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# 2021 *ANNUAL REPORT*

DEPARTMENT OF AGRICULTURE  
PHILIPPINE CARABAO CENTER

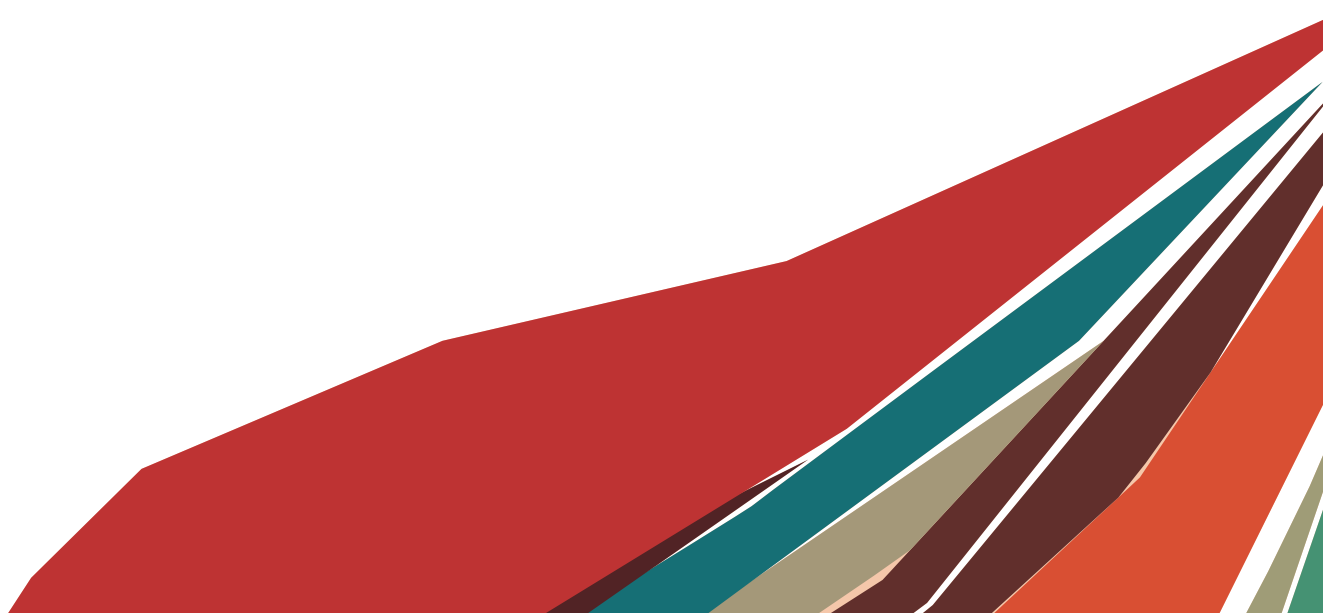
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# CONTENTS

<b>06</b>	About Us
<b>08</b>	Genetic Improvement Program
<b>19</b>	Carabao-based Enterprise Development
<b>26</b>	Research for Development
<b>40</b>	Knowledge Management
<b>44</b>	Planning and Institutional Management
<b>50</b>	Gender and Development Program
<b>52</b>	Integrated Management Systems
<b>54</b>	Human Resource Management
<b>57</b>	Budget and Finance Management



Ensuring socio-economic empowerment for nation-building

# ABOUT US

The Philippine Carabao Center (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.

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

**2,433 head**

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

{735 cows, 706 heifers, 580 calves, 318 bulls, 94 draft bulls and training animals}

{177 Philippine carabao, 1,992 Murrah (Bulgarian, Brazilian, Indian and US), 184 Italian Mediterranean and 54 crossbred buffaloes}

{346 head lactating dairy buffalo cows; 391 born calves}

### MILK PRODUCTION

**577,524.19 kg**

{produced from 346 lactating cows or an average of 4.64 kg of milk per cow}

### MEAT PRODUCTION

**PHP2,556,727.29**

{total sales of meat and live animals from the DA-PCC's institutional business modules}

### FORAGE PRODUCTION

**995 ha**  
area maintained

**10.5 ha**  
area developed





## **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}

{56 head of donor bulls actively contributed to the production of frozen semen, 46 of which from the DA-PCC at CLSU and 10 from the DA-PCC at UPLB bull farms}

### **SEMEN PRODUCTION & DISTRIBUTION**

## **235,485 doses**

{152,586 doses and 82,899 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 PRODUCTION & DISTRIBUTION**

{209,580 doses were 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}

{2,079 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**

## **82,438 services**

{26,044 of which were contributed by the LGU's technicians (n=551), 44,323 by the village-based AI technicians or VBAITs (n=401), and 9,499 by the DA-PCC's technicians (n=83)}

## **55,685 clients**

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

## ARTIFICIAL INSEMINATION

{The agency facilitated 27 Basic AI Trainings that resulted in an additional 188 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 26 AI technicians}

**17,165 calves**

{monitored calves on the ground based on AI services}

## NATURAL MATING (BULL ENTRUSTMENT PROGRAM)

{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}

**614 purebred breeding bulls**

{137 bulls were entrusted to farmers as of December 2021, 345 have records of active service registering 5,320 services and benefitted more than 5,171 carabao raisers}

**2,835 calves**

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

## DAIRY BUFFALO BREEDING PROGRAM

In 2021, the Genetic Improvement Program (GIP) laboratory continued the use of multi-trait random regression test day model (MT-RRM) for breeding value estimation (EBV) in Philippine dairy buffaloes. Pedigree and performance records of animals from 10 enrolled herds of DA-PCC (NGP, UPLB, CSU, MMSU, VSU, USF, CMU, USM, MLPC, CLSU) up to December 2020 were included in the genetic evaluation run. There were 2,819 buffaloes in the pedigree file extending seven generations with 16,313 monthly milk test day records as well as 9,393 and 9,276 fat and protein test day records, respectively.

Based on the MT-RRM model, there were 214 bulls with progeny performance and breeding values; 114 of which are island born. The youngest bulls reported with progeny performance were born in 2012. From the top 10 ranked bulls based on total merit index (combined EBVs for milk, fat, and protein yield traits) eight are semen donor bulls. The top five ranked bulls are among the youngest (Table 1). This is a big improvement because in 2019, although some of the youngest bulls, born in 2012 and 2011, made it in the top ten, these were not top ranked then. The highest ranking daughter of the top 4 bulls were all born in 2016, the youngest or latest generation of cows in the genetic evaluation run.

This validates the genetic evaluation system being used and is consistent with the breeding principle that with proper selection and breeding, “the younger generation is better than the older generation”. We are now looking at the younger generation starting to surpass the previous one.

There were also 2,641 cows reported with breeding values for milk, fat, and protein yields. Top performing centers’ bulls (Table 1) and cows (Table 2) based on EBVs were reported to the concerned Centers during the GIP Coordinators’ meeting in 2021. Top ranked cows came exclusively from the NGP, CMU, VSU, and UPLB herds. The top ranked cow in 219 is now number 2 ranked, surpassed by a younger cow. Notable is the fact that the top ten cows are from the latest generation. Good genetics truly runs in the family and that, the genetic contribution of the dam is as equally important as the sire.

**Table 1.** Top 10 ranking riverine bulls based on daughters' performance

BULL ID	Sire	Dam	No. of Offspring	TMI	EBV Milk	EBV Fat	EBV Prot	Highest ranking daughter
2CM11032	2GP06055	2CM07044	15	102.9	710	66	27	2GP16167
2GP10003	2GP03026	2GP03004	25	102.6	652	55	28	2GP16116
2GP11080	2GP03026	2GP97023	19	102.5	652	50	27	2GP16068
2CM12021	2CM07036	2CM08001	5	102.2	632	44	25	2CM15048
2UP10023	2GP99107	2UP98582	32	103.0	626	74	27	2GP16152
2GP01102	MAPEL	2GP97103	77	102.4	606	58	23	2GP15113
BR092209	0	0	16	102.7	580	76	22	2GP17065
2GP10076	2GP03093	2GP08021	7	102.1	573	48	22	2GP15098
2GP08064	2GP03020	2GP02011	47	101.8	563	38	20	2LS14005
2GP03020	MEMO	2GP97103	11	101.9	558	40	20	2GP08021

TMI - Total Merit Index, EBV - Estimated Breeding Value

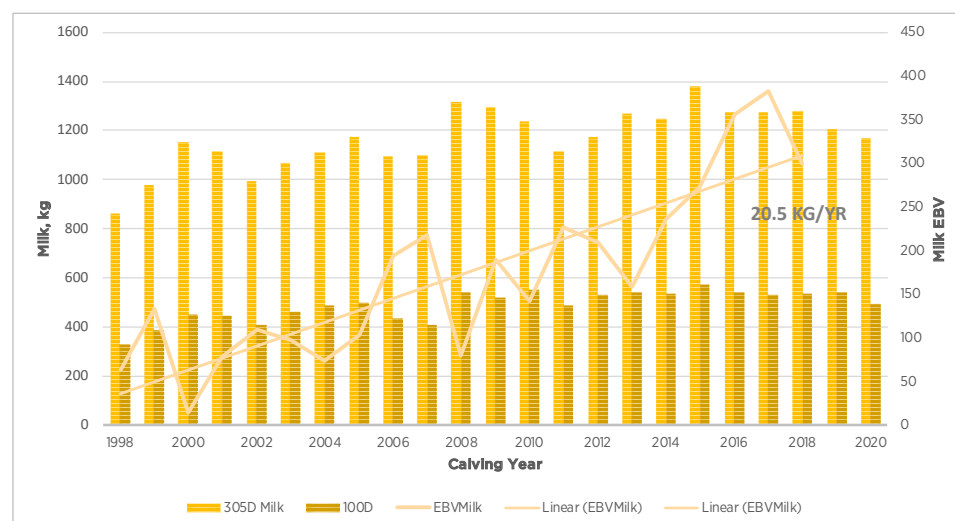
**Table 2.** Top 12 cows based on Estimated Breeding Values (EBVs)

ID	Sire	Dam	EBV Milk	EBV Fat	EBV Prot	TMI	Milk, kg	DIM	AMP	AAC Mos.
2GP17065	BR092209	2GP10032	995	91	39	104.3	1902.4	305	6.2	27.5
2GP16068	2GP11080	2GP10099	945	62	36	103.5	2317.6	305	7.6	40.4
2GP15113	2GP01102	BR091960	829	66	33	103.3	2308.5	305	7.6	34.5
2GP16152	2UP10023	BR090284	767	69	33	103.3	1613.1	305	5.3	33.9
2GP08021	2GP03020	2GP04029	762	63	30	103.0	1822.5	305	6.0	28.5
2CM08001	2GP01102	2CM04046	750	53	31	102.8	1941.3	305	6.4	34.3
2GP16106	2GP01102	2GP08095	740	54	30	102.8	1836.3	305	6.0	35.0
2GP16129	2GP11080	BR090068	727	49	30	102.7	2084.3	305	6.8	35.4
2GP11166	2GP00097	2GP08021	716	50	28	102.6	2368.2	305	7.8	37.5
2LS14005	2GP08064	2LS05006	715	42	29	102.5	2560.6	305	8.4	36.1

EBV - Estimated Breeding Value, AAC - age at calving

A full list of available semen donor bulls and their genetic merit per the 2020 genetic evaluation run has been reported to the various DA-PCC regional centers. The same information was also posted in the online sire directory (<http://sd.pcc.gov.ph/sire-directory/2020>) and printed copy. While the printed copy was not updated in 2021, the online copy was given an update.

The phenotypic and genetic trend (Fig. 1) for milk yield is positive as indicated by increasing average milk yield per cow per lactation and average estimated breeding value (EBVmilk). The phenotypic trend is lower compared to the previous year most likely due to the Covid-19 pandemic that caused several lockdowns, which affected production. The genetic trend is however significantly higher.

