AI Trainings that resulted in an additional 199 new AI technicians being added to the pool of trained AI technicians in the country. A total of four advanced trainings were also facilitated, which enhanced the skills of 28 AI technicians}

**18,611 calves**

{monitored calves on the ground based on AI services}

## **NATURAL MATING (BULL ENTRUSTMENT PROGRAM)**

In areas where AI services were inaccessible, farmers accessed the DA-PCC's bull entrustment program in support of the carabao upgrading program. This was made possible through the initiative of the LGUs.

**507 purebred breeding bulls**

{105 bulls were entrusted to farmers as of December 2022, 402 have records of active service registering 3,972 services and benefitted more than 3,882 carabao raisers}

**4,392 calves**

{monitored calves on the ground based on natural mating services}

{In support of the carabao upgrading program and in areas where AI services were not accessible, farmers were entrusted with purebred breeding bulls through the initiative of their respective LGUs}





# CARABAO-BASED ENTERPRISE DEVELOPMENT

## REGULAR PROGRAM

### NEWLY CREATED CARABAO-BASED MODULES

{To expand the development reach of carabao-based enterprises, the DA-PCC partnered with the LGUs, cooperatives, and farmer association in order to mobilize and assist more carabao owners, particularly the owners of crossbreds produced through AI and bull entrustment programs in the regional impact zones (RIZ). The CBED aims to increase opportunities for smallholder farmers to generate income. There were 32 new partner cooperatives/associations across the country who participated in the program.}

## EXISTING CARABAO-BASED MODULES

**8,620**

{carabao owners engaged in carabao-based enterprises and who are members of 259 cooperatives/associations}

{top 10 provinces with highest milk production}

- 1 Nueva Ecija
- 2 Pampanga
- 3 Bulacan
- 4 Cavite
- 5 Batangas
- 6 Bohol
- 7 Bukidnon
- 8 Laguna
- 9 Isabela
- 10 Leyte





**VOLUME AND VALUE  
OF BUFFALO-DERIVED  
PRODUCTS TRADED**

**5,752,173.31 kg/  
PHP1,098,234,126.20**

{buffalo-derived products coming from the RIZ, National Impact Zone (NIZ), and DA-PCC Institutional Herd and traded total value}

**CAPABILITY BUILDING AND  
STRENGTHENING SUPPORT**

**21,264**

{participants provided with 1,256 types of trainings in support of the DA-PCC's assisted cooperatives and associations in Luzon, Visayas, and Mindanao}

**2,440**

{clients oriented by the regional centers on the Carabao Development Program (CDP) and Carabao Upgrading Program (CUP)}



# ANALAB KARBAWAN

## **CBIN** **CARABAO-BASED BUSINESS IMPROVEMENT NETWORK**

**8,620**

{carabao owners engaged in carabao-based enterprises}

**1,256**

{trainings facilitated}

**21, 264**

{participants trained}

**2,440**

{clients oriented on CDP}

To expand the development reach of carabao-based enterprises, the DA-PCC partnered with the LGUs, cooperatives, and farmer association in order to mobilize and assist more carabao owners, particularly the owners of crossbreds produced through AI and bull entrustment programs in the RIZ. The CBED aims to increase opportunities for smallholder farmers to generate income. There were 32 new partner cooperatives/associations across the country who participated in the program.

There were 259 cooperatives/associations consisting of 8,620 carabao owners engaged in carabao-based enterprises. The top ten milk-producing provinces are Nueva Ecija, Pampanga, Bulacan, Cavite, Batangas, Bohol, Bukidnon, Laguna, Isabela, and Leyte.

The DA-PCC Regional centers provided 1,256 types of training to cooperatives and associations receiving assistance. There were 21,264 participants from Luzon, Visayas, and Mindanao at these training sessions. In addition, DA-PCC Regional centers provided Carabao Development Program (CDP)/Carabao Upgrading Program (CUP) orientation to a total of 2,440 clients.

Since 1993, the DA-PCC has shown that carabaos can be draft animals and sources of high-quality milk and meat. The umbrella program of DA-PCC, the Carabao Development Program (CDP), anchored on three banner programs: Genetic Improvement Program (GIP), Research for Development (R4D), and Carabao-based Enterprise Development (CBED), has demonstrated the socio-economic benefits of carabao by creating livelihood and additional income for farmers and viable enterprises for cooperatives and entrepreneurs. The program also supplies the Milk Feeding Program under RA 11037, the Masustansyang Pagkain Para sa Batang Pilipino Act, for DepEd and DSWD's school-based feeding program.

Value-chain players sustain and grow the CDP. This includes



stakeholders in production, consolidation, processing, marketing, logistics, and other services. Farmers and entrepreneurs can exploit every value-chain link. Government agencies, working with DA-PCC, provide technical and legislative support.

In support of the CBED program, the Carabao-based Business Improvement Network (CBIN) and Coconut Carabao Development Project (CCDP), popularly known as “ALAB Karbawan,” were initiated and funded by the Office of the Senate Committee on Agriculture, Food, and Agrarian Reform, chaired by Hon. Cynthia A. Villar. These projects entrust dairy buffaloes, provide dairy processing equipment, build dairy processing and market outlets, and provide technical support and capability-building to establish a strong carabao-based enterprise value chain in recipient provinces.

The value-chain opportunities in the CBIN and CCDP projects aim to improve our partners’ economies. These projects are expected to create jobs in milk processing and marketing, as well as business opportunities for cooperatives and entrepreneurs. Farmers will directly benefit from the program through the milk they produce.

The CBIN and CCDP proof-of-concept in selected cities nationwide aims to inspire farmers, entrepreneurs, and local executives and legislators to join the “dairy loop.” More farmers will produce dairy buffaloes due to the raw milk market. Dairy farmers are going to experience the motto “Sa dairy, ang kita ay daily” since cooperative beneficiaries of these projects must buy locally-produced milk to supply DepEd and DSWD’s school-based feeding program. Other entrepreneurs can capitalize on these opportunities by buying milk from dairy farmers, processing it into premium products, and selling them to institutional markets.

The 2019 CBIN and CCDP projects now have 81 project sites in over 60 provinces (Table 1 and Figure 1). DA-PCC has shown grit and resiliency by continuing to serve clients, especially farmers, despite the COVID-19 pandemic. Since 2019, DA-PCC has entrusted 3,169 dairy buffaloes to recipient provinces, boosting dairy production. With the AI program of DA-PCC and the LGU, this animal herd build-up component of the projects will increase the number and genetic quality of animals in the province. Some 1,321 farmers nationwide received animal entrustment. Entrusted animals have had 392 calves.

# CCDP

**COCONUT-CARABAO  
DEVELOPMENT PROJECT**

**549**

{female purebred dairy buffaloes to selected farmer trustees, DBMF operators and institution assisted by NIZ (25) DA-PCC at CLSU (80), DA-PCC at CSU (105), DA-PCC at MMSU (20), DA-PCC at UPLB (80), DA-PCC at USF (106), DA-PCC at LCSF (40), DA-PCC at VSU (54), DA-PCC at USM (120), DA-PCC at MLPC (80) and DA-PCC at CMU (25).}



# GEOGRAPHICAL COVERAGE OF THE CBIN AND CCDP PROJECTS

Strong cooperatives and associations were chosen as project partners to aid enterprise growth. Their expertise and workforce are needed to operationalize and expand the dairy processing and market outlet that will consolidate and process farmer recipients' milk. Value-adding milk for market sale or the Milk Feeding Program will give them business opportunities. DA-PCC currently works with 85 dairy cooperatives and associations to improve the industry. A total of 28 cooperatives supply the Milk Feeding Program.

These projects include building DA-PCC's "Dairy Box," a one-stop dairy shop. This facility serves local dairy consumers and

tourists for "pasalubong." A total of 35 Dairy Box processing plants operate nationwide. These projects will build 78 dairy processing and market outlets by 2023.

Other interventions are needed to strengthen the carabao industry's foundation and accelerate these enterprises' growth nationwide. Localizing the CDP can make this possible, i.e., the LGUs can include carabao as a priority commodity in their development plan and create an enabling environment through industry-friendly ordinances. To be sustainable and grow without intervention, the cooperative partners must own and run the business.

**Table 1. Overview of the Status of CBIN and CCDP Sites**

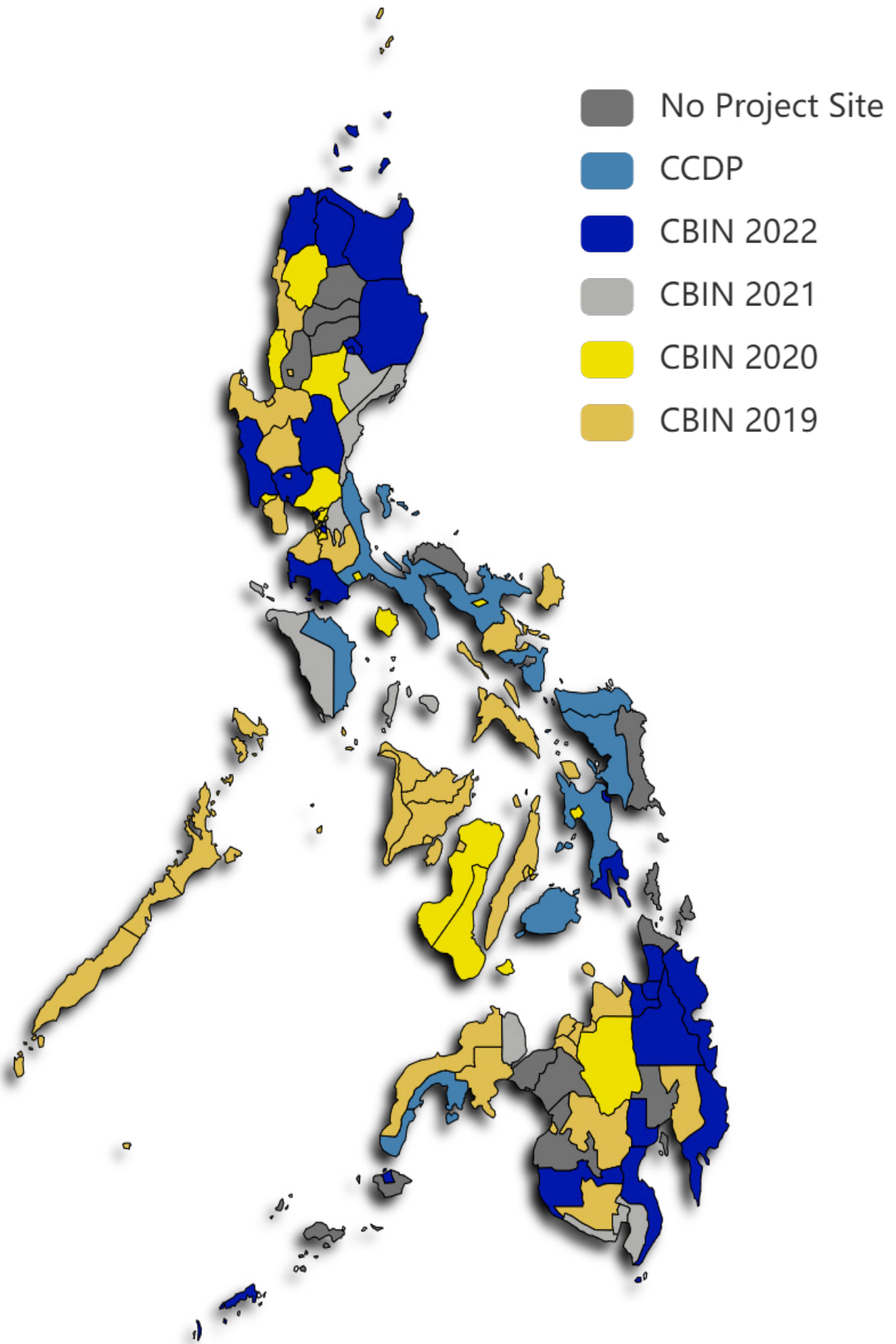
Project	No. of Sites	No. of Conduit Coops	No. of FCAs Engaged in Milk Feeding Program	No. of Entrusted Buffaloes		
				Project	Project	Project
CBIN 2019	17	21	12	933	201	1,134
CBIN 2020	11	11	5	596	0	596
CCDP	17	17	3	687	3	687
CBIN 2021	11	11	2	484	0	484
CBIN 2022	25	25	0	265	0	265
<b>TOTAL</b>	<b>64</b>	<b>68</b>	<b>21</b>	<b>2,965</b>	<b>204</b>	<b>3,169</b>
<b>21</b>	<b>10,619</b>					



# 10,619

## MILK FEEDING BENEFICIARIES

{Number of undernourished children supplied with milk (DSWD Supplementary Feeding Program-Hot Meals)}



# MILK FEEDING PROGRAM

The DA-PCC supports the lead agencies, namely DepEd and DSWD, in implementing the Milk Feeding Program, as authorized by the RA 11037 or “Masustansyang Pagkain Para sa Batang Pilipino Act”.

In 2022, the DA-PCC supported DepEd-funded School Based Feeding Program - Milk Component in 16 regions and 49 provinces. A total of 38 DA-PCC-assisted dairy cooperatives/suppliers provided milk to 1,330,984 children, which represents 38.39% of the undernourished children from Kindergarten to Grade Six in public elementary schools.

## **DEPED-FUNDED SCHOOL-BASED FEEDING PROGRAM**

**1,330,984**

{total number of undernourished children from kindergarten to Grade Six enrolled in public elementary schools supplied with milk by 38 DA-PCC-assisted dairy cooperatives}

## **DSWD-FUNDED SUPPLEMENTARY FEEDING PROGRAM**

**40,285**

{total number of undernourished children from Supervised Neighborhood Play (SNP) and Child Development Centers (CDCs) supplied with milk by eight (8) DA-PCC-assisted dairy cooperatives}



**Table 2.** Number of undernourished children supplied with milk (DepEd-funded Milk Feeding Program).

Region	No. of Provinces	No. of Undernourished Children
CAR	6	36,419
I	4	153,605
II	4	83,686
III	7	204,490
IV-A	2	86,160
IV-B	2	39,531
V	5	179,355
NCR	1	104,645
VI	3	77,538
VII	3	72,227
VIII	1	4,550
IX	4	129,663
X	2	71,298
XI	1	26,576
<b>XII</b>	<b>2</b>	<b>15,977</b>
<b>CARAGA</b>	<b>2</b>	<b>45,264</b>
<b>Total (16)</b>	<b>49</b>	<b>1,330,984</b>

**Table 3.** Number of undernourished children supplied with milk (DSWD funded Milk Feeding Program).

Region	No. of Provinces	No. of Undernourished Children
I	3	4,914
II	4	3,872
III	5	2,713
VI	3	7,460
VII	3	3,625
IX	1	5,787
<b>XII</b>	<b>2</b>	<b>1,594</b>
<b>Total (7)</b>	<b>21</b>	<b>10,619</b>

# ENHANCED PARTNERSHIP AGAINST HUNGER AND POVERTY (EPAHP)

The EPAHP is a DSWD-led convergence program that aims to alleviate hunger, ensure food and nutrition security, and reduce poverty in rural and urban communities. The Pilot Gatasang Kalabaw Project, in which DA-PCC was involved, aims to: (1) establish viable enterprises along the value chain as a source of additional income for farmers and members of community-based organizations; and (2) increase the volume of locally produced milk that can be supplied to the National Feeding Program. In 2022, DA-PCC distributed 75 dairy buffaloes to beneficiaries in Region 3 (Nueva Ecija) and Region 4 (Batangas).



# RESEARCH FOR DEVELOPMENT

## **COORDINATION & FACILITATION** ACTIVITIES

The DA-PCC's R&D Division (RDD) is primarily responsible for the administration and coordination of sections and units conducting scientific research. The RDD supports the dissemination of scientific knowledge through the implementation of learning interventions such as webinars, workshops, and trainings. The Division was able to conduct 15 S&T caucus or seminars and trainings in 2022, with topics ranging from Socioeconomic Dimensions Impacting the Carabao Industry to Emerging Animal Disease Factors (Appendix 1). The speakers were diverse, ranging from in-house and local experts to international animal science specialists. Various sections in the RDD performed activities in their respective disciplines.

## **REPRODUCTION & PHYSIOLOGY**

The Reproduction and Physiology Section is tasked with conducting R&D activities related to the reproduction and physiology of water buffaloes. The section's main objective is to enhance the efficiency and success rates of reproduction programs in water buffaloes and even other livestock species through the use of biotechnologies.

In 2022, three (3) Intellectual Property documents were also submitted by the Section. Likewise, the Section was also able to establish a future collaboration with the Hungarian MATE Laboratory, which resulted in the reopening/restarting of the Repro ARTs laboratory for embryo production and transfer activities.





## **ANIMAL GENETIC RESOURCES AND UTILIZATION SECTION- CRYOBANK UNIT/NATIONAL LIVESTOCK CRYOBANK**

This section is responsible for the collection, preservation, and utilization of animal genetic resources, with an emphasis on the conservation and propagation of carabao germplasm in the Philippines. It plays a crucial role in preserving the genetic diversity of the Philippine carabao population and boosting the productivity and profitability of the local livestock industry through its cryopreservation facilities and expertise in reproductive biotechnology.

The National Livestock Cryobank opens in 2022, providing more opportunities to strengthen links and contribute valuable science through research for development to livestock clients.

The research addressed livestock farmers' concerns about preserving and identifying animal genetics. National Scientists and Semen Processing Laboratory researchers improved cryopreservation protocols for goat, cattle, and swine semen.

Asian wild and domesticated water buffalo genetic diversity research was peer-reviewed and published. One study found that tamaraw and swamp maternal lineage B and Thai wild buffalo and swamp maternal lineage A are genetically closer than other swamp maternal lineages. "Study of the genetic diversity of the Philippine Carabao swamp buffalo in the Philippines" was another related study. Philippine carabao PC subpopulations showed genetic diversity. Two purebred swamp buffalo subpopulations, Swamp 1 for Calayan Island, Cagayan, and Swamp 2 for Pitogo Island, emerged. This would affect planning effective in-situ and ex-situ conservation and management programs for breeding and preserving genetic resources for sustainability. In accordance with the Intellectual Property patent application on "A Method of Identifying Blood Percentage Proportion of Water Buffaloes Using Microsatellite Markers" (1-2022-50050/11 February 2022). DNA-based methods and advanced molecular tools with informative genetic markers can determine the genotypes and blood percentage proportions of swamp buffalo riverine buffaloes.

## BIOSAFETY & ENVIRONMENT

The RDD's Biosafety and Environment Section (BES) oversees the DA-PCC's Animal Health Monitoring Program. In 2022, the BES staff physically and virtually monitored the 12 DA-PCC Regional Centers and farms, including UPLB, CLSU Dairy/Bull Farm, CMU, USM, DMMMSU, LCSF, USM, MLPC, WVSU, CSU, USF, MMSU, VSU, Genepool, and LBRAF.

The BES also collected 2,723 samples of feces, blood, urine, etc. DNA extraction and molecular testing for Surra and Leptospirosis were also done. A total of 2,915 serum, 1,754 whole blood, and 1,557 feces samples were tested for parasitic infection and Brucella infection.

Some 733 samples underwent culture, Tb ELISA, Blood chem, Johnes test, and necropsy. All specimens are section-collected and walk-in. Some 441 water buffaloes, 814 goats, and 3,640 animals received TB, CAEV, and California Mastitis tests while 906 animals received hemorrhagic septicemia vaccination, vitamin/mineral administration, deworming, and antibiotic treatment. The section provided 10,777 animal health services.

The BES staff attended 48 technical and non-technical trainings, seminars, workshops, and conferences for professional development for extension support, education, and training. Four (4) technical animal health forums (LSD) and seminars were held for DA-PCC technical staff, BAI, LGU, IACUC members, veterinary practitioners, coop-farmers, NGO, and other stakeholders. RADDLs and ADRRL employees attended a DA-Livestock Biotechnology Center workshop in the BES laboratory.

## PRODUCTION SYSTEMS & NUTRITION

The Production Systems and Nutrition Section (PSNS) employs biotechnology to improve carabao nutrition and physiology. In 2022, the section prioritized research on plant growth promoters in forage production, enteric fermentation greenhouse gas mitigation, silage quality improvement, mineral block mineral deficiencies, and seaweed feed supplements. The section's five-year research thrusts include these technologies.

The section has provided technical services and assistance to 96 clients with 332,112 services for planting materials like grasses and legumes and laboratory services to cooperatives, DA-PCC researchers, state university and college students, other government agencies, and private institutions. This effort encouraged farmers to establish their own forage area to support their animals' daily nutritional needs and determine the nutritive values to address ruminant nutritional deficiencies.

The PSNS team held quarterly meetings to monitor and recommend feeding management practices using iFeed, increase forage production through best cultural management practices, and address animal nutritional needs to help regional centers reduce calf mortality.

Client capacity enhancement trainings included face-to-face and webinars to communicate significant technology results and increase farmer adoption. 356 cooperative, LGU, and DA-PCC Regional Center clients attended the trainings. Ensiling and Total Mixed Ration workshops are included. The PSNS team also lectured clients on Sweet Sorghum production,





Farmer's Livestock School (FLS), Dairy Buffalo production and management, Grameen Nutrition Refresher course on KBGAN iFeed application, ASEAN Livestock Biotechnology Center training, and soil improvement workshop.

Animal nutrition is essential for animal production and livestock sector improvement. New feed rations and feed supplement evaluations are crucial to animal efficiency and performance. Besides nutrient content and rumen microbiota interaction, feed ration optimization requires determining feed resource digestibility.

Enteric methane production, a major greenhouse gas contributor, is also neglected in livestock production. Ruminants like buffalo produce methane gas from feed digestion and fermentation in their rumens. Improved forages, feeding practices, and technologies can boost livestock performance and reduce greenhouse gas emissions. To manipulate methane emission through nutrition, animal feed rations must be determined. The PSNS team collaborated with international experts from New Zealand Agriculture Research Center (NZARC) to develop technological and science-based solutions for strengthening AMIA villages and mitigating greenhouse gas (GHG) emissions from enteric fermentation in the Philippines.

Utilization of feedstuffs will reduce feed costs and increase the profitability of livestock farmers and sectors, but animal productivity and performance depend on the availability of feeds and proper management, which increases the demand for quality feeds. Thus, technology interventions like ensiling were used to preserve crops to improve their nutrient quality. This study supported the USDA's National Corn Program's goal of increasing farm productivity, product quality, and cost

effectiveness to improve farmers' income and quality of life. Lactic acid bacteria inoculants improved aerobic stability and fermentation quality of corn and sorghum silages.

The research team worked with DA-PCC-LCSF to implement the study on Production, Conservation, and Potential Use of Sugarcane Plant as Feed for Growing and Lactating Buffaloes. Ensiling preserved locally available forages. This promotes the use of sugarcane plant as a high-nutrient forage source and assesses the economic viability of sugarcane silage in different Philippine regions.

The PSNS team wants to study farmers' low adoption of urea molasses mineral block technology. Small farmers avoid urea as a supplement because it can poison animals. To reduce feed supplement urea concentration, legume-based multinutrient blocks were created. This can boost water buffalo rumen microbial growth, feed intake digestibility, live weight gain, growth rate, and milk production.

Given the diversity and richness of marine species, they can be used as an ingredient in an alternative feed supplement to solve water buffalo mineral deficiencies. Seaweeds are rich in potassium, sodium, calcium, magnesium, phosphorus, iron, manganese, copper, zinc, cobalt, selenium, and iodine. Seaweeds have 20–25% protein, 50–70% carbohydrates, vitamins, and macro and micro minerals, making them good alternative feeds.

“Animal nutrition is essential for animal production and livestock sector improvement. New feed rations and feed supplement evaluations are crucial to animal efficiency and performance. Besides nutrient content and rumen microbiota interaction, feed ration optimization requires determining feed resource digestibility.”



# PRODUCT DEVELOPMENT & INNOVATION

The Product Development and Innovation Section (PDIS) is an internally created Section under the RDD. The Section focuses on research, development, and innovation of milk and other carabao-based products for market promotion and the creation of sustainable livelihood opportunities for dairy farming communities. It implements and commercializes technologies and products developed for DA-PCC-assisted dairy cooperatives and other interested clients.

## TECHNOLOGY APPLIED/ COMMERCIALIZED

Two (2) of the developed technologies/ products were commercialized:

1

### **Karabun (carabao's milk-flavored bun)**



2

### **Mozzarella cheese (direct acidification)**



**Table 4. Intellectual Properties (IP) applications filed**

	Application No./ Date Filed	Status
1. Composition of a Sterilized Toned Carabao (Buffalo) Milk	IKG06D030082022E3V June 30, 2022	Awaiting for IPOPHIL's formality examination report
2. Composition of Stirred Type Yogurt with Carabao Milk and Coconut Milk Blend	2/2021/050371 Jun 29, 2022	Awaiting for IPOPHIL's formality examination report

**Table 5. Intellectual Properties (IP) protected/ registered**

Title	Date of publication/ registration
Composition of Stirred Type Yogurt with Carabao Milk and Coconut Milk Blend	Jan 13, 2021/ IPOPHL Official Gazette Vol 24 No. 5
Process of Producing Lemon-flavored isotonic drink from whey	April 19, 2021/ IPOPHIL Official Gazette Vol 24 No. 82



## KARABUN ROLLOUT

Karabun technology was rolled out to the DA-PCC regional focals and members of DA-PCC assisted dairy coops which will be potential suppliers of Karabun for the the DepEd National Feeding Program.