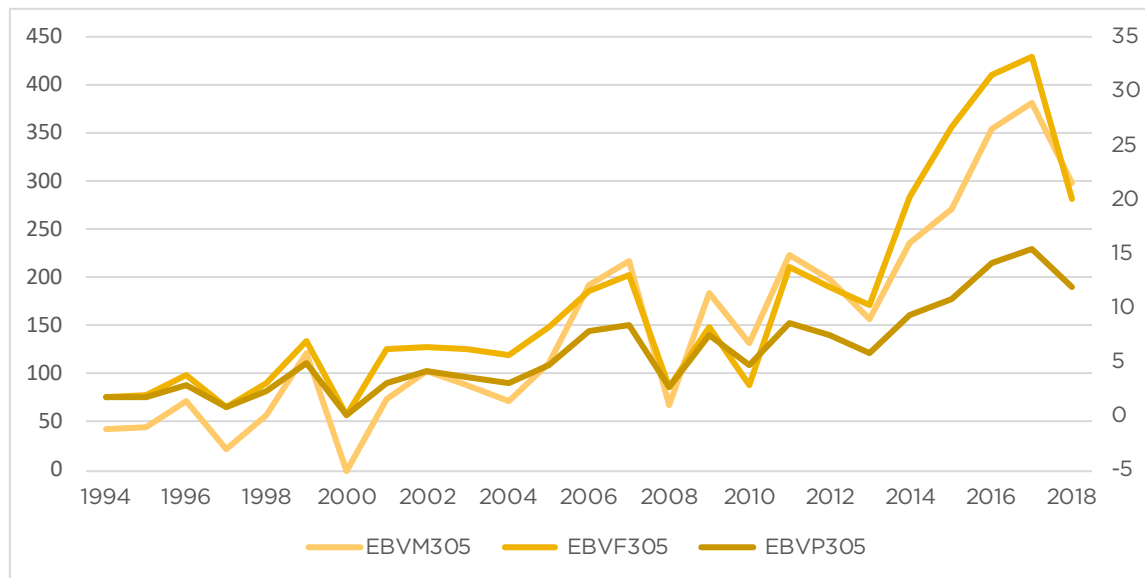


**Fig. 1.** Average milk production per lactation of DA-PCC dairy buffaloes plotted per calving year

The average milk fat (Fat%) and milk protein (Prot%) percentage has been decreasing at a steady rate for several years hence, selection index put more weight to fat and protein yield to arrest this trend. The decrease in Fat% and Prot% is expected due to a negative genetic correlation of the two traits to milk yield. The first set of young semen donor bulls selected based on Total Merit Index (TMI) was in 2014. The TMI combines an individual's estimated breeding values of milk, fat and protein yield with different weight

for each trait into a single value index ranking. More weight was given to fat and protein yield compared to milk yield. subsequent index slightly reduced the with applied to fat and protein yield. In 2019. the daughters of these young bulls have started giving lactation performance and EBVs. Giving more emphasis to selection for fat and protein resulted in higher response to fat yield and protein yield. The higher trend continued further in 2019 and declined in 2020 (Figure 2).

**Fig. 2.** Average milk, fat and protein EBVs of cows per birth year



Based on parent-average EBVs, nine young bulls were short listed for training to become semen donor bulls. The actual number of bulls to become semen donor will depend on these nine young bulls' genomic breeding values (gEBV) and passing the semen quality evaluation.

### MEAT LINE OF RIVERINE BUFFALOES

In line with the initiative to develop a specialized line of meat-type buffaloes, baseline performance and preliminary estimates of genetic parameters have been reported during the last PMC Meeting in 2020. Data reported are all from male buffaloes from the NGP. The same results are being prepared for publication in a scientific journal. Performance records being taken for the development of the meat type breed are body weights, eye muscle area (EMA), rib fat, and rump fat. Tenderness score, percent fat, and other physico-chemical tests are being done on meat samples of some young bulls slaughtered. Real-time ultrasound scan is also being done on swamp buffaloes. Initial results show that there are exceptional swamp bulls with large eye muscle area. The EMA measurements between swamp and riverine bull are shown in Figure 3. We find that for this particular swamp bull, the measurement is comparable with that of riverine bulls at 65cm<sup>3</sup>.

Preliminary estimates of body weights, meat and carcass characteristics of male riverine buffaloes are shown in Tables 3a and 3b. Slaughter age is 24-36 months of age. Body weight, EMA, and rib fat increase with age and appear to increase more with increasing age. However, the growth rate starts to decrease at about 24 months, which is highly suggestive of the start of finishing male buffaloes for a fattening scheme. Large variation in carcass quality measurements were observed. Most notable is the measurement for tenderness. In beef cattle, a Warner Bartzler shearforce (WBSF) score ranges from tough (>4.4), tender (3.9 - 4.4) and very tender (<3.9). While the male buffaloes had an average of WBSF 4.9 (tough), two animals had very tender score of WBSF1.6. This indicates a very good potential for improving the tenderness score of buffaloes through selection.

**Figure 3.** Ultrasound scan of eye muscle area of Enteng and Marco, a swamp and riverine bull, respectively



**Table 3a.** Average body weight and ultrasound scan measure from male buffaloes in the NGP

Age Category	Body Weight			Live Ultrasound Scan				
	n	Mean	SD	EMA			Rib Fat	
				n	Mean	SD	Mean	SD
Birth	361	33.2	5.2					
6 months	262	136.4	27.1					
12 months	271	224.1	33.4	54	27.6	5.4	2.9	0.6
18 months	182	312.6	50.8	102	35.1	6.7	3.8	1.0
24 months	81	378.3	62.9	26	42.3	10.2	4.6	2.1
36 months	37	478.7	69.7	26	46.4	8.9	4.9	3.6

**Table 3b.** Carcass quality of male buffaloes from the NGP

Parameter	Mean	Min	Max
Age at slaughter	34.1	19.5	48.3
Live weight, kg	475.3	298.0	600.0
Dressing percentage	49.0%	45.2%	56.3%
Water holding capacity (% free water)	16.5	9.8	23.8
Firmness (1/10mm)	138.3	108.0	190.6
Tenderness (shear force, kg)	4.9	1.6	7.3
% Lean	60.2	55.2	67.4
% Fat	20.6	15.2	24.7
% Bone	19.1	13.5	27.3

Genetic parameters for growth rate and EMA was estimated so that young animals can be evaluated and ranked for selection, furthering the development of meat type buffaloes. Heritability estimates obtained at various age categories showed moderate values (Table 4). This is lower than what is reported in beef cattle. Fortunately, genetic correlations among the different growth traits are moderately high making multi-trait selection easier and faster. The genetic correlation between 6 months and 24 months at 0.92 indicates selection at younger age is enough. It may not necessary to wait 24 months before selection. Thus, the preliminary estimates obtained are very encouraging for the breed development.

Multi-trait analysis between growth rate and EMA was also done at 12 and 18 months of age. Genetic correlations were moderately high between and among traits (Table 5). The result suggests very promising opportunity to increase through selection growth and EMA simultaneously and the high heritabilities indicate selection on the basis of individual performance alone would result in substantial genetic progress. The need to have a separate breed development for meat and dairy buffaloes is further substantiated by the low but negative correlation (-0.053) between milk and bodyweight EBVs of individual animals at 18 months of age.

**Table 4.** Genetic parameters obtained from running a multi-trait full animal model using ASReml software on body weights of male riverine buffaloes at the NGP

Age Category	Birth	6 Months	12 Months	18 Months
Birth	0.49 ±0.16	0.13	0.067	0.14
6 months	0.73	0.11 ±0.17	0.52	0.4
12 months	0.15	0.78	0.28 ±0.18	0.75
18 months	0.59	0.51	0.30	0.21 ±0.24

Diagonal - heritability, upper diagonal - phenotypic correlation, lower diagonal - genetic correlation

**Table 5.** Genetic parameters obtained from running a multi-trait full animal model using ASReml software on body weight and eye muscle area (EMA) of male riverine buffaloes at the NGP

Category	12 Months	EMA 12 Months	EMA 18 Months
12 months	0.30 ±0.18	0.64	0.63
EMA 12 months	0.90	0.39 ±0.25	0.79
EMA 18 months	0.84	0.94	0.39 ±0.29

ID	Age at measurement, mos.	EMA, cm2	WT, KG	ADG	TMI
2GP19139	13.8	34.3	296	0.63	102.2
2GP19061	17.7	54.6	430	0.74	101.6

Diagonal - heritability, upper diagonal - phenotypic correlation, lower diagonal - genetic correlation

The most recent development in development of meat line of riverine buffaloes is that for the first time, two young bulls were selected and sent to the CLSU bull farm in Digdig for semen collection. These were selected on the basis of multi-trait EBV index for growth and EMA. These two young bulls are the second set of bulls selected for development of meat type buffaloes. At close to 18 months, 2GP19061 is already more than 400kg with a big rib eye area (EMA).

Pictured below (Figure 4) is 2GP20074, son of Von, one of the foundation sires for meat development. He is slated to be nominated for semen collection if he passes final evaluation. At 12 months of age, he already weighs 273 kg.



**Figure 4.** 2GP20074, son of one of foundation sire Von, for meat development

# MILK TEST DAY RECORDING

## PERFORMANCE RECORDING AT THE INSTITUTIONAL HERDS

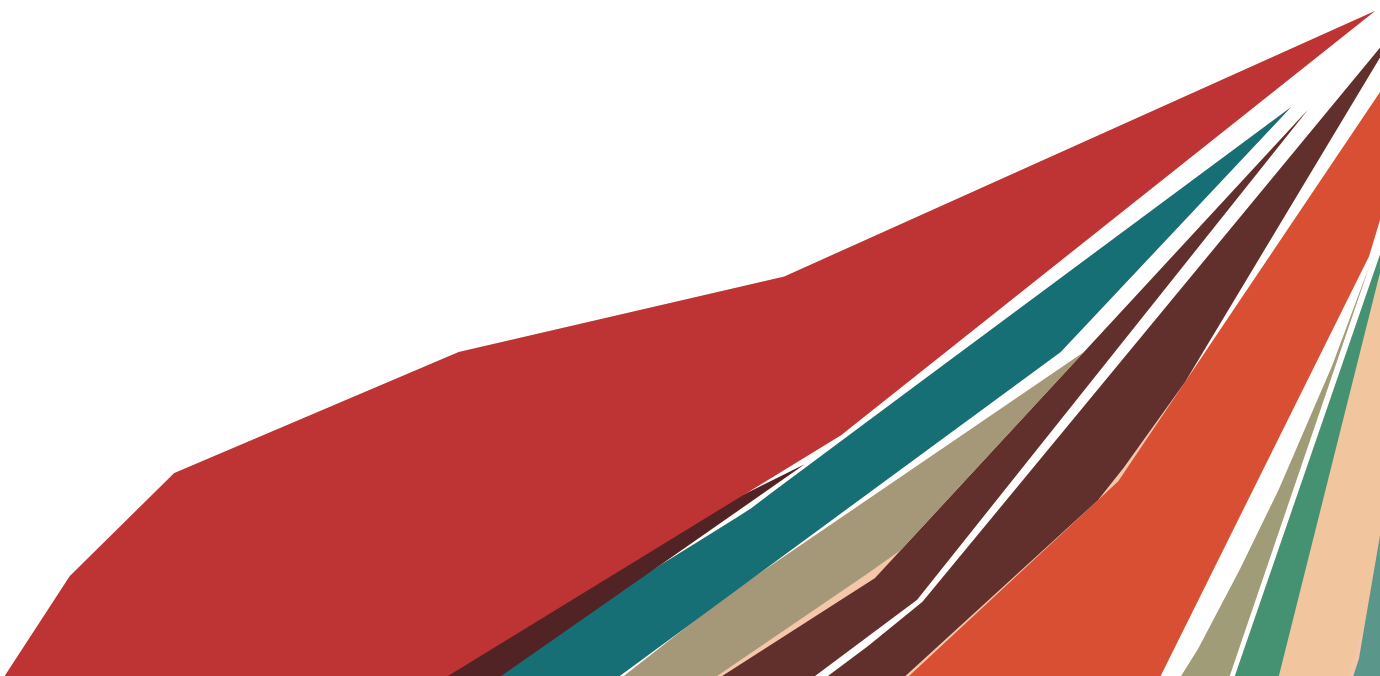
Monthly milk and milk components test day recording was not done regularly in 2021 due to the pandemic. Courier or delivery service is not yet fully available in some areas in Visayas and Mindanao such that courier companies could not guarantee that samples would arrive within 3 days like before hence in 2021, only seven institutional herds submitted milk samples for analysis. Adding to the problem in milk analysis is the fact that the main machine for analyzing milk composition has been under repair for several months already. The backup machine can only analyze milk fat percentage, milk protein percentage and somatic cell

count. Table 6 below presents the average test day milk, fat, protein and SCC from various DA-PCC herds that submitted samples in 2021. The average milk yield, fat% and prot% were all lower compared to the previous year. Even the top three herds (USM, MMSU, CSU) in terms of milk yield had lower values compared to the previous year. There was a very big decrease in milk yield at the NGP from a high of 6.2 kg in 2020 to 4.4 in 2021. The average milk fat and protein percentage was also lower in 2021 compared to 2020. The change was larger to fat% compared to prot%. Lower fat percentage may be an indicator of poor quality forage or lack thereof and should be addressed by management.