**Table 6. Karabun rollout**

Cooperatives	Participants	Date (2022)
San Jose Workers MPC	5	January 28
JCG Marketing Group Inc.	16	January 28
Rueda's Bakery	4	January 28
TRFALCO	3	January 28
Esteems Industries Inc.	5	February 4
Bakers PH	7	April 1
Eastern	8	April 22
TOTAL	48	

## MARKET DEVELOPMENT ASSISTANCE SUPPORT TO RA 10611 (FOOD SAFETY ACT OF 2013)

The PDIS provided technical assistance in the application and renewal for License to Operate (LTO) as a food manufacturer and or trader to one (1) DA-PCC regional centers and four (4) dairy cooperatives:

**Table 7. Market Development Assistance**

Cooperative/ DA-PCC Regional Center	Location
DA-PCC at Ubay Stock Farm (USF)	Ubay, Bohol
San Agustin Dairy Cooperative (SADACO)	San Agustin, Isabela
Licaong Agriculture Cooperative	Science City of Muñoz, Nueva Ecija
Eastern Primary Multipurpose Cooperative (EPMPC)	San Jose City, Nueva Ecija
Barotac Nuevo Development Cooperative	Barotac Viejo, Iloilo

## SUPPORT TO RA NO. 11037 (MASUSTANSYANG PAGKAIN PARA SA BATANG PILIPINO ACT)

In support of RA 11037, the DA-PCC facilitated the implementation of the DepEd-funded School Based Feeding Program -Milk Component in thirteen regions and forty-one provinces nationwide. For the DepEd FY 2020 funds being implemented by DA-PCC in partnership with DepEd, 32 DA-PCC-assisted dairy cooperatives provide milk for 1,031,354 children, or 32.91 percent of the total number of undernourished children enrolled in public elementary schools from Kindergarten to Grade Six.

The PDIS provided assistance to DA-PCC regional milk feeding focals and supported cooperatives as milk program facilitators and suppliers. Dairy cooperatives were provided with pertinent trainings to ensure the production of high-quality, safe dairy products:

Other related services and technical assistance were provided by PDIS staff to address concerns and other requirements of the milk feeding program.

Analysis of pasteurized toned carabao milk to determine compliance to quality and safety standards

Analysis of water samples from processing plants of dairy cooperatives

Formulation of toned carabao milk

Nutrition facts of pasteurized toned carabao milk and milkybun

Link to suppliers of ingredients and packaging for toned milk

Coordination with San Miguel Yamamura Packaging Corporation (SMYPC) for the manufacture of sterilized toned carabao milk for the milk feeding program

Linkage to service provider for the analysis of physico-chemical and microbial analysis of milk

Compliance to legal and statutory requirements needed for the procurement of milk for the feeding program

Raise concerns of DA-PCC regional focals and assisted cooperatives to the DepEd and DSWD milk feeding team

# **SOCIO-ECONOMICS AND POLICY**

The Socio-economics and Policy Research Section (SEPRS) led the development and implementation of four research projects in 2022.

The first research is a continuation of the completed study, “Evaluating the Operational Procedure of the Initial Implementation of the Milk Feeding Program in Nueva Ecija, Philippines.” It aimed to examine the impact of the Milk Feeding Program on the revenue of the cooperatives in Nueva Ecija that supplied milk for the program.

The second is a recently concluded study that assessed the waste management practices of Philippine dairy buffalo farms within each farm category. It also seeks to identify the factors that influence the adoption of such waste management practices and to recommend an appropriate waste management system for each dairy buffalo farm classification. The collected data will also contribute to the inventory of greenhouse gas emissions that the Climate Change Commission is currently compiling.

The third research aims to profile all key stakeholders along the value chain of carabao-based enterprises in order to enhance project planning, monitoring, and evaluation. A total of 2,086 farmers have been profiled using a survey questionnaire that collects information on their socio-demographic profile, farm information including GPS coordinates, animal inventory, management system, and raw milk market.

In contrast, the final research is an operational study that aims to document and model a province-wide carabao-based enterprise value chain in specific regions.

## **PARTICIPATION IN SCIENTIFIC CONFERENCES, WORKSHOPS & TRAININGS**

The DA-PCC actively participated in local and international scientific conferences and workshops in 2022 to promote its research and development initiatives.

Through these events, DA-PCC was able to inform a larger audience about its significant achievements in the field of carabao research and development. In addition, the agency established new partnerships with other institutions and organizations to enhance the quality of its research and development initiatives. Overall, DA-PCC’s participation in scientific conferences and workshops has proven to be an effective strategy for promoting its advocacy of improving the lives of carabao farmers and expanding the Philippine carabao industry.

## **EXTERNALLY FUNDED PROJECTS**

The DA-PCC has undertaken several externally funded R&D projects in 2022. These projects were initiated to advance the productivity, profitability, and sustainability of the carabao industry in the country.

## **LEARNING EVENTS FOR DA-PCC CLIENTS**

The DA-PCC researchers collaborated with the agency’s Knowledge Management Division (KMD) to facilitate learning events for various clients in 2022 (Appendix 5). The purpose of these educational events was to provide clients with current knowledge and skills regarding carabao-based enterprises, genetic improvement, and other related topics.

The learning events included customized workshops, training sessions, and seminars. Clients who participated in the learning events included farmers, students, local government units, and other livestock industry stakeholders.

## **PUBLICATIONS IN SCIENTIFIC JOURNALS AND CONFERENCE PROCEEDINGS**

The DA-PCC is committed to disseminating its research findings and knowledge via various channels, such as scientific publications. The agency’s researchers and scientists published multiple articles in scientific journals and conference proceedings in 2022. These publications covered a vast array of research and development-related carabao topics, including genetics, reproduction, nutrition, health, and socioeconomics

## **BUSINESS DEVELOPMENT & COORDINATION**

### **INTENSIFIED RESEARCH-BASED ENTERPRISE BUILD-UP (IREB) DASHBOARD ANALYSIS AND MONITORING**

The iREB Dashboard was utilized by the 12 regional centers and the National Dairy Business Hub (NDBH, formerly NIZ) to monitor client production and business performance. The mobile data collection application and web-based dashboard of the system were updated.

The DA-BAR approved and funded the Project Proposal titled "Enhancement of the iREB Database Management System for Carapreneurs in the Philippines". On this project, the Business Development and Coordination Unit (BDCU), the Planning and Information Management Division (PIMD), and the Information and Communication Technologies Section (ICTS) work together.

The project cascaded and pilot-tested the upgraded support-to-client monitoring systems of DA-PCC and its Value Chain Player for the Luzon and Visayas cluster. It implemented and pilot-tested iREB DBMS enhancements, reviewed the mobile app, and cascaded other user-interface tool enhancements.

## **AWARDS & RECOGNITIONS**

**The DA-PCC researchers received various awards and recognitions in 2022 signifying the agency's commitment to excellence in performing R&D activities**

### **MARVIN A. VILLANUEVA**

{Career Scientist I}

Scientific Career System - National Academy of  
Science and Technology DOST

### **LILIAN P. VILLAMOR**

{PhD in Agricultural Science}

Tokyo University of Agriculture

{Best Completed Paper (DA-PCC R&D In-House Review)}

{Best Oral Presenter (DA-PCC R&D In-House Review)}

{Certificate of Recognition for paper publication}

{Certificate of Recognition for Patent Application}

RDD, DA-PCC

### **THERESE PATRICKA C. CAILIPAN ET al.**

{Certificate of Recognition for paper publication}

{Certificate of Recognition for Patent Application}

RDD, DA-PCC

### **AIVHIE JHOY DS. ESCUADRO ET al.**

{Certificate of Recognition for paper publication}

RDD, DA-PCC

### **AIVHIE JHOY E. CUANANG**

{Certificate of Recognition for paper publication}

RDD, DA-PCC

### **AIVHIE JHOY E. CUANANG**

{Certificate of Recognition for Patent Application}

RDD, DA-PCC

### **ERIC P. PALACPAC**

{Best Paper Award in Socio-Economics (59th PSAS  
Scientific Seminar and Annual Convention)}

Philippine Society of Animal Science  
(PSAS)

## FINANCIAL SERVICES PROVIDED

Another function of the BDCU is the provision of various financial services to internal and external clients. For 2022, the unit provided the following services:

Updated Silage Production Investment Indicators 2022
Presentation of the Financial Projections of Carabao Farming and Processing and Marketing Businesses to Mr. Dante Ang and Team
250-Cow Dairy Farm Module
500-Cow Dairy Farm Module
BIR financial requirements of Milka Krem
Updated Costing and Pricing of Milk Pops for Deped
Updated Dairy Box Investment Calculator
Discussion Of the Treatment of Biological Assets to Cooperative Books (Oro Integrated Coop)
Updated Milka Krem Beverage Costing
Costing and Pricing for 9 Milk Analysis Tests
Assistance to the Project Proposal of FCCT for Silage Production
Discussion of the Carabao Business modules to Army retirees
Costing and Pricing Assistance to Mountain High Dairy Cooperative
<b>Cost and Return Comparison of Native and Upgraded Carabao Production</b>

## CARABAO VALUE CHAIN BUSINESS PORTFOLIO ANALYSIS

There were 11 modules developed that will be updated and reproduced in 2023 as knowledge products of the agency. The following are the modules in the portfolio:

5 - cow Module
10 - cow Module
15 - cow Module
20 - cow Module
25 - cow Module
50 - cow Module
Silage Production
Vermicomposting
Small-scale Processing
Dairy Box
Kardeli Retail

# BizTalk

## Carabao Business Workshop

Sen. Cynthia A. Villar, chairperson of the Senate Committee on Agriculture, Food, and Agrarian Reform, supported the concept of “Province-wide Carabao-Based Business Improvement Network (Alab-Karbawan)” in order to promote an inclusive, sustainable, and competitive local dairy industry.

The DA-PCC and concerned LGUs, other government entities, cooperatives, smallholder farmers, agri-entrepreneurs, and other stakeholders created the CBIN, a modified and enhanced version of the existing National Impact Zones/Regional Impact Zones for carabao-based enterprises in rural farming communities.

The objective of client services is to develop businesses that enhance client lives and advance the industry. The “Business Talk: Carabao Business Workshop,” held on November 23-25, 2022 at the Villar Social Institute for Poverty Alleviation and Governance (SIPAG) Farm in Bacoor, Cavite, instructed participants in financial analysis, asset management, product costing and pricing, and marketing strategies as part of the dairy value chain.

South Luzon had 11 cooperatives from Regions 4A, 4B, and 5 that were CBIN recipients. Each cooperative sent three representatives, including the chairman, manager, encoder, or accountant.



### **DAIRY BOXES AND CLIENT PROCESSING AND MARKETING OUTLETS (PMOS) AUDITED AND MONITORED**

DA-PCC-assisted cooperatives visited 29 Dairy Boxes and Client PMOs in order to audit and monitor their carabao-related financial reports. Problems with inventory records, petty cash/cash management, and marketing materials were frequent audit findings. The milk feeding program increased the cooperatives' and their members' income as well as their general standing.

### **DA-PCC BUSINESS UNITS MONITORING (INSTITUTIONAL HERDS - IHS, PMOS AND DA-PCC HOSTEL)**

Through dashboards, the monthly performance of DA-PCC IHS and PMOs was monitored. In addition to monitoring the return on investment (ROI) beginning in 2023, the self-liquidating rate, or the ability of these operating units to generate cash to cover their expenses, will also be tracked.

### **KARDELI TECHNOLOGY INTRODUCTION AND PITCH**

During the Livestock Philippines Expo held on August 24-26, 2022 at the World Trade Center Manila, Kardeli™, the newest addition to the DA-PCC's carabao-based enterprises, was introduced. The technology was packaged with economic and financial valuation for private sector commercialization by 2023. The Kardeli offers premium carabao meat products, including prime cuts, sausages, and unique recipes. In addition, it was invited as one of the technologies to be pitched at the Agri-Aqua Innovation PitchFest at the Acacia Hotel in Alabang, Muntinlupa. This event was organized by the Technology Transfer and Promotion Division of the DOST-PCAARRD.

### **THE FINANCIAL VIABILITY OF THE DAIRY BUFFALO FARMING BUSINESS**

In addition to establishing village businesses based on buffalo, one of the ultimate goals of the CDP is to increase the income of rural farming families. This objective prioritizes the evaluation of the viability of various carabao-based businesses. It is of the utmost importance that clients are aware of the options for potential investment enterprises that will ultimately increase investment and income. This includes modules for dairy buffalo farming with varying initial cow head counts, silage production, and vermicompost production.

Among the analyses that can be used to determine the viability of a business is the cost-benefit analysis. It is the systematic cataloging of impacts as benefits (pros) and costs (cons), valuing in monetary terms (assigned weights), and then determining the proposal relative to the status quo based on the net benefits (benefits minus costs) or benefit-cost ratio (divide benefits by costs). This is an essential analysis performed during the business planning phase.

### **TECHNICAL EFFICIENCY AND TECHNOLOGY ADOPTION IN DAIRY BUFFALO MILK PRODUCTION IN CENTRAL LUZON, PHILIPPINES**

This study aims to provide an answer to the following research question: "Is it possible for farmers to improve their technical efficiency by adopting specific available technologies and recommended practices?"

Given the current restrictions on increasing the number of cows, the Total Factor Productivity represents the most practical means of increasing productivity. The analysis of the production function will reveal the direction and magnitude of the inputs' influence on milk production.

This information will instruct farmers and extension agents on how to practically adjust production levels to increase milk output. Prediction of the farmers' technical efficiency scores will lead to the identification of champion dairy farmers and serve as an indicator of the efficacy of DA-PCC and LGU's production support, veterinary, and other extension services. By determining which farmer or farm characteristics influence a farmer's decision to adopt a new technology, specific interventions can be designed and a programmatic approach can be developed for national application.

### **CREDIT FACILITATION SERVICES**

There is one request for assistance with ACEF credit requirements from John Bert Luis, a young farmer. The requirements include a feasibility analysis for 5-cow and 10-cow dairy buffalo business modules, an animal pen floor plan, and the local price of buffaloes.

# PLANNING & INFORMATION MANAGEMENT

The Planning and Information Management Division (PIMD) is responsible for preparing the agency's overall plans, monitoring its major final outputs, and coordinating foreign-funded projects. Through its expertise in strategic planning and information management, the PIMD helps to guide and shape the agency's activities, ensuring that they align with its mission and goals. Appendix 8 summarizes the agency's Major Final Outputs in 2022.

## **ADVISORY BOARD MEETING**

Undersecretary William Medrano led the 23rd Advisory Board meeting at the Livestock Innovation and Biotechnology (LIB) Complex on March 24, 2022, at 2:00 pm. The meeting discussed the 2023 Budget Proposal, Intensified Herd Buildup in Bicol Region, Operational MOA-R4D, Senate Bill 119, The Philippine Livestock Development Plan Act of 2019, and MOU on Research and Academic Cooperation with the Hungarian University of Agriculture and Life Science.

Dr. Ronnie D. Domingo, OIC-Executive Director, presented the Agency's \$740 million budget and Tier 1 funding, the DBM's annual operational requirement calculation based on three years of agency spending, during the meeting. Dr. Claro Mingala presented the Bicol Intensified Dairy Herd Buildup and Operational MOA-R4D to the host universities.

The AdBoard also appreciated Ms. Minda R. Diloy's report on Regional Center ISO Certification and National Headquarters Integrated Management System maintenance. Mr. Alvin David also updated the body on AO25 compliance. Dr. Rovina Piñera of DA-PCC at CSU informed the AdBoard that the farm is the first GAHP-compliant government farm in the Philippines.

### ***ENHANCEMENT OF THE INTENSIFIED RESEARCH-BASED ENTERPRISE BUILDUP (IREB) DATABASE MANAGEMENT SYSTEM FOR 'CARAPRENEURS'***

With the assistance of the DA-Bureau of Agricultural Research, the DA-PCC has improved its two database management systems (DMS), iREB 2.0 and MFO dashboard version 3, for digitalizing carapreneurship. The iREB 2.0 measures the profitability and productivity of the carabao-based enterprise (CBE), whereas the MFO dashboard measures the agency's output and performance. The enhanced DMSs are effective information generation and business decision-making tools. The iREB 2.0 makes it simple to evaluate the performance of farmer members and the areas that require immediate assistance. In May and July, participants were introduced to the two DMS through hands-on sessions, and the information was then disseminated to clients and carabao-based enterprise development coordinators.



#### **PL480: INTENSIFIED COMMUNITY-BASED DAIRY ENTERPRISE DEVELOPMENT**

The project was included as an unprogrammed appropriation in the General Appropriations Act of 2022, but the agency could not begin implementing it until August 2022, causing delays. To address this issue, a November 2022 activity titled “PL480 Project Writeshop: Applied Research Towards Value Chain Enterprise Build-Up” was conducted to identify common interventions that will enhance each research and its impact on DA-PCC MFOs. The project’s impact must align with the agency’s Carabao Development Program goals, and the areas in which it contributes to the overall organization’s outcome and has a targeted impact on value chain participants will be identified. To encourage enterprise development in the carabao industry, possible enterprises will be supported by applied research with actual application on the ground, and will serve as a model for others to emulate.

## **INFORMATION MANAGEMENT SYSTEMS**

Through the approved Information System Strategic Plan (ISSP) 2021-2023 from the Medium-Term Information and Communications Technology Harmonization Initiative (MITHI) fund, the DA-PCC’s Information and Communication Technologies Section (ICTS) facilitated the continuous development and implementation of the Finance and

Administrative Support Tracking System 9 (FAST System) for monitoring the agency’s financial transactions. The ICTS has continuously improved the online Intensified Research-based Enterprise Build-up (iREB) on its version 2.0 Dashboard System as a tool for analysis on the client/farmer aspects, as well as the Major Final Output (MFO) dashboard as a method for measuring the agency’s physical targets and budget utilization.

With the assistance of the (MITHI) fund, the ICTS continuously enhanced and upgraded a number of desktops, central processing units (CPUs), laptops, and servers at the DA-PCC operating units/sections and regional centers. The purchase and upgrade of 55 computers and other ICT peripherals has ensured the modernization of workstations. Continuous maintenance and patch upgrading of Windows Server Data Center 2019 edition Operating System, SOPHOS Firewall, and Secure Sockets Layer (SSL) Licensed software, including Microsoft Windows 10 and 11 64-bit Operating System, Microsoft Office 365, and Adobe CS 6 were also accomplished.

In coordination with the 12 DA-PCC regional centers, the ICTS facilitated and continuously supported the upgrading of ICT hardware, software, and equipment.

To ensure a virus-free Local Area Network (LAN), Symantec End Point Protection Server and Client-based anti-virus were routinely updated. This also ensures that all computers connected to the LAN-Active Directory are protected from any unforeseen computer viruses.





The DA - Philippine Carabao Center joins the

AGENDA NG Kababaihan Tungo sa Kaunlaran



2022 National Women's Month Celebration

WE Make CHANGE Work for WOMEN

March 1-31, 2022



# GENDER & DEVELOPMENT PROGRAM

2. The DA-PCC organized and spearheaded a Wellness Break Zumba activity among the employees in support for the national Women's Month celebration.



{participated in the the Wellness Break Zumba activity}

## GAD GOAL 1

### IMPROVED INSTITUTIONAL CAPACITY TO ENHANCE & SUSTAIN GENDER MAINSTREAMING IN THE AGENCY

1. Conducted GAD-related learning events such as Orientation on Safe Spaces Act and Magna Carta and Gender Sensitivity Training for PCC staff and GAD Orientation for Cooperatives during the 29th anniversary celebration of DA-PCC.



{participated in the GAD related learning events}



{attended the GAD Orientation for Cooperatives}

3. Milka Krem products outlet offered a one-day 5% discount for all its products on International Women's Day (March 8) as part of the "Serbisyo para kay Juana" to all of its women clients in appreciation for women's various contributions in the society.

4. Conducted a one-day Hybrid Training and Orientation on the Use of the Harmonized GAD Guidelines (HGDG) to mainstream GAD Elements in the Project Development Cycle.



## GAD GOAL 2

### **INCREASED ACCESS OF WOMEN TO TECHNOLOGIES AND SERVICES ON THE PRODUCTION, PROCESSING AND MARKETING OF CARABAO AND CARABAO-BASED PRODUCTS.**

1. Increased number of women who have access to technologies and services on the production support services



{recipient of production support services and given access/information to technologies}

2. Increased number of women who have access to market development services



{women assisted, participated, given linkage to market development services (MDS)}

3. Increased number of women who have access to extension support, education and training services



{women participated, provided & given access to ESETS conducted by DA-PCC}



{clients provided with IEC materials}

## GAD GOAL 3

### **INCREASED PARTICIPATION OF WOMEN IN THE PLANNING, IMPLEMENTATION, MONITORING AND EVALUATION OF DA-PCC PROGRAMS.**

Increased documentation and recognition of the contribution of women and youth clients in the implementation of DA-PCC programs



{participated, contributed & being recognized as partners in the implementation of DA-PCC programs}





# KNOWLEDGE MANAGEMENT

**40**

{media exposures in diverse news platforms (TV, Radio, Press, Online, and Social Media) and has uploaded 74 articles to the DA-PCC website and popular social media (Facebook)}

**100**

{documentations, communication activities, and legwork have been translated into knowledge products and other reports.}

**4**

{Cara-Ugnayan events with media partners}

## **SUSTAINED MASSIVE INFORMATION & COMMUNICATION CAMPAIGN**

In 2022, the DA-PCC led the production and distribution of the following knowledge products or information, education, and communication (IEC) materials through the Knowledge Management Division's (KMD) Applied Communication Section (ACS):

- Six (bimonthly) issues of CaraBalitaan (the Tagalog-language newsletter for the National and Regional Impact Zones)
- Four (quarterly) issues of the Tagalog-language Karbaw Magasin.
- Four (quarterly) English-language issues of the Bubalus Newsletter
- One issue of the English-language publication R4D Highlights
- Two issues of ALAB Karbawan Newsletter (written in TagLish), a publication produced in support of the Accelerating Livelihood and Assets Buildup project sponsored by the Senate Committee on Agriculture, Food, and Agrarian Reform and chaired by Senator Cynthia Villar's office.



- Reprint of AI Manual and knowledge products created for the Farmers Livestock School on Dairy Buffalo Production: FLS Session Guide and Technical Handouts.
- Reprinting of the first edition of the coffee table book Faces of Success in Carapreneurship
- Production of souvenir programs for DA-PCC's 29th anniversary and 8th National Carabao Conference respectively. • Production of 21 audio-visual materials for aggressive promotion of various components of CDP. • Launching of the 26-minute audio-visual presentation titled "Magiging na Carapreneurs sa Isip, sa Salita, at sa Gawa."
- One hundred documentations, communication activities, and legwork have been translated into knowledge products and other reports.

## OTHER MEDIA FORMS

- The KMD has facilitated and recorded 40 media exposures in diverse news platforms (TV, Radio, Press, Online, and Social Media) and has uploaded 74 articles to the DA-PCC website and popular social media (Facebook).



- Obtained from the Intellectual Property Office of the Philippines certificates of trademark application for KBGAN iHealth and iFeed mobile apps and copyright registration for 13 knowledge products (Faces of Success in Carapreneurship Coffee Table Book, 10 KBGAN Learning Video Series, Philippine Livestock Biotechnology AVP).
- Conducted Planning-Workshops on KM Interventions for the ALAB Karbawan Project in Regions III, VI, VIII, XI, and XII in coordination with DA-PCC at CLSU, DA-PCC at WVSU, DA-PCC at VSU, and DA-PCC at USM to provide real-time accessibility of KPs and engage LGUs and value chain CSOs in the production of KPs and capacity building of clients.

# LEARNING EVENTS COORDINATION

## WEBINAR TRAININGS

The PCC's Learning Events Coordination Section facilitated 12 types of webinar training, which were participated in by 1,290 attendees. These online events were categorized under the Production Support Service and Marketing Support Service-related technical trainings. Topics includes the following:

- 1 Dairy Feb-Ibig: All for the love of Dairy Products (Special Valentine Episode)
- 2 Forage Production and Conservation, Animal Feeding Management and Nutrition
- 3 Mga Karaniwang Sakit ng Kalabaw: Bloat at Surra. Sweet Bulakenya: Biyaya sa Panahon ng Pandemya
- 4 Care and Management of Pregnant Buffaloes
- 5 Carabao-Based Enterprise Development
- 6 Dairy Box Opportunity and Heat Detection and Breeding Services.

# CARA ARALAN Webinar Series

12

{types of webinar training facilitated}

1,290

{attendees participated in webinar trainings}

17.59%

{improvement in average post-training ratings on knowledge gained from the topics presented}

4.72

{overall webinar satisfaction rate or Very Satisfactory}





## **FACE TO FACE TRAININGS AND MEETING WITH PARTNERS**

Sixteen face-to-face trainings, seminars and meetings were also conducted and facilitated. These learning events included the following:

- 1 Social Preparation Training
- 2 Training on Mobile Extension Advisory Services (EAS) App Solution
- 3 Refresher Course on Feeding and Nutrient Management
- 4 Good Manufacturing Practices
- 5 Sanitary Standard Operating Procedures and Pest Control
- 6 Dairy Box Standardization Workshop
- 7 Training Course on Dairy Buffalo Production and Management
- 8 AI and PD Training and FDA License to Operate Training

# 16

{face-to-face training facilitated}

## **FARMER LIVESTOCK SCHOOL ON DAIRY BUFFALO PRODUCTION (FLS-DBP)**

In 2022, three workshops were conducted for FLS-DBP Facilitators involving participants from Leyte, Southern Leyte, Biliran, Samar and Northern Samar, President Roxas and North Cotabato. A total of 68 participants were trained during the conduct of this learning event.

# 3

{conducted for FLS-DBP Facilitators}

# 68

{participants trained}

## **SCHOOL-ON-THE-AIR**

To continuously disseminate the PCC's programs, services, and technologies on dairy buffalo production, the PCC at University of Southern Mindanao funded by Agricultural Training Institute Region XI and Region XII.

# 16

{episodes of SOA on Dairy Buffalo Production airs over DXRD 711MHz radio station and on its FB page where experts from PCC at USM serves as the resource speakers}

# 719

{enrollees are farmers coming from Davao Del Sur in Region XI and North Cotabato in Region XII}

## **ASSISTANCE TO VISITORS AND CUSTOMERS' SATISFACTION**

Through the KMD's Learning Events Coordination Section (LECS), a total of 961 scheduled and walk-in visitors were received, oriented on the PCC's programs and services, and toured to the PCC's facilities. The LECS earned a satisfaction rating of 4.77 (5 as the highest rating possible).

# 961

{scheduled and walk-in visitors were received, oriented on the PCC's programs and services, and toured to the PCC's facilities}

# 4.77

{satisfaction rating LECS earned}

# INTEGRATED MANAGEMENT SYSTEMS

The Management Systems Audit Office (MSAO) is instrumental in ensuring that the DA-PCC maintains its integrated management systems, i.e., ISO 9001:2015 (Quality Management System), ISO 14001: 2015 (Environmental Management System), and ISO 46500:2018 (Occupational Health and Safety), certifications.