On the other hand, average SCC was markedly lower in 2021 but this pattern was not consistent across the herds that submitted samples. Some herds actually increased in values such as CLSU and CSU.

**Table 6.** Average milk component parameters for 2021 monthly milk testing in different DA-PCC institutional herds

Center	N	Milk, kg	% Fat	% Prot	SCC cells/ml '000	SCC above 200,000 cells/ml		SCC above 1,000,000 cells/ml	
						n	%	n	%
CLSU	264	5.3	8.0	4.1	138.4	37	14.4%	4	1.6%
CSU	82	5.5	6.8	4.2	93.1	6	7.5%	1	1.3%
MLPC	82	4.8	4.4	3.9	238.6	8	10.4%	1	1.3%
MMSU	59	5.5	6.47	3.8	80.4	4	7.0%	0	
USM	81	5.7	5.6	4.1	36.8	2	2.5%	0	
WVSU	6	3.9	4.2	3.8	147.8	1	16.7%	0	
NGP	950	4.4	7.9	4.3	143.2	130	15.8%	12	1.5%
<b>Overall</b>	<b>1524</b>	<b>5.0</b>	<b>6.2</b>	<b>4.0</b>	<b>125.5</b>		<b>10.6%</b>		<b>1.4%</b>



# **National GAHP Certification of DA-PCC at CSU's Institutional Herd**

The Department of Agriculture-Philippine Carabao Center (DA-PCC) at Cagayan State University (CSU) becomes the first government-owned farm that received the certificate of compliance for Good Animal Husbandry Practices (GAHP).

GAHP is a set of principles in good practices and minimum requirements for commercial or backyard rearing of farm animals for food use. The code aims to ensure food safety and quality, protect and promote welfare of animals, promote health and safety of farm workers, and support environmental management.

The agency also holds ISO 9001:2015 Certification compliant to management system for six years now and is also the first government livestock research agency certified compliant to Animal Welfare Act (AWA).

**2021  
DA-PCC  
MILESTONE**





# Appointment as National Livestock Cryobank

The ex situ or offsite conservation and management of animal genetic resources (AnGR) paves the way for sustainable genetic diversity of livestock species in the country through the National Livestock Cryobank (NLC) facility.

Department of Agriculture Secretary Dr. William Dar recently signed a memorandum circular anent the implementing guidelines for the National Livestock Cryobanking Program months after he led the unveiling of the NLC facility marker, which serves as a national repository of germplasm and biological samples from diverse livestock species.

The NLC will aid in the advancement of research for development (R4D) works on ex situ cryo conservation for animal genetic resources (AnGR) from diverse livestock species towards conservation, management, and utilization, leading to sustainable animal production systems.

These endeavors are seen to sustain the genetic diversity of livestock species such as buffalo, cattle, and goat, among others, in the country and to provide a source of genetics to be used by farmers, livestock breeders, and other interested clients.

The construction of this facility was made possible through the technical assistance and generous support of DA-PCC's international partners, which include the Republic of South Korea through the Korea International Cooperation Agency (KOICA) and the United States of America through the

Public Law (PL) 480 project, "Strengthening the Livestock Biotechnology Center".

2021  
DA-PCC  
MILESTONE





## REGULAR PROGRAM

### NEWLY CREATED CARABAO-BASED MODULES

{In order to expand the development reach of carabao-based enterprises, the agency continuously established partnerships with the local governments and farmers' cooperatives and associations to mobilize and help more carabao owners, particularly, the owners of crossbred buffaloes produced out of AI and bull loan programs in the regional impact zones (RIZ). The CBED program aims to create more income-generating opportunities for smallholder carabao raisers. There were eight new partner cooperatives and associations involved in the program across the country.}

### INFUSION OF PUREBRED BUFFALOES

**549**

{female purebred dairy buffaloes entrusted to select farmer trustees, DBMF operators, and institutions}

## EXISTING CBED PROJECTS

**8,165**

{carabao owners engaged in carabao-based enterprises and who are members of 213 cooperatives/associations}

{top 10 provinces with highest milk production}

- 1 Nueva Ecija
- 2 Cavite
- 3 Zamboanga del Norte
- 4 Bulacan
- 5 Pampanga
- 6 Bohol
- 7 Iloilo
- 8 Leyte
- 9 Negros Occidental
- 10 Cagayan



# CARABAO-BASED ENTERPRISE DEVELOPMENT

## VOLUME AND VALUE OF BUFFALO-DERIVED PRODUCTS TRADED

**5,047,902 kg/  
Php762,103,999**

{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)}





# ALAB KARBAWAN

## CARABAO-BASED BUSINESS IMPROVEMENT NETWORK

**PHP185M**

{fund released for identified recipient provinces for 17 project sites in 16 provinces}

**969**

{animals entrusted to 378 recipients}

**1,050**

{clients trained}

**12**

{project sites provided with dairy processing and marketing outlets through the Bayanihan II Fund}

**11**

{additional project sites identified for inclusion under the GAA FY 2020}

**575**

{female crossbred buffaloes entrusted to 262 farmers in 11 provinces for 2020}

**7**

{project sites established with Dairy Boxes}

The province-wide CBIN, popularly known as ALAB Karbawan, is a project initiated and funded by the Office of the Senate Committee Chairperson on Agriculture, Food and Agrarian Reform, which aims to establish robust CBED value chains in identified provinces, promote the creation of livelihood among farmers, and kick-start the development of the dairy buffalo sector in the said provinces.

In 2019, the fund for the first list of identified recipient provinces was released to the DA-PCC amounting to Php185 million, which is intended for 17 project sites in 16 provinces. Currently, majority (82%) of the sites are already operational, which means that all the components of the value chain already exist and are functioning. The remaining 18% are still in the production stage wherein the animals are already entrusted to the farmers and the main activities are on production such as forage production and nutrition, animal health, and breeding. Under this fund, a total of 969 animals were entrusted to 378 recipients; 1,050 clients were trained; and 17 complete lines of dairy processing equipment were procured. The approval of the Bayanihan II Fund has also enabled the construction of dairy processing and marketing outlets in 12 project sites.

With the success of the 2019 CBIN project sites, additional 11 sites were identified and included in the GAA FY 2020, as expansion to the project. Under the CBIN 2020, three sites (27%) are already at the operational stage while seven sites (64%) are at the production stage. Only one site (9%) is still waiting for the delivery of animals, which was delayed due to the super typhoon that wreaked havoc in the Visayas. Through the CBIN 2020, a total of 575 female crossbred buffaloes were entrusted to 262 farmers in 11 provinces. Moreover, dairy processing and marketing outlets (Dairy Box) were established in seven project sites. Capacity building activities are continuously being conducted in all the CBIN project sites to empower the partner farmers to become successful carapreneurs.



The CCDP aims to augment income of coconut farmers by integrating Carabao-based Enterprise Development (CBED) in coconut farming system and adopting the concept of CBIN. In 2019, the Philippine Coconut Authority (PCA) allocated a total amount of Php164 million for the implementation of the project in 17 sites across the country.

Currently, the value chain of one site (5%; Sorsogon) is already operational because the farmers and the cooperative made the initiative to buy their own carabaos and processing equipment. Thus, the farmers are already producing milk, processing it into different milk-based products, and marketing it in their mini grocery. They are also working out to participate in the milk feeding program. On the other hand, 12 sites (71%) are still in the production stage wherein the carabaos are already entrusted to the farmers and are being subjected to nutrition and breeding activities. A total of 363 female crossbred buffaloes were procured and entrusted to 12 sites, benefiting 210 small coconut farmers. The processing and marketing facility and dairy processing equipment will also be procured under the Year 2 budget, which is expected to be downloaded from PCA in the first quarter of 2022.

Preparatory activities including courtesy call, project orientation, social preparation training, and technical training were done in almost all of the sites. The legal documents such as MOA, usufruct and deed of donation (in case the cooperative will donate a lot for infrastructure) are also being processed except for Camarines Sur due to the concern of the provincial government—that the budget for the two sites will be integrated only in one site.

The DA-PCC, in partnership with PCA and other stakeholders, is always steadfast and committed in attaining the penultimate goal of this project—increased income of farmers.

# CCDP

COCONUT-CARABAO  
DEVELOPMENT PROJECT

**PHP164M**

{fund released for identified recipient provinces  
for 17 project sites}

**363**

{female crossbred buffaloes entrusted to 210 small  
coconut farmers in 12 project sites}



# MILK FEEDING PROGRAM

## DEPED-FUNDED SCHOOL-BASED FEEDING PROGRAM

**1,032,318**

{total number of undernourished children from kindergarten to grade six enrolled in public elementary schools supplied with milk by 32 PCC-assisted dairy cooperatives}

## DSWD-FUNDED SUPPLEMENTARY FEEDING PROGRAM

**10,619**

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

The DA-PCC provides support to the Milk Feeding Program, as implemented by the Department of Education (DepEd) and the Department of Social Welfare and Development (DSWD). The Program is pursuant to RA 11037, also known as the “Masustansyang Pagkain Para sa Batang Pilipino Act”.

For the year 2020, the agency facilitated the implementation of the DepEd-funded School-Based Feeding Program - Milk Component in 14 regions and 40 provinces nationwide. In 2021, 32 DA-PCC-assisted dairy cooperatives were able to supply the milk requirements of 1,032,318 children or 32.92% of the total undernourished children from kindergarten to grade six enrolled in public elementary schools (Table 7).

Likewise, the DA-PCC facilitated the DSWD-funded

Supplementary Feeding Program - Milk Component in six regions and eight provinces nationwide. In 2021, seven DA-PCC-assisted dairy cooperatives supplied the milk requirements of 10,619 children (Table 8) or 21.77% of the total undernourished children from Supervised Neighborhood Play (SNP) and Child Development Centers (CDCs).

The DA-PCC provided technical assistance on aspects of proper and hygienic milk handling and processing to produce food safety-compliant pasteurized carabao’s milk. This Program has provided an assured market for the milk produced by the dairy cooperatives, sustained livelihood and increased income, during the pandemic.

**Table 7.** Number of undernourished children supplied with milk (DepEd-funded Milk Feeding Program)

Region	No. of Provinces	No. of Undernourished Children
I	4	174,622
II	4	82,396
III	7	261,758
IV-A	4	99,118
IV-B	2	21,278
V	1	13,128
VI	2	45,543
VII	3	81,502
VIII	1	15,503
IX	3	117,361
X	3	66,670
XII	2	29,362
CAR	2	13,167
CARAGA	2	10,910
<b>Total</b>	<b>40</b>	<b>1,032,318</b>

**Table 8.** Number of undernourished children supplied with milk (DSWD funded Milk Feeding Program)

Region	No. of Provinces	No. of Undernourished Children
III	2	1,603
IV-A	1	860
IV-B	1	697
VI	2	2,836
VIII	1	925
IX	1	3,698
<b>Total</b>	<b>8</b>	<b>10,619</b>

# ENHANCED PARTNERSHIP AGAINST HUNGER AND POVERTY (EPAHP)

The EPAHP is a convergence program led by the DSWD, which aims to mitigate hunger, ensure food and nutrition security, and reduce poverty in rural and urban communities. The particular convergence project that DA-PCC was involved in is the Pilot Gatasang Kalabaw Project, which aims to: (1) establish viable enterprises along the value chain as a source

of additional income of 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. The DA-PCC entrusted 75 head of dairy buffaloes to the identified recipients in Region 1 (Ilocos Norte), Region 6 (Iloilo) and Region 9 (Zamboanga del Norte).