The MSAO is responsible for facilitating audits of the agency to ensure compliance with the three international standards.

The MSAO is also responsible for conducting internal audits of the DA-PCC's operations, identifying risks and opportunities for improvement, and recommending ways to increase the agency's effectiveness and efficiency.

The MSAO ensures that the DA-PCC's operations are aligned with its vision of becoming a world-class center of excellence for carabao development.

## **FOR THE NATIONAL HEADQUARTERS AND GENE POOL**

- Maintained validity of certificates for ISO 9001:2015; ISO 14001:2015 and ISO 46500:2018 by:

1. conducting Internal Audits on all processes to measure its performance including the quality of both products and services;

2. holding of Management Review Meetings to determine appropriateness of Policies, extent of achievement of Objectives and discuss issues that affect the performance of Integrated Management Systems. New set of Objectives was also finalized for the next cycle of Certification.

The meetings also served as the venue to review and re-assess the risks and opportunities at the agency level.

3. Airing and presentation of 49 topics of educational video materials pertaining to Environmental, Occupational Health and Safety both at the lobby monitor and Monday start-off meetings. This endeavor strengthened the employees' compliance to the requirements of Environmental and Occupational Health and Safety Management Systems.

- Compliance to applicable Legal and Other Requirements (LOR) such as:

1. For the employees:

- a. Mandatory drug testing; and

- b. Annual Physical and Medical Examination to ensure a healthy workplace

2. For the facilities,

- a. maintained validity of the following:

- License to Operate from Food and Drugs Administration;



### **FOR THE REGIONAL CENTERS**

- Permit to Operate for 5 standby gensets
- Permit to discharge hazardous wastes (including effluents)
- Renewed the License from Philippine Drug Enforcement Agency (PDEA) for the Use of Controlled and Pre-Cursor Elements and Chemicals (CPECs) at the different laboratories
- Strengthened the Internal Audit process by enhancing the capability of designated auditors through the conduct of training-workshop on ISO 45001:2018, Occupational Health and Safety Management System (OHSMS);
- Initiated activities to help improve the health of employees through the “Balik Sigla Program” with jumping rope every Thursday and Virtual Walkathon that ran for three (3) months.
- Through the consistent implementation of Health Protocols, prevented the contagion of COVID-19 and other communicable disease within the workplace.

Consistent with the agency’s commitment to attain 100% Quality Management System (ISO 9001:2015) Certification of the Regional Centers, MSAO accomplished the following:

1. Assistance for the successful certification of DA-PCC at WVSU to ISO 9001:2015
2. Internal Quality Audits (IQAs) to four (4) Centers namely: DA-PCC at VSU, DA-PCC at WVSU, DA-PCC at DMMMSU and DA-PCC at MLPC;
3. Full documentation assistance to DA-PCC at DMMMSU and DA-PCC at MLPC;
4. Virtual trainings on Quality Management System Requirements and Internal Quality Auditing to DA-PCC at VSU and DA-PCC at CSU. Similar training was also conducted face-to-face at DA-PCC at CMU with participants also from DA-PCC at USM
5. Initial efforts were also made to regain certification of three (3) Centers: DA-PCC at MMSU, DA-PCC at UPLB and DA-PCC at CMU that have lost their certification.

# HUMAN RESOURCE MANAGEMENT

The DA-PCC's Human Resource Management (HRM) Section is responsible for managing the center's workforce, fostering employees' professional and personal development, and meeting the center's staffing requirements. The HRM Section manages the screening and filling of vacant positions for both permanent and temporary personnel. This includes the posting of job openings, the screening of applicants, and the interviewing and testing of qualified candidates. In addition, they provide regular training and development programs, such as capacity-building workshops, seminars, and coaching sessions, to enhance employees' skills and competencies and ensure their continued growth within the organization.

## Contract of Service (COS) Staff

Employees Training Request (Learning and Development)

223

Total # Training Request Received

211

Total # Training Request Approved

12

Total # Training Request Disapproved





**Table 8.** Personnel Complement (As of Dec. 31, 2022)

Operating Units	Total Filled Positions (Permanent)	No. of Vacant Positions
I. Office of the Executive Director*	5	0
II. Administrative, Financial & Management Division	15	4
III. Planning & Information Management Division	7	3
IV. Knowledge Management Division	6	0
V. Research & Development Division	18	8
VI. Regional Centers:		
* Central Luzon State University	21	3
* UP at Los Baños, Laguna	20	2
* Cagayan State University	8	3
* Central Mindanao University	12	0
* Ubay Stock Farm	8	0
* La Carlota Stock Farm	7	1
* Mariano Marcos State University	8	3
* Don Mariano Marcos Memorial State University	6	3
* Visayas State University	6	0
* West Visayas State University	9	1
* University of Southern Mindanao	11	1
* Mindanao Livestock Production Complex	10	0
<b>TOTAL</b>	<b>177</b>	<b>32</b>

# ADMINISTRATIVE AND FINANCE MANAGEMENT

The DA-PCC has continued its commitments to public expenditures management reform objectives of the government. These commitments were translated in the operating budget of DA-PCC for FY 2022, specifically addressing the following critical areas of the agency financial management system:

**a. Fiscal discipline.** In accordance with agency policy, all operating units are expected to spend government funds with care and prudence. The implementation of effective measures to prevent excessive and unjustifiable expenditures. All programmed expenditures are aligned with the agency's strategic priorities.

**b. Fund management effectiveness.** Consistent with the government's public financial management reform road map, the DA-PCC has continued to increase the regional centers' adoption of the Unified Accounts Code Structure (UACS) system. The UACS provides a unified budgetary and accounting code classification that facilitates the efficient and accurate reporting of the center's actual revenue collections and expenditures.

The institutionalization of the UACS system throughout the DA-PCC networks has enhanced internal controls and risk management by streamlining and simplifying financial reporting, thereby enhancing expenditure management's transparency and accountability. The DA-PCC implemented the New Government Accounting System (eNGAS) at its Central Office and regional centers.

**c. Operational effectiveness.** In 2022, an effort was made to increase the participation of program implementers, ground personnel, and frontline service providers in the budget preparation process. During both the budget cycle and the implementation of the programs, a consultative mechanism involving partners and key stakeholders was implemented.

The budgetary needs of the center's operating units were met on time and in accordance with the approved plans. In addition, administrative policies, procedures, and processes were implemented to increase operation transparency and reduce procurement lead time for essential goods and services. Similarly, some Cash Budgeting System adoption-related strategies are currently being implemented.



## **HIGHLIGHTS OF FY 2022 BUDGETARY EXPENDITURES**

The DA-PCC has implemented its VIPPS 2020-2024 Medium-Term Strategic Plan, which aims to enhance carabao value chain development by providing relevant services to farmers, forming partnerships with key stakeholders, and expanding carabao-based enterprise impact models.

In its first year of implementation, DA-PCC prioritized the enhancement of the existing genetic program, including the production of high-quality frozen sperm, the cryobanking of genetic materials, and the DNA-based screening for genetic defects. The center has also engaged in educating farmers and training AI technicians in order to increase live births and decrease mortality through the application of scientifically supported solutions, the incorporation of modern equipment, and the dissemination of expert knowledge.

The DA-PCC has also utilized funds to support carabao-based enterprises and strengthen partnerships with stakeholders, including the creation of a value-chain portal and continuous support to multiplier business farms. Focusing on genetic improvement, technology advancement, and carabao-based businesses, the center has also conducted significant Research for Development (R4D) to provide solutions to pressing industry issues and problems.

The Department of Social Welfare and Development (DSWD), the Department of Education (DepEd), and the Philippine Coconut Authority (PCA) have implemented collaborative projects with DA-PCC to combat malnutrition, alleviate poverty, and increase the income of coconut farmers through carabao's milk-based enterprises.



# SOURCES & USAGE OF FUNDS

The agency main sources of funds to support its operation are provided by the national government through the General Appropriation Act (GAA) and Revolving Fund. Details of allotment and utilization are as follows:

Research funding is allocated to special projects by various government agencies. Transfers of funds from DOST-PCAARRD and DA-BAR support the development of carabao-based enterprises and genetic improvement initiatives. Increased funding is required for the implementation of Locally-Funded Projects titled “Strengthening the ALAB-Karabawan Project through Herd Build-Up and Support to Foreign-Assisted Projects (under SARO-BMB-E-22-0005472 dated June 29, 2022)” in the amounts of PHP250,000,000.00 and PHP454,530,000.00, respectively.

In addition, under Continuing Appropriations, there is another Locally-Funded Project titled Establishment of Carabao Dairy Centers with a budget of Php110,000,000.00 that was released on December 31, 2021 via SARO-BMB-E-21-0014333.

# RECOGNITION AWARDS

The DA-PCC takes pride in receiving the 1st Placer Award – Attached Agency Category for demonstrating sustained and effective financial and cash management throughout the Fiscal Year 2022. This is the third time that the Agency received this award, from FY 2020 to FY 2022. It was given during the DA Year-End Financial Evaluation and Assessment for FY 2022 last February 20, 2023 held in Puerto Princesa City, Palawan.

**Table 9.** Statement of Financial Position as of December 31 (PHP Million)

Particulars	FY 2021	FY 2020	% Change
<b>Assets</b>			
Current Assets	1,185.41	836.06	42%
Property, Plant & Equipment	1,103.71	1,075.66	3%
Biological Assets	130.80	124.33	5%
Other Assets	0.75	2.36	(68%)
<b>Total Assets</b>	<b>2,420.67</b>	<b>2,038.41</b>	<b>19%</b>
Liabilities	827.81	398.10	108%
Accumulated Surplus (Deficit)	1,592.86	1,640.31	(3%)
<b>Total Liabilities &amp; Net Assets/Equity</b>	<b>2,420.67</b>	<b>2,038.41</b>	<b>19%</b>

**Table 10.** DA-PCC Sources and Utilization of Funds as of December 31, 2022 (PHP Million)

Fund Source	Authorized Allotment (a)	Total Obligation (b)	Total Disbursement (c)	Budget Utilization Rate (BUR)	
				Obligation BUR (b/a)	Disbursement BUR (c/b)
<b>GAA-Current Appropriation</b>	<b>766,093</b>	<b>761,605</b>	<b>727,974</b>	<b>99.41%</b>	<b>95.58%</b>
Personnel Services	150.700	150.591	145.047	99.93%	97.22%
Maintenance & Other Operating Expenses	386.000	343.199	300.953	88.91%	93.36%
Financial Expenses	0.050	0.004	0.002	8.20%	0.00%
Capital Outlay	85.019	8.664	8.033	10.19%	92.72%
Unprogrammed					
<b>GAA – FY2021 Continuing Appropriation</b>	<b>115.113</b>	<b>113.936</b>	<b>113.609</b>	<b>98.98%</b>	<b>99.71%</b>
<b>Revolving Fund- Dairy Business Module &amp; Income from DA-PCC Hostel facilities</b>	<b>313.941</b>	<b>167.266</b>	<b>145.484</b>	<b>53.28%</b>	<b>86.98%</b>
<b>Special Projects</b>	<b>1,329.626</b>	<b>970.737</b>	<b>859.315</b>	<b>73.01%</b>	<b>88.52%</b>
<b>TOTAL</b>	<b>2,380.449</b>	<b>1,754.397</b>	<b>1,572.443</b>	<b>73.70%</b>	<b>89.63%</b>

# FINANCIAL PERFORMANCE

Table 27 presents the agency's Statement of Financial Performance for the year end FY 2021. The agency's total revenue for the year posted PHP200.72 million comprising mainly of the business income from 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 and Milka Krem and income from DA-PCC Hostel training hall and accommodation. These income represents the revolving fund of the agency.

Personnel Services expenses posted PHP152.54 million, while total Maintenance and Other Operating Expenses including financial and non-cash expenses is PHP628.70 million giving a deficit from current operation of PHP580.52 million. The increase in Personnel Services is due to the 2nd tranche implementation of the Salary Standardization Law of 2019, payment of hazard pay and laundry allowance for CY 2021 under RA No. 8439, and Performance-Based Bonus for FY 2019. The posted deficit of PHP33.46 million is attributed to the increase in the current operating expenses.

**Table 11.** Statement of Financial Performance for the period ending of December 31 (PHPM)

Particulars	FY 2021	FY 2020	% Change
<b>Revenue</b>			
Service and Business Income	154.17	111.55	38%
Gains & Donations	46.55	37.47	24%
Total Revenue	200.72	149.02	35%
Current Operating Expenses			
<b>Personnel Services</b>	<b>152.54</b>	<b>146.00</b>	<b>4%</b>
Maintenance & Other Operating Expenses	537.67	413.18	30%
Financial & Non-Cash Expenses	91.03	104.09	(13%)
Total Current Operating Expenses	781.24	663.27	18%
Surplus (Deficit) from Current Operation	(580.52)	(514.25)	13%
Assistance and Subsidy	551.12	408.91	35%
Gain/(Loss) of Assets	(4.06)	(8.01)	(49%)
Surplus (Deficit) for the period	(33.46)	(113.35)	(70%)





# APPENDIX 1

## TECHNICAL CAUCUS

Date (2022)	Title and/or Topic Presented	Resource Speaker
28 January 2022	Total Factor Productivity of Dairy Buffalo Milk Production in Nueva Ecija, Philippines	Mr. Zadieshar G. Sanchez, CPA
23 February 2022	7S Good Housekeeping	Mr. Randy P. Umali
27 April 2022	Introduction to the Scientific Career System	Dr. Claro N. Mingala
27 April 2022	Magna Carta for Scientists, Engineers, Researchers, and Other S&T Personnel in Government	Ms. Aimee T. Fulgencio
24 May 2022	Fibroblast-based Gene Banking in Porcine	Mr. Ivan Carl Dela Rosa
27 May 2022	Techniques for Measuring Methane Emissions from Livestock	Dr. Roger Hegarty
30 June 2022	Understanding Animal Reproduction at the Cellular and Molecular Level: The Role of Asprosin in Bovine Follicular Development and Functions	Dr. Excel Rio S. Maylem
23 September 2022	Establishing the Agency's Animal Care and Use Program and Describing Guidelines for its Implementation	Dr. Gemerlyn G. Garcia
23 September 2022	Alternative Research Animals	Dr. Alice Alma C. Bungay
25-26 October 2022	From Bench to Business: Bridging Together Biotechnology Advances to Address Challenges of the Philippine Livestock Industry	Dr. Clarissa Yvonne Jueco-Domingo Ms. Cecil Dyann C. Daniel Ms. Mylene A. Alano Mr. Lee S. Gaitana Mr. Neal A. Del Rosario Dr. Alfonso Serrano Dr. Liza G. Battad
28 October 2022	Lessons Learned from a Human Biobank Experience in the Philippines	Dr. Michael C. Velarde
07 November 2022	Molecular Epidemiology of Bacterial Zoonotic Pathogens	Prof. Chie Nakajima, PhD, DVM
07 November 2022	Gene Diagnostic Methods for Animal Infectious Diseases to Enable Effective Counter Measures	Prof. Yasuhiko Suzuki, PhD
08 November 2022	Human and Animal Fascioliasis, a Worldwide Emerging Zoonotic Disease	Prof. Santiago Mas-Coma
08 November 2022	Snail Vectors of Emerging Diseases: Multidisciplinary Assessments in Fascioliasis and Schistosomiasis	Prof. Maria Dolores BARGUES





# APPENDIX 2A

## ONGOING STUDES

### A. REPRODUCTION AND PHYSIOLOGY

Program/Project Title	Project Leader/ Proponents
1. Early Pregnancy Diagnosis by Detection of Pregnancy-Associated Glycoproteins Using Various Biotechnologies in Water Buffaloes	Edwin C. Atabay
2. Establishment of Dairy Cattle Foundation Breeder Herd thru Embryo Transfer Using Imported Pedigreed Frozen Embryo	Eufrocina P. Atabay
3. Networking of Heat Stress Related Genes for Thermotolerance Identification and Development of Reproduction Strategies for Climate Resilient Water Buffalo Production	Excel Rio S. Maylem
4. Development of an Immunochromatographic-based Pregnancy Test Strip using Pregnancy-Associated Glycoproteins (PAG) for Water Buffaloes	Roseline D. Tadeo
5. Early Detection of Pregnancy and Profile of Pregnancy-Associated Glycoprotein (PAG) during and post-pregnancy period in Philippine native/crossbred goats ( <i>Capra hircus</i> L.)	Joseph Oliver C. Lofranco
6. Detection and Management of Embryonic and Fetal Loss in Dairy Buffaloes	Edwin C. Atabay
7. Recovery and Cryopreservation of Epididymal (ES) from slaughtered water buffaloes ( <i>Bubalus bubalis</i> ) for Animal Genetic Resources (AnGR) Cryobanking and Conservation	Lerma C. Ocampo
8. Water buffalo Epid sperm characterization by CASA raw data analyses/profiling as a sequelae to DA-BAR completed research	Lerma C. Ocampo
9. PL480, B: Strengthening increased Calf Production by Establishment of Organized AI Service Providers	Danilda H. Duran
10. PL480, G: Dairy Engagement Recruitment for Buffalo Raisers	Danilda H. Duran
11. Inactive Bulls	Danilda H. Duran
12. FHA-Factors Affecting AI	Danilda H. Duran
13. FHA Effect of Environmental Parameters	Danilda H. Duran
14. The Influence of Ovarian Structures during Initial Hormonal Treatment on Pregnancy in Water Buffaloes	Zhesalyn Fajardo

### B. ANIMAL GENETIC RESOURCES AND UTILIZATION SECTION-CRYOBANK UNIT/NATIONAL LIVESTOCK CRYOBANK

Program/Project Title	Project Leader/ Proponents
1. Molecular Characterization of White Swamp Buffaloes in Brgy. Lamac, Pinamungajan, Cebu: In Support to Conservation Management and Future Utilization	Aivhie Jhoy E. Cuanang, Lilian P. Villamor, Therese Patricka C. Cailipan/Dr. Bernard Bacule, Dr. Caro Salces
2. Assessment on the Quality and Microbial Survival of Long-Term Storage of Cryopreserved Semen in the Cryobank Facility	Therese Patricka C. Cailipan, Lilian P. Villamor, Aivhie Jhoy E. Cuanang, Ms. Emma Venturina, Mr. Matthew Peralta
3. Establishment of Reference Database on Genotypes of Crossbred Buffaloes using Microsatellites: What is the Percentage of Riverine Bloodline?	Lilian P. Villamor Aivhie Jhoy E. Cuanang Therese Patricka C. Cailipan
4. Validation and optimization of various protocols on processing biological samples: Application to Animal Genetic Resources in the National Livestock Cryobank	Lilian P. Villamor Jetro P. Magnayon Aivhie Jhoy E. Cuanang Therese Patricka C. Cailipan

### C. BIOSAFETY AND ENVIRONMENT

Program/Project Title	Project Leader/ Proponents
1. Development of A Pen-Side Nanosensor Diagnostic Tools For Mycobacterium Avium Subsp. Paratuberculosis and Mycoplasma Bovis	Claro N. Mingala
2. Upscaling of The Quickcare Dry LAMP CAEv Test Kit	Gabriel Tubalinal
3. Surveillance And Characterization Of Antimicrobial Resistant Escherichia Coli and Salmonella From Livestock Farms, Milk And Meat In The Philippines	Claro N. Mingala
4. Screening For Beta Lactam Antibiotic Residues In Raw Buffalo Milk Delivered To Selected Dairy Buffalo Milk Collection Centers In The Philippines	Randolph Tolentino
5. Establishment of Sequencing Facility to Elevate the Research Capacities of Biotechnology Centers' R4D Network	Gabriel Tubalinal
6. Epidemiological and Financial Analysis of Tuberculosis, Brucellosis and Leptospirosis In Water Buffaloes (Bubalus Bubalis) Of Dairy Cooperatives In Nueva Ecija, Philippines	Randolph Tolentino
7. Molecular Epidemiological Study of Dengue Virus Among Livestock and Domesticated Animals as Potential zoonotic reservoir	Claro N. Mingala/ Gabriel Tubalinal
8. New Generation Feed Enzymes on the Production Performance and Microbiome of Chicken	Claro N. Mingala / Jayson J. Juan

### D. PRODUCTION SYSTEMS AND NUTRITION

Program/Project Title	Project Leader/ Proponents
1. Effect of Chitosan on Growth, Yield and Nutrient Composition of Forage Grasses	Reynald D. Amido, Cyril P. Baltazar, Paz Kenneth S. Baja, Phoebe Lyndia T. Llantada, Charity I. Castillo, Mary Roe Uy-De Guia
2. Mining Alternative Mineral Sources From Various Seaweeds as a Feed Supplement to Water Buffaloes (Bubalus bubalis)	Mary Rose Uy-De Guia, Edwin G. Gonzales, Phoebe T. Llantada, Reynald D. Amido, Charity I. Castillo
3. Developing technological and science-based solutions for strengthening AMIA villages, Component 5: Mitigation of greenhouse gases (GHG) emissions due to enteric fermentation in the Philippines	Phoebe T. Llantada, Karl D. Managa
4. Production, Conservation and Potential utilization of Sugarcane plant as feed for Growing and Lactating Buffaloes	Phoebe T. Llantada, Charity I. Castillo, Mary Rose Uy- De Guia
5. Development of Legume-Based Multi-nutrient Lick Pods (MNL P) as Milk Booster Supplement in Dairy Water Buffaloes	Mary Rose D. Uy- De Guia, Vienna Kristel Grospe, Reynald D. Amido, Phoebe T. Llantada, Charity I. Castillo, Arnel N. Del Barrio
6. Development of Lactobacillus inoculants for silage quality and aerobic stability enhancement	Reynald D. Amido, Edwin G. Gonzales, Phoebe T. Llantada, Charity I. Castillo, Mary Rose D. Uy, Arnel N. Del Barrio

## E. PRODUCT DEVELOPMENT AND INNOVATION

Program/Project Title	Project Leader/ Proponents
1. Extension of Shelf life of Nutritional Carabao Milk Bread	Teresita M. Baltazar, Patrizia Camille O. Saturno, Jenica DC. Salazar, Joan Joy Soliven, Rica Rose dela Cruz
2. Utilization of Restructuring Technology on the Production of Carabao Non-Emulsified Meat Loaf and Wet-Cured Ham	Jenica DC. Salazar, Patrizia Camille O. Saturno, Teresita M. Baltazar, Joan Joy Soliven
3. Extension of Shelf-Life of Pasteurized Toned Carabao Milk Using Hot Fill Method	Dan Lowie B. Dacanay, Kyrene Abad, Marivic Orge, Patrizia Camille O. Saturno, Teresita M. Baltazar
4. Development of Yogurt from Buffalo Milk and Coconut Milk Blend (Milk Blend and Cheese)	Teresita M. Baltazar, Jenica DC. Salazar, Patrizia Camille O. Saturno

## F. SOCIO-ECONOMICS AND POLICY

Program/Project Title	Project Leader/ Proponents
1. Profiling and Mapping the Carabao-Based Enterprise Development Value Chain Stakeholders for Improved project Planning, Implementation, Monitoring and Evaluation	Estella P. Valiente
2. Province-Wide Carabao-based Business Improvement Network (ALAB Karbawan): Modelling a Carabao-based Enterprise Value Chain	Estella P. Valiente

## G. TECHNOLOGY TRANSFER

Program/Project Title	Project Leader/ Proponents
1. Utility of KBGAN iHealth Mobile App for Diagnosis and Management of Diseases in Water Buffaloes in Select Municipalities in Bataan, Isabela, Pangasinan, Pampanga, Iloilo, and South Cotabato	Eric P. Palacpac, Marvin Villanueva, Randy Tolentino
2. Utility of KBGAN iFeed Mobile App for Ration Formulation and Nutrition Management in Water Buffaloes in Select Municipalities in Bataan, Isabela, Pangasinan, Pampanga, Iloilo, and South Cotabato	Eric P. Palacpac, Phoebe T. Llantada, Charity I. Castillo, Mary Rose D. Uy
3. Effectiveness of KBGAN Learning Videos on Improving the Knowledge, Attitude and Practices of Dairy Carabao Keepers	Eric P. Palacpac, Rovelyn T. Jacang, Camille F. de Gracia, Ronalyn Canute, Ma. Cecille Irang-Mariano, Rowena Galang





# APPENDIX 2B

## COMPLETED STUDIES

### A. REPRODUCTION AND PHYSIOLOGY

Program/Project Title	Project Leader/ Proponents
1. Determination of pregnancy-associated glycoproteins (PAGs) during and post pregnancy in riverine buffaloes ( <i>Bubalus bubalis</i> Linn.)	Rigos LM, Atabay EC, Atabay EP, and Apolinario JPR
2. A potential role of fibrillin-1 (FBN1) mRNA and asprosin in follicular development in water buffaloes	Maylem E.R.S, Spicer, L.J, Atabay, E.P, Atabay E.C, Batalha, I, Schutz, L. F.
3. Current Status of Assisted Reproductive Technologies in Buffaloes.	Danilda Hufana-Duran, Eufrocina P. Atabay, Peregrino G. Duran, Edwin C. Atabay
4. Influence of Ovarian Structures and Pre-Ovulatory Follicular Size on Pregnancy Rates after CIDR-Synch Fixed Timed Artificial Insemination in Water Buffaloes	Atabay EP, Atabay EC, dela Cruz CF, Apolinario JPR, Maylem ERS, Tilwani RC, Ortiz JGM, and Flores EB
5. Optimizing Fixed Time Artificial Insemination Efficiency Through Co-Synch Techniques in Water Buffaloes ( <i>Bubalus bubalis</i> )	Carlito F. Dela Cruz, Edwin C. Atabay, Eufrocina P. Atabay