**Further expansion of the carabao value-chain through the**

## **Carabao-based Business Improvement Network and the Coconut-Carabao Development Project**

The implementation of the Accelerating Livelihood and Assets Buildup (ALAB)- Karbawan projects has become a harbinger of hope not only in providing business opportunities to carapreneurs but also in boosting the local dairy industry.

ALAB-Karbawan is an umbrella program initiative and popularized name for two province-wide Carabao-based Enterprise Development implementation projects namely Carabao-based Business Improvement Network (CBIN) and Coconut-Carabao Development Project (CCDP), both initiated and funded by the Office of the Senate Committee on Agriculture, Food, and Agrarian Reform Chairperson Senator Cynthia Villar.

The CBIN and CCDP are expected to start up or improve dairy development in the identified provinces through entrustment of dairy buffaloes, engagement of processing plants and outlets to pursue carabao-based business ventures, and provision of capability-building and technical support services.

The project sites include Ilocos Sur, Pangasinan, Tarlac, Bataan, Oriental Mindoro, Quezon Province, Camarines Sur, Albay, Sorsogon, Palawan, Negros Occidental, Negros Oriental, Antique, Aklan, Leyte, Biliran, Northern Samar, Samar, Zamboanga Peninsula, Misamis Oriental, Davao Del Sur, Davao De Oro, Davao Oriental, South Cotabato, and North Cotabato.

**2021  
DA-PCC  
MILESTONE**



# 2021 DA-PCC MILESTONE

*Participation of dairy buffalo  
farmers in the*

## *national milk feeding program*

The implementation of the milk feeding program, led by the Department of Education (DepEd) and the Department of Social Welfare and Development (DSWD) through the help of assisted cooperatives of DA-Philippine Carabao Center (DA-PCC) nationwide, had supplied the milk requirements of 2,635,329 undernourished children in S.Y. 2019-2022 under the DepEd's School-Based Feeding Program and 60,644 beneficiaries for DSWD's Supplementary Feeding Program in SY 2020-2022.

Pursuant to Republic Act 11037 also known as Masustansyang Pagkain para sa Batang Pilipino Act, promulgated on June 20, 2018, the National Feeding Program shall be implemented targeting all undernourished in public day care, kindergarten and elementary schools to address undernutrition and hunger. One of the components of the National Feeding Program is the Milk Feeding Program.

The program is not only beneficial to undernourished children but also to dairy value chain players as it has created a higher demand for locally produced milk, thus, providing them sustainable livelihood and boosting the local dairy industry.



# RESEARCH FOR DEVELOPMENT

*The Research for Development (R4D) Program leads efforts focused on increasing farm productivity, adoption rate of farm-based practices, and product development. This is through the better understanding of the foundation and dynamics of genetic improvement, animal health and nutrition, buffalo-based enterprises, and the underlying socio-economic issues related to program implementation.*

The R&D agenda has been drafted and laid down since the initial operation of the Center in 1993. Revisions and refinement were regularly injected, and in 2004, the concept of operational research evolved. Moreover, to continuously maintain the relevance of the agency's R&D programs, projects and activities in addressing the industry's issues, the PCC's R&D was shifted into its new paradigm, the R4D or Research for Development. The PCC is moving into a non-traditional, problem-oriented research, which has more relevance to the industry's stakeholders. Most recently, translation of research innovations into products and services is aggressively pursued to better serve its partner-clients and industry.

## COMPLETED & ONGOING RESEARCHES

The DA-PCC is keeping up with the designation given by the DA as the lead agency for livestock biotechnology. Despite the pandemic, the DA-PCC has continued conducting researches in various disciplines and particular thematic areas, as determined under the agency's R4D Agenda. Biotechnology researches are complemented by relevant researches that explore and address problems or issues that are being encountered in the course of the agency's implementation of the CDP.

In 2021, 29 researches were completed while another 47 were ongoing (Table 9, Appendix 1-Tables 1a, 1b and 1c). Some of these researches were also presented in the agency's Evaluation of On-going Researches and R&D Symposium held at the DA-PCC National Headquarters.

29

{completed researches presented in various fora}



**Table 9.** Type, number, and status of researches

Thematic Areas	Completed	Ongoing
Production Management System		6
Biosafety	3	8
Genetic Improvement	0.15	0.78
Animal Genomics/Genetic Diversity and Cryopreservation	4	10
Reproductive and Cryopreservation Techniques	6	13
Product Development	3	3
Enterprise Development		3
Socio-Economics Dimension of CDP	7	3
Technology Transfer		
Environment and Climate Change		
Industry and Policy		
Institutional Development		1
Production System and Nutrition	6	
<b>TOTAL</b>	<b>29</b>	<b>47</b>

## R4D & IN-HOUSE REVIEW

### RESEARCH AND DEVELOPMENT OPPORTUNITIES FOR TRANSFORMATIVE INNOVATIONS UNDER THE NEW NORMAL

The agency's strong research thrust is evident in the conduct of its R4D In-house review of completed researches, which serves as an avenue in making sure that the research efforts being carried out are in line with the agency's R4D agenda. This is also an integral part in fostering connections and interactions within and among researchers and research institutions as they also present here their notable contributions, accomplishments, and more importantly, their learnings that can be shared to one another.

Unfortunately, the pandemic is still taking its toll on all of us. As a result of the on-going global health threat, the R4D evaluation was held virtually. This has also been the method of conduct for the pre-in-house review wherein on-going researches from different research centers are presented to a panel of internal evaluators for discussion and refinement. As for the in-house review, external evaluators helped the R&D team assess the technical integrity, relevance, and merits of researches under review. Also, the R&D team is expecting that there may be relevant and significant information and

data that will be generated from this activity, which can be used to propose potential technologies for IP protection, which will later be transferred and introduced to the public for common use.

The evaluation of on-going researches was held on August 18, 2021, wherein nine researches were presented and evaluated. This was followed by the R4D In-House Review held on September 28-30, 2021 wherein 19 completed researches were presented and evaluated. The researches presented covered the thematic areas of biosafety, genetic improvement-reproductive biotechnology, genetic improvement – animal genomics, socio-economics, production management system, product development, and technology transfer.

Four experts were tapped to serve as panel of evaluators, namely, (1) Dr. Virginia Venturina, Dean of College of Veterinary Medicine, CLSU; (2) Jessica Rustia, Associate Professor V of Department of Food Science and Technology, CLSU (3) Dr. Joice San Andres, Department Chair of Animal Science, College of Agriculture, CLSU; and (4) Dr. Consuelo Amor Estrella, Associate Professor II, Institute of Animal Science, College of Agriculture and Food Science, UPLB.

Several awards were given during the activity (Table 10). Moreover, incentives and special citations were given to the researchers as a form of motivation and recognition of their notable contribution in the field of research.

## 13

{awards/incentives/citations given to DA-PCC researchers during the In-House Review}

**Table 10.** Awards, incentives, and citations during the 2021 R4D In-House Review

AWARDEE	AWARD
Thelma A. Saludes	Best Presenter
Claro N. Mingala, Alona T. Badua, and Paula Blanca V. Gaban	Best Paper
PCC at Ubay Stock Farm	Most Number of Papers Presented
Marvin A. Villanueva	Outstanding Young Scientist
Charity I. Castillo	Patent application A Pellet Feed with Enhanced Rice Straw (e-RS) for Ruminants and Method of Producing thereof
Teresita M. Baltazar	Patent application A Method of Producing Nutritional Bread with Buffalo Milk
Jenica dc. Salazar	Patent application A Shelf-stable Milk Candy and The Process in Making thereof
Reynald D. Amido	Publication Title: Chemical Composition and In vitro Digestibility of Rice Straw treated with <i>Pleurotus florida</i>
Paulene S. Pineda	Publication Title: Opportunities and Challenges for Improving the Productivity of Swamp Buffaloes in Southeastern Asia
Lilian P. Villamor	Publication Title: Genetic Diversity of Philippine Carabao ( <i>Bubalus bubalis</i> ) Using Mitochondrial DNA D-loop Variation
Roseline D. Tadeo	Publication Title: Early pregnancy diagnosis in water buffaloes through detection of Pregnancy-associated glycoprotein (PAG) in milk using Enzyme-link immunosorbent assay
Excel Rio S. Maylem	Publication Title: Changes on the Heat Shock Protein 70 (HSP70) In Water Buffalo Spermatozoa Revealed the Capacitation-like event in Cryopreservation
Gabriel Alexis S.P. Tubalinal	Publication Title: Application of Noble Metals in the Advances in Animal Disease Diagnostics

## CONFERENCE PRESENTATIONS & JOURNAL PUBLICATIONS

Consistent with the norm of sharing R4D outputs to wider research and scientific communities, the DA-PCC researchers have actively participated in local and international scientific conferences (Appendix 3- Table 1). Likewise, there were 14 research papers published in refereed journals (Appendix 3-Table 2) while 21 papers were included in scientific proceedings (Appendix 3-Table 3).

## TECHNICAL SEMINARS CONDUCTED AND/OR FACILITATED

The R&D Division has conducted or facilitated a series of Technical Caucus/Seminars on various topics (Appendix 4-Table 1) with the help of concerned section or unit. Its aim was to improve and sustain awareness of DA-PCC staff and other invited researchers and government institutions on technical matters and issues relevant to the livestock industry, in general and DA-PCC operations, in particular.

## AWARDS & RECOGNITIONS

The DA-PCC staff members continued to gain recognition from various award-giving bodies in 2021.

### DR. ESTER B. FLORES

{National CSC Pag-Asa Awardee (Individual category)}  
*CSC Honor Award Program*

### DR. MARVIN A. VILLANUEVA

{2021 Outstanding Young Scientist}  
*DOST-National Academy of  
Science and Technology*

### DR. RANDOLPH TOLENTINO

{Best Presenter (Disease Diagnosis Category)}  
*Philippine Society of Animal Science*

### DR. LERMA C. OCAMPO

{Best Presenter for the paper "Post thaw survivability  
of native pig spermatozoa from Markaduke boar studs  
after cryopreservation"}  
*PCC National Headquarters*

### DR. EMERSON TAPDASAN

{2020 Outstanding Researcher (given March 2021)}  
*PCC National Headquarters*



# HIGHLIGHTS OF ACCOMPLISHMENTS OF RDD SECTIONS & UNITS

## BIOSAFETY AND ENVIRONMENT SECTION (BES)

The Animal Health Monitoring Program of the agency was carried out successfully by the Biosafety and Environment Section (BES). The BES personally and virtually monitored 13 Institutional herds maintained at the DA-PCC's at UPLB, CLSU Dairy, CMU, USM, DMMMSU, LCSF, MLPC, WVSU, CSU, USF, MMSU, Genepool, and LBRAF. It also catered the routine testing services such as collection of 958 samples (feces, blood, urine, etc.). DNA extraction and molecular testing for Surra on 2,384 whole blood were performed along with leptospirosis test on 345 urine samples. Likewise, 2,213 serum samples were subjected to Brucella infection testing while 1,457 whole blood and 896 fecal samples were tested for parasitic infection. Some 256 samples were also tested for special tests such as bacterial culture, Tb ELISA, Blood chemistry, test for Johne's disease, and necropsy.

Other services such as Tuberculosis (TB) testing for 493 water buffaloes, CAEV testing for 454 goats and California Mastitis Test of 2,268 animals were performed. The section assisted in the prevention and treatment (hemorrhagic septicemia vaccination, vitamin/mineral administration, deworming, antibiotic treatment, etc.) to 1,180 animals. All in all, a total of 7,243 animals received animal health services from the section.