### B. ANIMAL GENETIC RESOURCES AND UTILIZATION SECTION-CRYOBANK UNIT/NATIONAL LIVESTOCK CRYOBANK

Program/Project Title	Project Leader/ Proponents
1. Phylogenetic Relationship and Genetic Variation of Wild and Domesticated Water Buffaloes in Genus <i>Bubalus</i> Using Mitochondrial DNA D-loop Variation	Lilian P. Villamor/ Koh Nomura, Takashi Amano, Yukimizu Takahashi
2. Phenotypic and Molecular Characterizations of White Swamp Buffaloes ( <i>Bubalus bubalis</i> ) in the Pinamungajan, Cebu, Philippines	Aivhie Jhoy E. Cuanang, Lilian P. Villamor, Therese Patricka C. Cailipan
3. Assessment on the Quality and Microbial Survival of Long-Term Storage of Cryopreserved Semen in the Cryobank Facility	Lilian P. Villamor, Therese Patricka C. Cailipan, Jetro Magnayon
4. Establishment of Reference Database on Genotypes of Crossbred Buffaloes using Microsatellites: What is the Percentage of Riverine Bloodline?	Lilian P. Villamor Aivhie Jhoy E. Cuanang Therese Patricka C. Cailipan

### C. BIOSAFETY AND ENVIRONMENT

Program/Project Title	Project Leader/ Proponents
1. Relationship Of B-Mode Ultrasonography Features of The Mammary Gland And Teat With CMT Finding and Somatic Cell Count In Dairy Buffaloes <i>Bubalus bubalis</i> (Linnaeus, 1758) With Subclinical Mastitis	Cristian Santos/ Marvin Villanueva
2. Antimicrobial Susceptibility Of <i>Salmonella</i> Enterica And Molecular Mechanism Of Reduced Susceptibility To The Quinolone In The Philippines AH21004-RC	Lawrence Belotindos

### D. TECHNOLOGY TRANSFER

Program/Project Title	Project Leader/ Proponents
1. Evaluation of Farmer Livestock School on Dairy Buffalo Production (FLS-DBP) as a Modality for Technology Development and Diffusion for Farmers	Eric P. Palacpac, Rovelyn T. Jacang, Camille F. de Gracia



# APPENDIX 3

## PARTICIPATION IN R&D CONFERENCES, WORKSHOPS, TRAININGS

Program/Project Title	Venue	Date (2022)
Residues Of Veterinary Medicines In Foods Of Animal Origin	Virtual	Jan 17
Science and Technology Webinar Series: Total Factor Productivity Of Dairy Buffalo Milk Production In Nueva Ecija, Philippines.	Virtual	Jan 28
Animal Welfare Webinar	Virtual	Jan 18
Features & Working Safely With ESCO Cold Storage Equipment	Virtual	Feb 10
89th PVMA Scientific Conference And Annual Convention	Virtual	Feb 17-18
6th International Livestock Symposium "Research And Innovations Promoting Positive And Synergistic Relationship Between The Livestock Industry And Climate Change"	Virtual	Feb 22
RDD S & T Webinar Series On "7s Good Housekeeping"	Virtual	Feb 23
Comparison of Self-Reported Consumer Liking with Facial Expression Recognition Technique on Yoghurt with Different Protein Bases	Virtual	Feb 24
National Livestock Cryobank (29th PCC Anniversary Milestones TED Talk)	PCC-NHQGP	Mar 23
GAD Safe Spaces Act (RA 11313) & Magna Carta (RA 9710)	PCC-NHQGP	Mar 23
Gender Sensitivity Training	PCC-NHQGP	Mar 28
Lumpy Skin Disease Regional Update For Asia And The Pacific	Virtual	Apr 12
Integrated Environmental Monitoring Program	Virtual	Apr 20
S & T Webinar Series: Introduction To The Scientific Career System	Virtual	Apr 27
Magna Carta For Scientists, Engineers, Researchers, And Other S&T Personnel In Government	Virtual	Apr 27
Webinar Series: "How to be a scientist: An overview of the SCS and the duties and responsibilities of a career scientist"	Virtual	Apr 27
FilHub Biology Month		Apr 30
Antimicrobial Resistance Education And Awareness Regional Webinar Series	Virtual	May 4
Working Together To Promote Antimicrobial Stewardship In The Animal Sector In The Philippines	Virtual	May 5
HRMS Prime Level 2 Orientation	Angeles City Hotel, Pampanga	May 11-12
Food Safety Training	Virtual	May 22
Techniques for measuring methane emissions from Livestock	Virtual	May 27
Food Packaging Technology Essentials	Virtual	May 28
RDD In-House Review	PCC compound	Jun 1-2
Basic Food Safety	Virtual	Jun 01
Food Products' Labeling Requirements	Virtual	Jun 04
Lumpy Skin Disease Advisory Forum	Virtual	Jun 9
Food Safety Caravan 2022	Victorias City Sports Complex, Negros Occidental	Jun 16
Cara-Aralan Webinar Series: Animal Feeding Management and Nutrition	Virtual	Jun 24
Fundamentals of Cooperatives	Virtual	Jun 28

Cara-Aralan Webinar Series: Mga karaniwang sakit ng kalabaw: Bloat at Surra	Virtual	Jun 28
Cara-Aralan Webinar Series Disease on Bloat and Surra	Virtual	Jun 28
NIR Solutions for the Feed & Food (Meat) Industry	Virtual	Jun 29
RDD Caucus Series	Virtual	Jun 30
Capability Building of ASEAN Biotechnology Researchers for Livestock Resiliency and Sustainability	PCC-NHQGP	Jun-July
Capacity Building on the Cost and Benefit Analysis (CBA) and Action Planning for Expanded Policies and Measures (PAMs) on the Agriculture Commitments to the Philippine Nationally Determined Contributions (NDCs) to the Paris Agreement	Verjandel Hotel, Quezon City	Jul 7-8
Molecular Biology Techniques And Regulations On Biotech GM Products	Virtual	Jul 14-15
Importance of Statistics for Process and Product Quality, Monitoring and Improvement	Virtual	Jul 14
Food Spoilage Control and Shelf Life Management	Virtual	Jul 15
Food Safety Act Webinar	Virtual	Jul 15-16
Can We Boost Productivity Through Improving Digestion Efficiency And Reducing Enteric Fermentation Emission	Virtual	Jul 19
QMS Foundation Course	Virtual	Jul 21-22
2nd International Virtual Congress And 2022 Philippine Agriculturists' Summit	Virtual	Jul 21-23,
Competency Advancement on Policy Making and Engagement	PCC-NHQGP	Jul 26-28
EMS Foundation Course	Virtual	Aug 2-3
Developmental Biology Master Class 2022		Aug 6
Orientation Seminar on ORA-OHRA	Virtual	Aug 9-10
ISO 45001:2018 (Occupational Health And Safety Management System) Foundation Course And IMS Internal Auditing	PCC-NHQGP	Aug 9-12
ISO 9001:2015 and ISO 14001:2015 Foundation Course and IMS Internal Auditing Training	Virtual	Aug 10-11
Phil College Of Laboratory Animal Medicine Scientific Conference	Virtual	Aug 16
Shelf Life Analysis for Micro-Scale Food Processors	Virtual	Aug 16
AAAP Animal Production Congress	Jeju Island, South Korea	Aug 21-27
National IHR And PVS Pathway Bridging Workshop	Novotel, Manila	Aug 22-26
IP-TBM Workshop – Prior Art Search, Invention Spotting and Claim Drafting	Virtual	Sept 6-10
Leadership And Management Skills For Non-Managers	PCC-NHQGP	Sep 14-16
Courtesy Call And Kick-Off Meeting For The Mission Trip Of The Republic Of Korea's Animal And Plant Quarantine Agency For The Proposed Project Entitled " Strengthening The Philippine Animal Health Information System".	Animal Health Training And Information Center, BAI Compound, Q.C.	Sep 19
Cryopreservation training of boar semen using commercial breed with RPS team	PCC-NHQGP	Sep 19
8th Annual Public Policy Conference , CSC/PDIS : Concept of Social Justice In 21st Century	Virtual	Sep 13
Human Capital Development And Social Protection	Virtual	Sep 15
Annual Public Policy Conference (APPC) Webinar 3: Public Health Services And Infrastructure	Virtual	Sep 20
PCC R&D In-House Review	PCC-NHQGP	Sep 23
In-House Review Of On-Going And Completed Research	PCC-NHQGP	Sep 21-23
Care And Management of Pregnant Buffaloes By Dr. Randolph Tolentino	Virtual	Sep 27
Establishing The Agency's Animal Care And Use Program And Describing Guidelines For Its Implementation( Dr. Gem Garcia)	PCC-NHQGP	Sep 29



Alternative Research Animals (Dr. Alma Alice Bungay)	PCC-NHQGP	Sep 29
Laboratory Chemicals	Virtual	Sep 30
2022 NRCP Mindanao Regional Cluster Annual Scientific Conference And 20th Membership Assembly	Virtual	Oct 13
From Bench To Business: Bridging Together Biotechnology Advances To Address Challenges of the Philippine Livestock Industry With Certificate	Virtual/PCC-NHQGP	Oct 25
BAFS Livestock Standard Webinar "Good Practices In Cattle And Buffalo Production"	Virtual	Oct 27
59th PSAS Scientific Meeting And Annual Convention	Virtual	Oct 19-20
2022 Science And Technology Webinar Series(Lesson Learned From A Human Bank Experience In The Philippines	Virtual	Oct 28
NRCP Expert Class Season 3 Episode 2: Food Security And Animal Health As Resource Person	Manila	Oct 26
2022 RDD International Symposium Day 01, Session 01 Entitled "Disease And Diagnostics: Gene Diagnostic Methods For Animal Infectious Diseases To Enable Effective Counter Measures"	PCC-NHQGP	Nov 7
RDD International Symposium Day 02, Session 01 "Biosafety And Environment: Human And Animal Fascioliasis, A Worldwide Emerging Zoonotic Diseases, S & T Webinar Series "Snail Vectors Of Emerging Diseases: Multidisciplinary Assessments In Fascioliasis And Schistosomiasis."	PCC-NHQGP	Nov 8
Product Knowledge and Safe Handling of Nitrogen Training	PCC-NHQGP	Nov 9
2022 Future Science Leaders' Forum	Crimson Hotel, Alabang	Nov 11-12
National Workshop For Veterinary Workforce Development	Novotel, Manila	Nov 16
2021 NAST Future Science Leaders Forum	Virtual	Nov 17-18
PCC-IPTBM Technical Workshop on Copyrights and Trademarks for PCC Researchers and Employees	Virtual	Nov 22
GAD HGDG Tool For Project Cycle	PCC-NHQGP	Nov 29
60th PAFT Annual Convention	Virtual	Nov 24-25
Effective Supervisory Skills, Leadership and Management Seminar	Virtual	Dec 1-3
Refresher Training on OPU-IVEP-Cryopreservation Protocols in Livestock	PCC-NHQGP	Dec 2-9
Basic MOLBIO Training for DA Regulators: BLAST and Phylogenetic Analysis	PCC-NHQGP	Dec 5-7
Technical Seminar on the Fairness Opinion Report and Fairness Opinion Board for Technology Transfer	Virtual	Dec 14

## APPENDIX 4

### EXTERNALLY FUNDED R&D PROJECTS

Program/Project Title	Project Leader	Funding/ Collaborating Agency
Establishment of Dairy Cattle Foundation Breeder Herd thru Embryo Transfer Using Imported Pedigreed Frozen Embryo	Dr. Eufrocina P. Atabay	DOST-PCAARRD
Application of DNA Marker and Assisted Reproduction Techniques in Breeding Programs to Improve Productivity of Local Cattle in The Philippines,	Dr. Ester B. Flores, Dr. Eufrocina P. Atabay, Dr. Edwin C. Atabay	DOST-PCAARRD
Patent Mining Program for Selected AANR Commodities through Strengthened Intellectual Property-Technology Business Management (IP-TBM) Offices	Dr. Eufrocina P. Atabay	DOST-PCAARRD
Genetic structure analysis and development of genetic screening protocols for traceability of	Dr. Rommel Herrera	DOST-PCAARRD
	Dr. Wai Yee Low, Dr. Ester B. Flores, Ms. Paulene Pineda et al.	University of Adelaide and USDA

## APPENDIX 5

### FACILITATION OF LEARNING EVENTS FOR PCC CLIENTS

Date (2022)	Title and/or Topic Presented	Resource Speaker	No. of Participants
Feb	Training on ensiling, TMR	Phoebe Llantada and Edwin Gonzales	50
Mar	Ensiling and roll-out of Buro Booster	Phoebe Llantada and Vienna Grospe	21
Apr	Farmer's Livestock School (FLS)	Phoebe Llantada and Charity I Castillo	34
May	S&T Seminar	Dr. Hegarty	50
Jun	Nutrition Refresher Course	PSNS staff	20
Jul	ASEAN Livestock Biotechnology	PSNS staff	4
Sep	Dairy Buffalo Production and Management	Edwin Gonzales and Mary Rose Uy-De Guia	37
Sep	Ruminant Forum	Charity I. Castillo	70
Sep	Farmer's Livestock School (FLS)	Charity I. Castillo and Phoebe T. Llantada	21
Nov	Soil Forage Improvement Workshop	PSNS staff	15
Nov 18	Food and Drug Administration-License to Operate (FDA-LTO) Workshop	PDIS staff	28
Nov 20-25	Food Safety Compliance Officer (FSCO™) Training	PDIS staff	29
Mar 29	GAD Seminar: Empowered Women, Empowering Women	Diadem G. Esmero	123
Apr 26-27	Policy Formulation for PCC Assisted Cooperatives	Atty. Roney Jone P. Gandeza	131
Aug 23-24	Internal Control for Cooperatives	Atty. Roney Jone P. Gandeza	130

Sep 5-9	Training on the Fundamentals and Operation of Digital Veterinary Ultrasound Scanner	Dr. Edwin C. Atabay/Dr. Ester B. Flores	22
Feb 23	7S Good Housekeeping	PDIS staff	65
Jun 2 and Sep 21-23	Quality Evaluation of Pasteurized Carabao Toned Milk Stored in Different Ice Salt Mixture	DDacanay	100
Sep 15	FLS-DBP Training of Trainor	Teresita M. Baltazar	25
Sep 19	Ensuring Food Safety & Climate Change resiliency through Science-based Grazing management: Dairy Products Technology Transfer	Teresita M. Baltazar	48

## APPENDIX 6

### **PUBLICATIONS IN REFEREED JOURNALS AND CONFERENCE PROCEEDINGS**

Title	Authors	Journal
Determination of pregnancy-associated glycoproteins (PAGs) during and post pregnancy in riverine buffaloes ( <i>Bubalus bubalis</i> Linn.) I	Rigos LM, Atabay EC, Atabay EP, and Apolinario JPR.	International Journal of Agricultural Technology. 18 (4). 1753-1766
A potential role of fibrilin-1 (FBN1) mRNA and asprosin in follicular development in water buffaloes	Maylem E.R.S, Spicer, L.J, Atabay, E.P, Atabay E.C, Batalha, I, Schutz, L. F	Theriogeneology 178: 67-72
Current Status of Assisted Reproductive Technologies in Buffaloes	Kanokwan Srirattana, Danilda Hufana-Duran, Eufrocina P. Atabay, Peregrino G. Duran, Edwin C. Atabay, Kehuan, Yuanyuan Liang, Thuchadaporn Chaikhun-Marcous, Kasem Theerakittayakorn and Rangsun Parnpai	Journal of Animal Science
Phylogenetic Relationship and Genetic Variation of Wild and Domesticated Water Buffaloes in Genus <i>Bubalus</i> Using Mitochondrial DNA D-loop Variation	Lilian Villamor, Koh Nomura, Takashi Amano, Yukimizu Takahashi	The Journal of Animal Genetics. Vol 50, issue 2
Study of the genetic diversity of the Philippine Carabao swamp buffalo in the Philippines	Lilian P. Villamor, Aivhie Jhoy E. Cuanang, Therese Patricka C. Cailipan, Alexander M. Paraguas, Annabelle S. Sarabia, and Ester B. Flores	Food and Agriculture Organization (Book Chapter In Press)
A method of identifying blood percentage proportion of water buffaloes using microsatellite markers	Lilian P. Villamor, Aivhie Jhoy E. Cuanang, Therese Patricka C. Cailipan,	Patent Application No: 1-2022-50050/Date of Application: 11 February 2022.
Characterization of plasmids harbouring <i>qnrA1</i> , <i>qnrS1</i> , and <i>qnrB4</i> in <i>E. coli</i> isolated in the Philippines from food-producing animals and their products	Lawrence Belotindos et.al.	Journal of Global Antimicrobial Resistance (2022)
Molecular characterization of vaginal microbiome of lactating	Gabriel Alexis Tubalinal et. al	
dairy water buffaloes ( <i>Bubalus bubalis</i> , Lin.) using polymerase chain reaction-denaturing gradient gel electrophoresis		Philippine Journal of Veterinary Medicine
Adoption Scores for buffalo-based technologies in the Philippines as influenced by socio-economic, technological, communication, and institutional factors	Eric P. Palacpac, Erwin Valiente, Rovelyn Jacang, and Ma. Teresa Manito	Buffalo Bulletin 41(1)
Influence of Ovarian Structures and Pre-Ovulatory Follicular Size on Pregnancy Rates after CIDR-Synch Fixed Timed Artificial Insemination in Water Buffaloes	Atabay EP, Atabay EC, dela Cruz CF, Apolinario JPR, Maylem ERS, Tilwani RC, Ortiz JGM, and Flores EB.	AAAP Proceedings
Phenotypic and Molecular Characterizations of White Swamp Buffaloes ( <i>Bubalus Bubalis</i> ) in the Pinamungajan, Cebu, Philippines	Aivhie Jhoy E. Cuanang, Therese Patricka C. Cailipan, Lilian P. Villamor	59th Philippine Society of Animal Science (PSAS)



## APPENDIX 7

### R&D AWARDS AND RECOGNITIONS

Awardee	Title of Recognition	Award-Giving Body
Marvin A. Villanueva	Career Scientist I	Scientific Career System – National Academy of Science and Technology DOST
Lilian P. Villamor	PhD in Agricultural Science	Tokyo University of Agriculture
Lilian P. Villamor	Best Completed Paper (DA-PCC R&D In-House Review)	RDD, DA-PCC
Lilian P. Villamor	Best Oral Presenter (DA-PCC R&D In-House Review)	RDD, DA-PCC
Lilian P. Villamor et al.	Certificate of Recognition for paper publication	RDD, DA-PCC
Therese Patricia C. Cailipan et al.	Certificate of Recognition for paper publication	RDD, DA-PCC
Aivhie Jhoy DS. Escudro et al.	Certificate of Recognition for paper publication	RDD, DA-PCC
Lilian P. Villamor, Aivhie Jhoy E. Cuanang, Therese Patricia C. Cailipan	Certificate of Recognition for Patent Application	RDD, DA-PCC
Eric P. Palacpac	Best Paper Award in Socio-Economics (59th PSAS Scientific Seminar and Annual Convention)	Philippine Society of Animal Science (PSAS)

## APPENDIX 8

### DA-PCC SUMMARY OF MAJOR FINAL OUTPUTS FOR 2022

#### A. INDUSTRIALIZATION AND MODERNIZATION

##### 1.1.1 Production Support Services Provided to Clients by Island Clusters

	No. of Services	Percentage	No. of Clients	Percentage
Luzon (Nueva Ecija, Cagayan, Isabela, Bulacan, Ilocos Norte)	161,355	49.49	100,232	53.40
Visayas (Iloilo, Bohol, Negros Oriental, Cebu, Leyte)	133,863	41.06	64,351	34.28
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte, Agusan del Sur, Zamboanga del Sur)	30,807	9.45	23,120	12.32
TOTAL	326,025	100	187,703	100

## B. CONSOLIDATION

### MARKET DEVELOPMENT SERVICES

#### 1.2.1 No. of Organized Groups provided with Market Development Services

	No. of Services	Percentage
Luzon (Nueva Ecija, Cagayan, Bulacan, Laguna, Bataan)	174	74
Visayas (Bohol, Iloilo, Negros Occidental, Leyte, Cebu)	50	20
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte)	12	6
TOTAL	236	100

#### 1.2.2 Volume of Production Traded

	Volume (in Kg)	Percentage
Luzon (Nueva Ecija, Bulacan, Cagayan, Isabela, Laguna)	5,424,428	79
Visayas (Bohol, Leyte, Iloilo, Cebu, Negros Occidental)	755,300	11
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte, South Cotabato, Agusan del Norte)	686,637	10
TOTAL	6,866,365	100

#### 1.2.2 Volume of Production Traded

	Value (in PHP)	Percentage
Luzon (Nueva Ecija, Bulacan, Cagayan, Isabela, Laguna)	1,232,013,315	79
Visayas (Bohol, Leyte, Iloilo, Cebu, negros Occidental)	187,141,263	12
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte, South Cotabato, Agusan del Norte)	140,355,948	9
TOTAL	1,559,510,527	100

#### 1.2.3 Value of Production Traded

	Value (in PHP)	Percentage
Luzon (Nueva Ecija, Bulacan, Cagayan, Isabela, Laguna)	1,232,013,315	79
Visayas (Bohol, Leyte, Iloilo, Cebu, negros Occidental)	187,141,263	12
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte, South Cotabato, Agusan del Norte)	140,355,948	9
TOTAL	1,559,510,527	100

## No. of Dairy Box and Processing Plants Established

	Number of Dairy Boxes	Percentage
Luzon (Masbate, Sorsogon, Orani)	3	50
Visayas (Iloilo)	1	16.67
Mindanao (Bukidnon, Sarangani)	2	33.33
TOTAL	6	100

## New Groups linked to the Milk Feeding Program

	Number of Groups	Percentage
Luzon (Albay, Cagayan, Cavite, Bataan, Batangas (2), Isabela (2), Laguna, La Union, Nueva Ecija (9), Palawan, Pangasinan,	21	61
Visayas (Bohol, Cebu (2), Negros Occidental, Leyte, Iloilo (2)	7	21
Mindanao (Bukidnon, North Cotabato, Zamboanga Sibugay, Zamboanga Del Sur, Zamboanga Del Norte, Agusan Del Norte,	6	18
TOTAL	34	100

### 1.3.1 No. of Clients Trained

	Clients Trained	Percentage
Luzon (Nueva Ecija, Ilocos Norte, Cagayan, Pangasinan, Laguna)	9,329	45
Visayas (Bohol, Leyte, Iloilo, Antique, Negros Oriental)	6,590	32
Mindanao (Bukidnon, North Cotabato, Zamboanga del Norte, South Cotabato, Agusan del Norte)	4,931	23
TOTAL	20,708	100



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PHILIPPINE CARABAO CENTER

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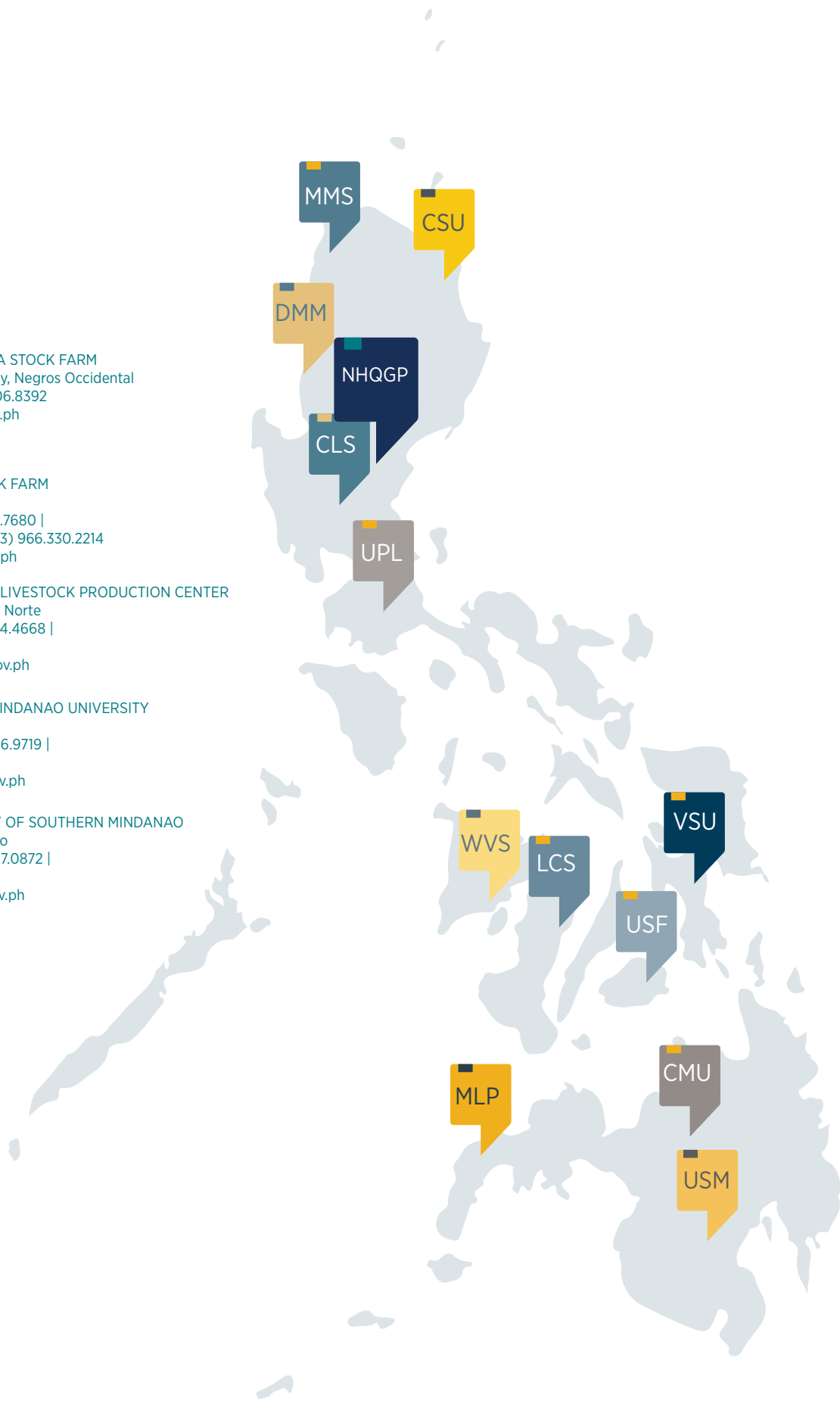
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