For the extension support, education, and training services, the BES conducted trainings on Safety in the Laboratory, Food Safety, Dairy Safety Regulations, Risk Management Training, AWA-GAHP, CBPP, AH Services, and seminars on buffalo health and management course for other researchers, members of the academe, veterinary practitioners, farmers, and other stakeholders. In addition, two workshops/seminars by the DA-Livestock and Biotechnology Center-NRCP to DepEd and Adamson on Molecular Biotechnology Training were also carried out involving 197 students.

## REPRODUCTION AND PHYSIOLOGY SECTION (RPS)

The Reproduction and Physiology Section (RPS) supported the Genetic Improvement Program by addressing reproduction problems through the use of applicable reproductive biotechnologies, provision of technical assistance, research interventions, and enhancing the production of genetically superior animals. For its major final outputs, AI in water buffalo resulted in 133.4% (508/420) accomplishment (SPCR, 2021). The FTAI output was 123.4%

(395/320), enhanced AI was 275% (55/20), and natural estrus AI was 152.2% (137/90) compared with the targets. On pregnancy diagnosis, 299.1% (1675/560) output was achieved with a total of 1,344 animals served using ultrasonography while 328 animals were subjected to early detection by PAGs. These activities were accomplished at the NGP, Ruminant Research Center in Saranay, San Jose City, ACDI Cooperator Farm in Buliran, San Antonio, Nueva Ecija, and other parts of the NIZ. For embryo transfer, four animals were treated for superovulation, of which, three were subjected to in vivo collection of embryos. Four animals were treated as recipients of embryos, two of which were used for embryo transfer.

In other livestock species, 170 cattle were subjected to FTAI and 376 were served with pregnancy detection by ultrasonography. These were done in Talavera, Pura, Tarlac, Zambales, and Pangasinan. In goats, 85 animals were served by the entrusted bucks and a total of 293 animals of farmers were subjected to pregnancy diagnosis by ultrasonography and provided with other reproduction related services. Six bucks were rotated in various farmer cooperators for breeding purposes in Bulacan, Tarlac, and Nueva Ecija.

In addressing the problems of non-performing and inactive bulls at the farmer cooperator areas, the DA-PCC at DMMMSU has completed the establishment of a night corral to enhance the breeding of recorded non-performing bull. So far, such bulls have impregnated eight female buffaloes. A project proposal on the "Efficiency of Night Corraling in Addressing Reproduction Performance of Active and Inactive Bulls Entrusted to Farmer Cooperators" was crafted with DA-PCC at DMMMSU as the implementer. Similarly, the DA-PCC at USF have initiated the research on the "Effect of L-Carnitine in Enhancing Reproduction Performance of Inactive and Non-performing Bulls" where they serve as the main implementer. The DA-PCC at CLSU also initiated the implementation of the research that will determine the appropriate concentration of L-carnitine for water buffalo bull. The bull at the NIZ, which was subjected to breeding soundness evaluation and libido assessment and was administered with Vitamins ADE and L-carnitine, are now performing and have resulted in pregnancies.

To produce more calves and increase animal population, the RPS Team collaborated in the establishment of the Le Ferme Farm-Owner of the MRL 7 Stars Brand in Mangaldan, Pangasinan resulting in a cattle farm with 750 head of cattle and 15 head of buffalo.

On the development aspects, the RPS has conducted one training course on AI with 10 participants and participated, as resource speakers, in the training courses on AI conducted by DA-PCC at CLSU and DA-PCC at CSU. A five-day virtual immersion of 111 students and faculty members of Bicol University was also accommodated.

## PRODUCTION SYSTEM AND NUTRITION SECTION (PSNS)

The Production Systems and Nutrition Section (PSNS) focuses on research studies dealing with the application of biotechnology in improving the nutritional and physiological status of the carabao. Research undertakings on forage production, which involve exploring alternative sources of feeds and feed additives that will improve the gut microflora of the animals were prioritized by the section. These include the development of BlockMate, a legume-based multi-nutrient lick pods as milk booster supplement to water buffaloes, Buro Booster to improve the fermentation quality and aerobic stability of corn and sorghum silage, development of sustainable rice straw management practices and technologies for ruminant fodder in the Philippines, nutritional evaluation of hydroponic corn fodder and its effect as substitute for feed concentrates for calves, characterization of bacterial microbiota in buffalo gastrointestinal tract (GIT) using PCR-based analysis, and feeding evaluation of yellow corn sprouts, as supplement for dairy buffaloes during the transition period to peak of lactation.

Research collaborations with the regional centers was strengthened this year. Two research proposals were drafted entitled “Mining Alternative Mineral Sources from Various Seaweeds as a Feed Supplement to Water Buffaloes (*Bubalus bubalis*)” and “Evaluation of Potential Utilization of Whole Sugarcane Plant as Feed for Feeding Buffaloes”. These proposals aim to ensure sufficient quality feed sources for water buffaloes. In support of the efforts of the Knowledge Management Division, the team is also technical focal for the ongoing development of the KBGAN iFeed mobile application. It is an offline feed calculator, which allows extension technicians and farmers to calculate the right amount and composition of feed for optimum milk production.

A total of 1,866.12 tons of fresh forage was produced at the NGP. The section has also provided technical services and assistance to 13 clients/farmers and seven regional centers with a total of 299, 974 planting materials (mainly sorghum seeds) distributed to various cooperatives in Nueva Ecija and regional centers in Luzon and Visayas. This is a continuous effort to support the daily nutritional requirements of their animals and the development of pasture areas. As part of the assistance to the NGP, the team also initiated the improvement of its irrigation system and rehabilitation of canals. Moreover, initiatives on monitoring the forage production of regional centers were done, both virtually and physically. In keeping abreast with the international standards in the laboratory testing of feeds, feedstuff and forages were analyzed at the nutrition laboratory to determine the nutritive value and address the nutritional deficiencies of ruminants and other livestock species. A total of 34 laboratory analysis requests from clients were accommodated. Also, a total of 112 different samples of feedstuff were analyzed.

## ANIMAL GENETIC RESOURCE SECTION (ANGRS)

The AnGRS consists of three units, namely: Cryobank (CRU), NGP Farm and Livestock Biotechnology Research and Animal Facility (LBRAF).

### CRYOBANK UNIT

The vision of the DA-PCC-Cryobank Unit to be the national germplasm repository of livestock species and other animals for in-vitro conservation began to come to life on September 3, 2021. The inauguration of the National Livestock Cryobank (NLC) was led by the Department of Agriculture Secretary, Dr. William Dar. The NLC will serve as a biological vault to sustain the genetic diversity of livestock species in the country and provide a source of genetics to be utilized by farmers, livestock breeders, and other interested clients.

The researches at the Cryobank Unit provided baseline information on the genetic pattern and identification of water buffaloes in the Philippines and on the paternal identification towards selection, breeding, and conservation of Philippine carabaos (PC). The outputs of the studies were published in three local and international ISI journals and highlighted the following information: First, the native buffaloes in the Philippines have various genes of buffaloes, of which, numbers are declining in Southeast Asian countries and showed that it is necessary to conserve and maintain them as valuable genetic resources while utilizing in the Philippines (Villamor et al. 2021). Second, the applicability of FAO microsatellite markers to determine the genetic diversity and potential forensic efficacy in the Philippine swamp buffalo populations (Escuadro and Villamor, 2021); and third, the molecular characterization of SRY gene in the Philippine Carabao swamp buffalo populations revealed a point mutation for nucleotide and amino acid to delineate *B. bubalis* subspecies for swamp and riverine buffaloes (Cailipan and Villamor, 2021).

### NGP FARM

**Physical Inventory.** As of December 31 2021, the NGP farm has an ending inventory of 492 animals (Table 11). There were 282 breedable (2 y/o and above) female with an average Artificial Insemination conception rate of 45.83%. The farm was able to produce 142 buffalo calves (69 females, 73 males) at 74.51% calving rate. Also, PCC – Gene Pool recorded an average of 16.13 months calving interval.

**Table 11.** National Water Buffalo Genepool Animal Inventory (as of December 31, 2021)

Category	BMB	BrMB	Cattle	PC	TOTAL
<b>FEMALE</b>					
Calves, < 1 yr. old	66		4		70
Heifer, 1-2 yrs. old	65				65
Heifer, >2 yrs. old	73	1	3	2	79
Cows, dry	58	10	6		74
Cows, lactating	115	9	5		129
Subtotal	377	20	18	2	417
<b>MALE</b>					
Calves, < 1 yr. old	61		3		64
Bulls, 1-2 yrs. old	2				2
Bulls, 2-3 yrs. old	1		2		3
Bulls, >3 yrs.old	1	1	3		5
Vasectomized	1				1
Subtotal	66	1	8		75
<b>TOTAL</b>	<b>442</b>	<b>21</b>	<b>26</b>	<b>2</b>	<b>491</b>

**Animals Released.** A total of 25 female buffaloes were released in support of the agency's GIP. Of these, 15 animals were dispersed to different areas in Nueva Ecija under a Paiwi Program while 10 animals were transferred to the DA-PCC at UPLB, as replacement stock for their institutional herd. Also, 70 male calves and yearlings were transferred to the Livestock Biotechnology Research and Animal Facility (LBRAF) for evaluation while two Junior bull cattle were sent to the National Bull farm for semen collection (Table 12).

**Table 12.** Number of buffaloes released in support of the CDP

	Recipient/ Destination	No. of Animals
Paiwi Program	Science City of Muñoz, Nueva Ecija	4
	San Jose City, Nueva Ecija	6
	Talavera, Nueva Ecija	1
	Aliaga, Nueva Ecija	1
	Sta. Rosa, Nueva Ecija	2
	Transferred	
	DA-PCC at UPLB	10
	National Bull Farm	2
	LBRAF	70

**Marketing of Buffalo Derived Products.** The farm produced 179,458.50 kg of raw milk for 2021 (Table 13). Around 108,757.00 kg of which was processed at a value of PHP7,926,980.00. The farm also produced a total of 3,406 bags of vermicast (50 kg/bag) through its waste management program and was able to sell 1,382 bags valued at PHP345,500.

**Table 13.** Monthly milk production

Month	Total Milk Production (kg)	Value of Milk Produced (PHP)
January	15,092.00	1,052,030.00
February	14,558.00	1,019,060.00
March	16,915.00	1,184,050.00
April	14,973.00	1,048,110.00
May	16,138.00	1,211,080.00
June	15,230.50	1,218,440.00
July	15,092.00	1,207,360.00
August	13,232.00	1,124,720.00
September	14,156.00	1,203,260.00
October	14,978.00	1,273,130.00
November	13,818.00	1,174,530.00
December	15,339.00	1,303,815.00
<b>TOTAL</b>	<b>179,521.50</b>	<b>14,019,585.00</b>

### LIVESTOCK BIOTECHNOLOGY RESEARCH AND ANIMAL FACILITY (LBRAF)

**Physical Inventory.** As of December 31, 2021, the LBRAF has an inventory of 106 animals, of which, 13 were Italian Mediterranean Buffalos (ITMB), 22 were native or Philippine Carabaos (PC), four were Brazilian Murrah Buffalos (BrMB), and 67 were Bulgarian Murrah Buffalos (BMB).

**Table 14.** LBRAF Animal Inventory (as of December 31, 2021)

Category	BMB	BrMB	PC	ITMB	TOTAL
<b>FEMALE</b>					
Calves, < 1 yr. old				1	1
Heifer, 1-2 yrs. Old	1		2	5	8
Heifer, >2 yrs. Old	3		2	1	6
Cows, dry	7	2	9	3	21
Cows, lactating	1				1
Subtotal	12	2	13	10	37
<b>MALE</b>					
Calves, < 1 yr. old			1		1
Bulls, 1-2 yrs. old	49	2		3	54
Bulls, 2-3 yrs. old	6		8		14
Bulls, >3 yrs.old					
Vasectomized					
Subtotal	55	2	9	3	69
<b>TOTAL</b>	<b>67</b>	<b>4</b>	<b>22</b>	<b>13</b>	<b>106</b>



**Animals Released.** In 2021, 55 animals were released from the farm: 34 were given to the Bull Loan Program recipient in Nueva Ecija, Zambales, Tarlac, Pampanga, Nueva Vizcaya, Pangasinan, Cagayan, Bicol, and Iloilo. Five bulls were transferred to the National Bull Farm in Digdig, Carranglan, Nueva Ecija to serve as semen donors. Bulls were also sent to the NGP and DA-PCC at CLSU for breeding purpose. Also, 14 female buffaloes were released to Paiwi Program recipients in Nueva Ecija, Bataan, and Zambales (Table 15).

**Table 15.** Number of buffalo released in support of the CDP

Particulars	Recipient/ Destination	No. of Animals
Paiwi Program	Lupao, Nueva Ecija	1
	San Jose City, Nueva Ecija	4
	Orani, Bataan	5
	San Felipe, Zambales	4
Bull Loan	Bicol Region	4
	Calinog, Iloilo	5
	Tarlac	4
	Dupax Del Sur, Nueva Vizcaya	5
	Laoac, Pangasinan	1
	Piat, Cagayan	2
	San Fernando, Pampanga	5
	Cabiao, Nueva Ecija	4
	Science City of Muñoz, Nueva Ecija	1
	Gen. Tinio, Nueva Ecija	1
	Jaen, Nueva Ecija	1
	Sta. Rosa, Nueva Ecija	1
Transferred	PCC at CLSU (Clean-up bull)	1
	National Water Buffalo Gene Pool (Clean-up Bull)	1
	National Bull Farm (Semen Donor)	5

## PRODUCT DEVELOPMENT AND INNOVATION SECTION (PDIS)

The PDIS is an internally created Section under the RDD. The Section is focused on the research, development and innovation in milk, meat, and other carabao-based products for market promotions and development of sustainable livelihood opportunities for the dairy farming communities.

Technologies or products developed by PDIS are rolled out to the DA-PCC-assisted dairy cooperatives and other interested clients for adoption and commercialization. Two of the developed technologies or products were applied or commercialized. These are sterilized toned carabao milk and Karabun (formerly called Milkybun, a bread flavored with buffalo's milk).

The Karabun technology was transferred to 24 DA-PCC regional focal persons and 91 members of DA-PCC assisted dairy cooperatives including 56 private entrepreneurs through the conduct of hands-on trainings on Karabun Production last June 15 and December 3, 2021. The participants are potential suppliers of Karabun for the DepEd's School-Based Feeding Program (SBFP) and DSWD's Supplementary Feeding Program (SFP).

The PDIS has completed three of the four research projects approved last year, which are the following: (1) Development of Yogurt from Buffalo Milk and Coconut Milk Blend (Nyogurt), (2) Development of Nutribun with Enhanced Nutritive Quality Using Carabao Milk (Milkybun), and (3) Enhancing Shelf Life of Toned Carabao Milk Through Retort Processing. The section has also developed technologies as follows:

1. Karabun - It was formulated to provide at least 500 kcal of energy per serving to comply with the nutritional requirements of the undernourished children beneficiaries of DepEd and DSWD
2. Milk Pops – bite-sized milk candies with longer shelf life than pastillas de leche and which do not need refrigeration on storage
3. Sterilized milk – a toned carabao's milk processed through retort to extend its shelf life without the need for refrigeration storage.
4. Kardeli – different choice cuts from carabao's meat and other carabao's meat products packaged into a new premium image hence boosting consumer awareness and eradicate the negative impression about carabao's meat.

Support to RA 10611 (Food Safety Act of 2013). In support of the RA 10611, the PDIS provided extension-related activities on the Hygienic Milk Handling Practices and other Food Safety-related standards through seminar-lecture series organized by the DA-PCC or other DA agencies. Moreover, the PDIS provided technical assistance in the application for License to Operate (LTO), as a food trader to three dairy cooperatives and LTO renewal application to three dairy cooperatives and two DA-PCC regional centers.

Support to RA No. 11037 (Masustansyang Pagkain Para sa Batang Pilipino Act). In support of the RA 11037, the DA-PCC facilitated the implementation of the Milk Feeding Program of the DepEd-funded SBFP in 14 regions and 40 provinces nationwide. In 2021, using the DepEd's FY 2020 funds, 32 DA-PCC-assisted cooperatives, in partnership with 94 School Division Offices (SDOs) nationwide, supplied the milk requirements of 1,032,318 children or 32.92% of the total undernourished children from Kindergarten to Grade Six enrolled in public elementary schools. Similarly, for the DSWD-funded Milk Feeding Program, 24 DA-PCC assisted cooperatives supplied the milk requirements for 120 days of 44,945 children or 42.48% of the total children in day care centers in 9 regions and 32 provinces nationwide. Furthermore, the PDIS provided assistance to DA-PCC regional milk feeding focal persons and assisted



cooperatives, as facilitators and suppliers of milk for the Milk Feeding Program. Relevant trainings were facilitated among dairy cooperatives to ensure production of quality and safe dairy products.

Development of Philippine National Standard (PNS) for Water Buffalo Milk. The PNS for Water Buffalo Milk - Product Standard - Specifications (PNS/BAFS 317: 2021 ICS 67.100.01)

### SOCIOECONOMIC AND POLICY RESEARCH SECTION (SEPRS)

The section is mandated to lead the preparation and implementation of researches related to the socio-economic and policy dimensions of the CDP. In 2021, the team was able to develop and implement five research projects, two of which were already completed.

The first research is a project aimed to transfer the DA-PCC-developed technology on Karabun production to a qualified cooperative as an enterprise opportunity. It is directed to help reduce the adverse effect of COVID-19 on the socio-economic situation of dairy value chain players and to produce nutritious food with longer shelf life to the public. The project was awarded to Catalanacan Multi-Purpose Cooperative (CAMPC), a DA-PCC-assisted cooperative in the Science City of Muñoz Nueva Ecija, through a MOA signing. Result showed that Karabun Production is a viable source of income for cooperatives. In a span of seven months, a total of 514,321 pieces of Karabun were produced that generated a total of PHP2,405,452.44 sales or income of PHP957, 132.72. The computed Return on Investment (ROI) of the project was 66%.

was developed by the DA-Bureau of Agriculture and Fisheries Standards (DA-BAFS), in consultation with PDIS chief and other members of the PNS Technical Working Group (TWG). The milk quality data gathered from the PCAARRD- funded Project (Milk Quality and Safety Assurance from Farm to Milk Processing Plant) were used as inputs in the development of the PNS.

The second completed research aimed to evaluate the initial implementation of the Milk Feeding Program in the Philippines. It attempts to document the procedures conducted by DA-PCC, DepEd and dairy cooperatives in the preparation and initial implementation of the Milk Feeding Program covering August 2020 to March 2021. Issues and concerns encountered along the process of the program were gathered and used as basis for providing appropriate recommendations for an improved implementation of the Milk Feeding Program in the country. The third research is a continuation of the second research, which aimed to analyze the effect of the Milk Feeding Program on the income of farmers and on the cooperatives in Nueva Ecija.

The last two researches are “Waste Management Practices of Semi-Commercial, Commercial, and Institutional Dairy Buffalo Farms in the Philippines”, and “Profiling and Mapping the Carabao-Based Enterprise Value Chain Stakeholders for Improved Project Planning, Implementation, Monitoring and Evaluation”

The section initiated and facilitated 11 trainings/seminars attended by 274 female and 296 male participants or a

total of 570 participants. These trainings involved lecture-discussion and open forum aided with MS PowerPoint presentations, which aimed to strengthen the capacity of different stakeholders of the CDP in terms of cooperative management and governance; enterprise development and management; environmental awareness; and dairy buffalo production engagement. These trainings were helpful in empowering our partner farmers and cooperatives to become successful carapreneurs and leaders in their own right; and in the organization or community they belong to.

### **CARABAO-BASED ENTERPRISE AND DEVELOPMENT SECTION (CBEDS)**

The CBEDS is a newly created section under the RDD. It is a section that illustrates the whole value chain, from research to innovation to marketing/commercialization. It composed of three units namely the National Dairy Business Hub (NDBH), Business Development and Commercialization Unit (BDCU), and Processing and Marketing Unit (PMU).

#### **NATIONAL DAIRY BUSINESS HUB (NDBH)**

**Entrustment of Purebred Dairy Buffaloes and Bulls.** A total of 161 head of purebred female buffaloes from the buy-back program and animal payment from the loaned animal in the NDBH were newly loaned to qualified members of the 21 partner dairy cooperatives, associations, and family modules under the Paiwi scheme.

Likewise, 15 head of riverine buffalo bulls were released and entrusted to the qualified buffalo bull handlers in the different locations of Nueva Ecija for water buffalo crossbreeding and upgrading use. Table 17 shows the distribution of dairy buffaloes in the different cooperatives, associations and family modules and the number of bulls released.

**Table 16.** Name of cooperatives, associations, locations and number of newly released female buffaloes and bulls

<b>Name of Cooperative/ Association</b>	<b>Location</b>	<b>No. of Animals Released</b>
<b>A. Existing Organization</b>		
1. Bibiclat Dairy Producers Cooperative	Aliaga	3
2. Caudillo Prutas at Gulay Producers Cooperative	Cabanatuan City	2
3. Eastern Primary Multi-Purpose Cooperative	San Jose City	27
4. Bongabon Dairy Producer Association	Bongabon	18
5. Delaen Agriculture Cooperative	San Jose City	13
6. Catalanacan Multi-Purpose Cooperative	Science City of Muñoz	14
7. Licaong Agricultural Cooperative	Sci. City of Munoz	11
9. San Carlos Agriculture Cooperative	Aliaga	9
10. Simula ng Panibagong Bukas MPC	San Jose City	22
11. Cinense Dairy Cooperative	Talugtug	11
12. Bibiclat Dairy Cooperative	Aliaga	3
13. Pao Producers Cooperative	Lupao	1
14. New Mamandil Dairy Cooperative	Talavera	8
15. Gabay Sa Bagong Pag-asa ng Bungo	Gapan	2
16. Jaen Dairy Farmers Association	Jaen	1
17. Bagong Pag-asa ng Magsasaka Multi-Purpose Cooperative	Cabiao	2
18. Bagong Pag-asa sa Bagong Talavera PMPC	Talavera	7
19. Maliolio Dairy Carabao Association	Sta. Rosa	5
20. Sunbeam Multi-Purpose Cooperative	Talugtug	2
21. Family Module		4
<b>Sub-Total</b>		<b>161</b>
<b>B. No. of Bulls Released</b>		<b>15</b>
<b>Grand Total</b>		<b>176</b>

**Provision of Technical Services.** The NDBH also provides various types of program and services to clients. These include treatment of sick animals, deworming, vaccination, prevention and control of mastitis among lactating animals, and collection of blood and fecal samples for laboratory analysis related to health and nutrition. Other services are assistance in the feeding and feeding management of animals for proper nutrition, provision of forage grasses planting materials for propagation of quality forage grasses, AI and pregnancy diagnosis for improving genetics and productivity of animals.

Table 17 shows the type and corresponding number of services rendered by NDBH in coordination with BES, NGP, ABGS, LBRAF and PSNS.

**Table 17.** Number of buffaloes released in support of the CDP

Types of Services	Number of Services Rendered
a. Animal health-related	4,576
b. Pregnancy diagnosis	2,760
c. Monitored the number of confirmed pregnant	1,020
d. No. of artificial insemination conducted	973
e. Nutrition-related	2,785

#### Milk Production and Genetically Improved Carabaos.

In line with the DA's twin objectives of bountiful harvest and increase in income, the NDBH posted a total of 1,708,497.6 liters of milk produced in 2021 valued at PHP132,612,688.75. It has also monitored and recorded the production of 1,020 head of genetically improved carabaos valued at PHP15,000.00 per head, which translate to PHP15,300,000.00. In summary, the NDBH project had contributed an additional income for 50 cooperatives or associations and dairy farmers in Nueva Ecija with a total amount of PHP138,912,688.75. The province of Nueva Ecija is now one of the major sources and contributors of buffalo's milk and genetically improved buffaloes in the country.

**Table 18.** Number of buffaloes released in support of the CDP

Source of Income	Quantity	Peso Value
Milk Production (kg)	1,708,497.6	132,612,688.75
No. of Calves produced (PHP15,000/calf)	1,020	15,300,000.00
<b>Total</b>	<b>973</b>	<b>138,912,688.75</b>

**Milk Supplementation/Feeding Program.** The R.A. 11037 (School-based Feeding Program or SBFP) is a continuing endeavor for the benefits of undernourished Filipino children. The feeding program that was supposedly implemented in 2020 was implemented in 2021. The feeding for 2021 was conducted mid-year and will continue until 2022.

Five farmers' organizations namely Catalanacan Multi-Purpose Cooperative (CAMPC), Eastern Primary Multipurpose

Cooperative (EPMPC), Licaong Agriculture Cooperative (LAC), Nueva Ecija Federation of Dairy Carabao Cooperatives (NEFEDCCO), and Pulong Buli Multi-Purpose Cooperative (PBPMP) supplied the pasteurized toned milk using the 2019 SBFP fund, serving the 87,488 undernourished pupils from 14 Schools Division Office (SDO) of the DepEd. Meanwhile, 265,459 beneficiaries from 17 SDO of (DepEd) in Nueva Ecija, Pampanga, Zambales, Olongapo, Tarlac and Nueva Vizcaya benefited from the 2020 SBFP fund. Additional two cooperatives participated in the Milk Feeding Program namely Brotherskeeper Multi-Purpose Cooperative (BKMP) and Simula ng Panibagong Bukas Multi-Purpose Cooperative (SIPBU). In total, seven cooperatives in Nueva Ecija were trained in manufacturing and processing of toned buffalo's milk and registered to comply as Milk Feeding Program suppliers. The said SBFP funds for 2019 and 2020 from the DepEd were both implemented in 2021.

Cooperatives who participated in the program had generated substantial income as shown in Table 19. Moreover, the feeding program had created an impact on the marketing and selling of buffalo's milk in Nueva Ecija. It also promoted buffalo's milk as an instrument in poverty alleviation and in improving the nutritional status of undernourished children. A total of 195 individuals were also given the opportunity to have a regular source of income. These include milk processors, logistics personnel, milk collectors, managers, and other employees of seven cooperatives in Nueva Ecija.

**Table 19.** National Water Buffalo Genepool Animal Inventory (as of December 31, 2021)

Name of Cooperatives	2019 SBFP FUND		2020 SBFP FUND	
	No. of Children Benefited	Total Revenue (PHP)	No. of Children Benefited	Total Revenue (PHP)
1. Eastern Primary Multipurpose Cooperative	11,325	2,764,200	7,507	3,565,825
2. Catalanacan Multi-Purpose Cooperative	23,007	9,037,800	25,114	10,752,232
3. Licaong Agricultural Cooperative	11,180	4,472,000	53,847	26,208,800
4. Nueva Ecija Federation of Dairy Carabao Cooperatives	10,052	3,618,720	70,240	35,654,040
5. Pulong Buli Multi-Purpose Cooperative	31,924	12,769,600	19,364	8,713,800
6. Brotherskeeper Multi-Purpose Cooperative	-	-	19,756	8,890,200
7. Simula ng Panibagong Bukas Multi-Purpose Cooperative	-	-	69,631	34,326,060
<b>TOTAL</b>	<b>87,488</b>	<b>32,662,320</b>	<b>265,459</b>	<b>128,110,957</b>

**On-Going Research Activities.** The unit has an on-going research study entitled “Quality Assessment of Milk and Survey of Milk Hygienic Practices Among Dairy Carabao’s Milk Players of Nueva Ecija, Luzon, Philippines”. This research study aims to identify, compare, and correlate hygienic and handling practices between and among dairy carabao’s milk value chain players, assess milk quality and come up with recommendations based on the outputs of the research study. This is a three-year research study involving dairy farmers, milk collectors, milk processors cum wholesaler/retailer and vendor/dairy outlets. Three cooperatives from the Science City of Muñoz were already visited, surveyed, and milk-collected for quality test. Other cooperatives are scheduled for interview and milk collection in 2022. The Unit was also involved in the study funded by PCAF, namely “Impact Assessment of the Genetic Improvement Program of PCC”, engaging dairy farmer-beneficiaries and nonbeneficiaries, AI technicians, and bull loan recipients as the main respondents. The goals of the study are to establish and strengthen a pool of genetically improved animals and transform the swamp buffaloes into milk and meat animals by crossing and sustained backcrossing with the riverine breed through AI and natural mating and utilize other reproductive biotechniques to enhance its rapid multiplication. More than 50 respondents were already interviewed and other respondents are to be scheduled in the coming year.

**Other Accomplishments.** The NDBH led the implementation of the “Gatas, Isda, Gulay at Karne” (GIGK) Project in helping the affected farmers during the COVID-19 pandemic in partnership with the City Government of San Jose City, Nueva Ecija. The project included the promotion of urban agriculture, buffalo fattening, clustering of buffalo milk producers, and food and feed production using the value chain approach.

As indicated in Table 20, the agency invested a total of PHP27,073,641.36 to support San Jose City as DA’s adopted city for the last two years. The investment included the value of carabaos given before the implementation of the GIGK project. The outcome of these strategies is valued at PHP88,895,517.00. which directly benefitted the farmers, consumers and 23,037 undernourished children in the city and nearby municipalities. The total value of the Kita of the farmers is PHP29,275,973.29 in just two years of GIGK project implementation with an ROI of 108%.

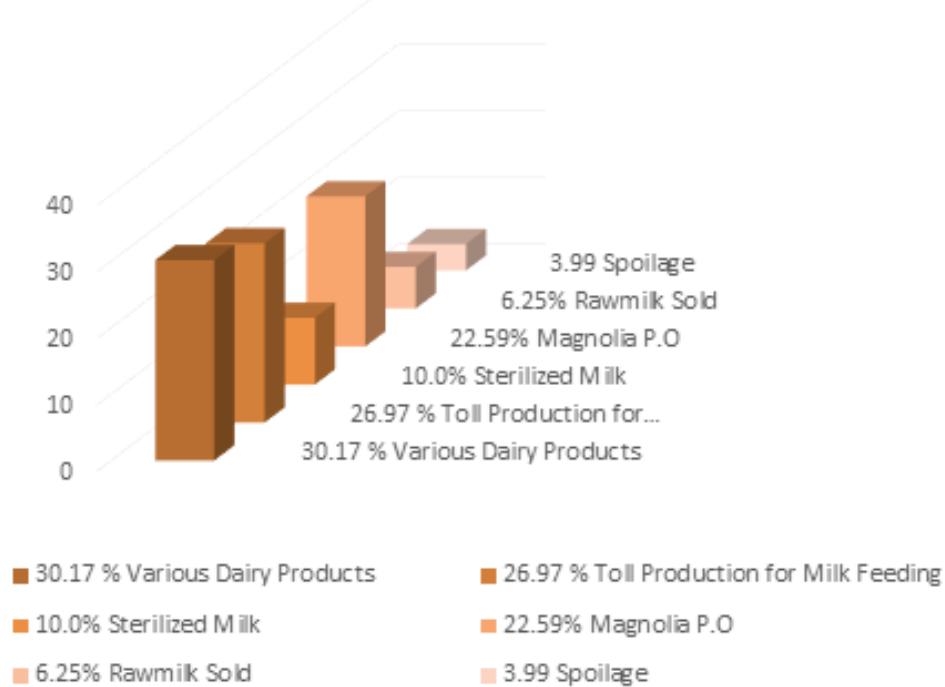
### PROCESSING AND MARKETING UNIT (PMU)

In 2021, the PMU received a total of 384,371.50 kg of raw milk, 71.68% of which was from individual, cooperatives, and milk used for toll processing and 28.23% came from the NGP farm. The number of samples provided for milk analysis is around 1,938. The list of individual and cooperatives that delivered milk are: (1) NGP, (2) Catalanacan MPC, (3) Eastern Primary MPC, (4) Pulong Buli Primary MPC, (5) SIPBU Dairy Cooperative, (6) ACDI, (7) Stephenhan Farm, (8) Licaong Agricultural Cooperative, (9) NEFEDCCO, (10) DA-PCC-CLSU, (11) Melchor Correa, (12) Onofre Dayag, (13) Richard Reyes, and (14) Adeline Farm. The total raw milk utilized is 377,346.74 kg. Figure 5 presents the breakdown of raw milk utilization.

**Table 20.** Key strategies, investment and Ani at Kita of farmers

Key Strategies	PCC Investment	Ani by Farmers	Kita for Farmers
<b>1. Clustering of Milk Producers</b>			
1. A (Carabao Production)	411 Carabaos (PhP14,385,000)	712 Carabaos (PhP24,920,000)	₱ 10,535,000.00
1. B (Buffalo Milk on Wheels)	1 Vehicle for BMW (PhP1,800,000)	Sales (PhP6,000,000)	₱ 2,100,000.00
1. C (Veterinary & Breeding Services)	5,666 Services (2,879,500)	315 Calves Produced (PhP4,725,000)	₱ 1,845,500.00
1. D (Milk Production)	5,666 Services (2,879,500)	473,345 Liters (PhP35,500,752)	₱ 9,545,763.20
<b>2. Carabao Fattening</b>	10 Carabaos (PhP326,100)	3,993 Kgs of Carabeef (PhP434,900)	₱ 108,800.00
<b>3. Urban Gardening</b>	Seeds and Fertilizer (PhP488,401.36)	325,650 Kgs of Vegetables (PhP2,847,700)	₱ 1,061,684.39
<b>4. Consolidation of Vegetables Producers</b>	Load for PCC Staff (PhP2,500)	1,136 kgs of Vegetables Sold (PhP29,580)	₱ 27,080.00
<b>5. Milk Feeding Program</b>	Salary for SBFP Staff (PhP1,412,640)	413,840 packs 200ml (PhP9,087,585)	₱ 2,404,145.70
<b>6. Establishment of Bakery for “Milkybuns” Production</b>	Capital for Coops (PhP2,350,000.00)	400,000 pcs. Of Milkybuns Sales Projected (PhP4,000,000)	₱ 1,400,000.00
<b>7. KADIWA ni ANI at KITA</b>	Project Cost (PhP550,000)	Sales Projected (PhP1,350,000)	₱ 248,000.00
<b>TOTAL</b>	<b>₱ 27,073,641.36</b>	<b>₱ 88,895,517.00</b>	<b>₱ 29,275,973.29</b>

**Fig. 5. Raw milk utilization percentage**



The total number of toll-processed pasteurized toned milk for the Milk Feeding Program is 4,364,117 sachets (200 ml per sachet). There are seven cooperatives that provided toll service for the Milk Feeding Program, which include Catalanacan MPC, Eastern MPC, Pulong Buli Primary MPC, SIPBU Dairy Cooperative, Licaong Agricultural Cooperative, Brotherskeeper Cooperative, and Enrico’s Dairy. Moreover, 100% is toll processed for Magnolia and Sterilized milk. The combined sales of Milka Krem and CDCPF in 2021 is valued at PHP87,989,381.08. There were also 73 new resellers/ distributors (individual and group) and 42 consignments or agreements.

**INTELLECTUAL PROPERTY-TECHNOLOGY BUSINESS MANAGEMENT (IP-TBM) PROJECT**

The implementation of the DOST-PCAARRD-funded Patent Mining in Dairy Buffalo and Cattle Thru Intellectual Property – Technology Business Management Project is hugely supportive of the recent effort of the Agency to efficiently manage the technologies and products generated from the R&D program of DA-PCC. On IP protection-related activities, important accomplishments for the year 2021 included are IP applications at the Intellectual Property Office of the Philippines (IPOP HL), which included four Patent applications, seven Utility Models, and five Trademarks/ Tradenames.

As part of the patent mining activities of IP-TBM, the project held a consultation meeting last June 21, 2021 where 17 technical experts and eight industry stakeholders were

invited to help validate the technology areas that are relevant to the dairy industry, as well as the gaps associated with these specific areas, which can help address through patent mining. The identified gaps in each technology areas will become the focal point of the patent mining study.

One important component of the Project is strengthening the technical capabilities of DA-PCC staff in various IP related activities. The Project was able to conduct technical workshop on prior art search and claim drafting for the agency’s researchers last September 6-10, 2021. Through this seminar, they were able to do their own patent search, write claims, and file their own inventions at IPOP HL. Subsequently, IP awareness and orientation seminars such as Introduction to Copyright and Trademarks, and Fairness Opinion Report and Fairness Opinion Board for Technology transfer were conducted and participated in by DA-PCC researchers and regional centers.

## Registration with IPO Philippines of DA-PCC developed intellectual properties

The DA-PCC has adhered to the policies being implemented by the Intellectual Property Office of the Philippines in strengthening the protection of IP rights in the country, upholding innovation and boosting production, use, protection, and respect of intellectual property.

Currently, the DA-PCC has a total of 5 patent applications, 20 Utility models, 13 trademarks, some of which are registered including Dairy Box, VeriSire, A2Choice, Prolipig, Buro Booster, Nyogurt, QuickCare, BlockMate, Kardeli, and Karabun.

## 2021 DA-PCC MILESTONES

## Commercialization of the Karabun Technology & Dairy Box modality

The DA-PCC, through its Research and Development Division (RDD), developed the Karabun, a nutrient-rich bread made with fresh carabao's milk, to help boost the immune systems of the vulnerable sector, especially children, because the amount of protein and carbohydrates in one glass of milk is equivalent to one Karabun.

Karabun contributes to addressing malnutrition. The DA-PCC ensures that this product provides the energy requirements of undernourished children, making it compliant with the standards set by the Department of Education (DepEd) and the Department of Social Welfare and Development (DSWD).

The product was formally launched in September of 2019 in line with the Bayanihan to Heal as One Act (RA 11469) and the DA's Ahon Lahat, Pagkaing Sapat (ALPAS) Kontra sa COVID-19 that targets displaced farmers and promotes urban agriculture during the pandemic.





# KNOWLEDGE MANAGEMENT

**15**

{regular publications}

**52**

{audio-visual materials for aggressive promotion of various components of CDP; official music video; testimonial narrative video to promote the ALAB Karbawan project}

**5**

{KBGAN learning videos}

**90,145**

{IEC materials distributed to the regional centers' coverage areas and identified PCC stakeholders, visitors, clients, and partner institutions}

**2,141**

{clients trained}

**700**

{scheduled visitors toured to the DA-PCC facilities}

## SUSTAINED MASSIVE INFORMATION & COMMUNICATION CAMPAIGN

The DA-PCC through the Knowledge Management Division's (KMD) Applied Communication Section (ACS) has spearheaded the production and distribution of the following knowledge products or information, education, and communication (IEC) materials in 2021:

- Six (bimonthly) issues of CaraBalitaan (Newsletter for the National and Regional Impact Zones written in Tagalog)
- Four (quarterly) issues of Karbaw Magasin (written in Tagalog)
- Four (quarterly) issues of Bubalus Newsletter (written in English)
- One issue of R4D Highlights (written in English)
- One monograph titled "The Science of Delivery: Exploring Dynamics Between Technical and Local Knowledge Within Delivery Systems"
- One planner and one Farmers' Calendar highlighting DA-PCC's commitment to One DA Reform Agenda of





the Department of Agriculture

- Reprinting of AI Manual and knowledge products produced for the Farmers Livestock School on Dairy Buffalo Production: FLS Session Guide and Technical Handouts
- 50 audio-visual materials for aggressive promotion of various components of CDP
- Five Knowledge Brokerage, Guidance, and Advisory Network (KBGAN) learning video series with topics on silage, carabao-based enterprise, milk benefits, artificial insemination and fixed-time AI, and vermicomposting
- Three cooking demo videos entitled “Caralutuan Food Vlog Series” featuring DA-PCC’s Kardeli Meat products
- DA-PCC’s new music video/jingle
- One 30-minute testimonial narratives video for the Accelerating Livelihood and Assets Buildup (ALAB) Karbawan project sponsored by Sen. Cynthia Villar
- Launching of DA-PCC knowledge portal for digitized knowledge products with a total of 276 subscribers as of December 2021
- A total of 90,145 copies of IEC materials were distributed by the regional centers and KMD to 49,233 identified PCC stakeholders, visitors, clients, and partner institutions

- A total of 94 documentations, communication activities, and legworks were translated into knowledge products and other reports

The development and launching of the DA-PCC’s Knowledge Portal is one of the ACS’ accomplishment highlights for the year. Simply called the K-Portal, this serves as a hub or a one-stop e-platform for all knowledge products, in various formats, produced by the KMD. Clients are encouraged to explore and navigate the portal which is like a website. A free subscription to the portal gives its subscribers access to the updated KPs of the DA-PCC.

## OTHER MEDIA FORMS

- The KMD has facilitated and recorded 49 media exposures in diverse news platforms (TV, Radio, Press, Online, and Social Media) and has uploaded 74 articles to the PCC website and popular social media (Facebook).
- Launching of the Knowledge Studio or K-Studio, which serves as a venue for live webinar and production of digital content to promote the CDP through “TeleRadyo” approach via the DA-PCC official Facebook page.

# ENHANCING THE SKILLS OF FARMERS & OTHER EXTERNAL CLIENTS

## WEBINARS

- The DA-PCC's Learning Events Coordination Section facilitated 18 types of webinars, which were participated in by 1,038 attendees. These online events were categorized under the Production Support Service and Marketing Support Service-related technical trainings. Topics included Enriched Rice Straw, Pagbuburo ng Damo with Buro Booster, Vermicomposting, Gelato Making, Production of Various Healthy Milk Drinks using Carabao's Milk, All About Cheeses, Whey Products, Mga Kasanayan at Karanasan sa Pag-aalaga ng Kalabaw, Milk Feeding Program.
- Blended training approach was also used as a new method of training participants to meet the evolving needs of new age learners. Combining face to face learning and e-learning, this approach was done during the conduct of Karabun training for 10 batches of participants.

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

Nine limited face-to-face trainings, seminars and meetings were also conducted and facilitated. These learning events included Social Preparation Training, Basic Buffalo Management Training, AI and Pregnancy Diagnosis and Farmer's Forum.

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

Since 2017, the PCC through its Knowledge Management Division (KMD) has been facilitating a learning modality titled "Farmer Livestock School on Dairy Buffalo Production" (FLS-DBP), which aims to promote improved practices in dairy buffalo production systems and accompanying technology options for smallholder dairy buffalo farmers to help increase their efficiencies and income.

In 2021, A re-tooling workshop was done and participated by FLS-DBP Facilitators involving participants from Pangasinan, North Cotabato, Quezon Province, Albay, and Zamboanga del Norte. A total of 26 participants were trained during the conduct of this learning event.

The record of utilization rate of technologies adopted by farmer-trainees registered at 54.43%.

To continuously disseminate the DA-PCC's programs, services, and technologies on dairy buffalo production, the DA-PCC at Cagayan State University (DA-PCC at CSU) together with the Agricultural Training Institute (ATI) Regional Training Center

II, Office of the Provincial Agriculturist of Cagayan and LGU of Cagayan, joined forces in the radio broadcast of the School on-the Air (SoA) on Dairy Buffalo Production targeting smallholder carabao keepers in Region II.

The (SOA) radio broadcast was aired over DZDA 105.3 MHz- Radyo Pangkaunlaran, San Gabriel, Tuguegarao City on August 12, 2021 until October 16, 2021. Its graduation ceremony was conducted with 277 carabao keepers (enrollees) and other partner stakeholders. The SOA topics were strategically designed based on the combined accompanying technology options for smallholder dairy buffalo farmers to help increase their efficiencies and income.

The SOA conducted by DA-PCC at CSU earned a satisfaction rating of 4.27 or Very Satisfactory.

Another SOA was also implemented by the DA-PCC at University of Southern Mindanao funded by Agricultural Training Institute Region XI with active participation of Provincial Veterinary Office of Davao Del Sur, Davao De Oro and Davao Oriental.

Launched last November 2021, the SOA will be completed on March 2022. The 16 episodes of SOA on Dairy Buffalo Production airs over DXRD 711MHz radio station and on its FB page where experts from DA-PCC at USM serves as the resource speakers.

The 750 enrollees are farmers coming from 13 municipalities from three different provinces in Region XI:

Davao del Sur: Hagonoy, Kiblawan, Matanao, Magsaysay and Bansalan

Davao Oriental: Tarragona, Mati City and Lupon

Davao De Oro: Monkayo, Montivesta, Nabunturan, Mawab and Pantukan

## ASSISTANCE TO VISITORS AND CUSTOMERS' SATISFACTION

Through the KMD's Learning Events Coordination Section (LECS), a total of 700 scheduled and walk-in visitors were received, oriented on the PCC's programs and services, and toured to the DA-PCC's facilities. The LECS earned a satisfaction rating of 4.85 (5 as the highest rating possible).

The LECS also spearheaded a digital innovation with the development of a Virtual Tour of the DA-PCC national headquarters and gene pool in the Science City of Muñoz in Nueva Ecija. It shows not just a glimpse of what it is like visiting the DA-PCC facilities but also provides useful information about water buffalo production and accompanying technologies. The Virtual Tour registered 302 visitors for 2021.

Scan the following QR codes to visit our Knowledge Portal and experience a virtual tour to the DA-PCC National Headquarters and Genepool

#### DA-PCC K-Portal



The DA-PCC Knowledge Portal (or simply called the K-Portal) serves as a hub or a one-stop e-platform for all knowledge products, in various formats, produced by the agency through the Knowledge Management Division.

#### DA-PCC Virtual Tour



To know more about DA-PCC's services and facilities, you can now explore the National Headquarters and Gene Pool via virtual tour which can also be accessed in the agency's official website.



The Planning and Information Management Division (PIMD) leads in the development of master plans (physical and financial) of the DA-PCC, monitoring and evaluation of the agency's major final outputs (MFO), securement of an external budget for other programs and projects, and creation and maintenance of a healthy linkage with local and international institutions.

For 2021, the PIMD was able to accomplish the following: (1) conduct of the 22nd advisory board meeting on September 3, 2021 at the DA-PCC National Headquarters in Science City of Muñoz, Nueva Ecija, and (2) production of the Carabao Industry Roadmap (CIRM) for 2022-2026 manuscript with the help of Dr. Libertado C. Cruz serving as the main consultant and writer. The agency's MARC for the same year also shows an overall average physical accomplishment of 108% and fund utilization of 90.69% through the concerted efforts of the DA-PCC workforce in its national headquarters and regional centers.

## ADVISORY BOARD MEETING

Annually, the DA-PCC conducts its advisory board meeting with the following members:

a) Secretary of the Department of Agriculture or his representative, as Chairman;

b) Undersecretary for Livestock, as Vice Chairman;

c) Executive Director, Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development;

(d) Chancellor of the University of the Philippines in Los Baños (UPLB) and Presidents of Central Luzon State University (CLSU), Central Mindanao University (CMU), Cagayan State University (CSU), Don Mariano Marcos Memorial State University (DMMMSU), Visayas State University (VSU), West Visayas State University (WVSU), University of Southern Mindanao (USM), and the president of the state college or university where a carabao center may be established pursuant to the Republic Act 7307;

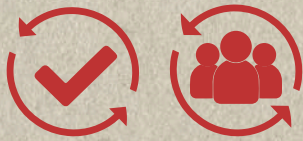
e) Director of the Bureau of Animal Industry;

f) Executive Director of DA-PCC; and

g) Farmers' representative to be appointed by the Board.

The AdBoard is a venue to formulate policies, programs, and projects for the development of the Philippine carabao, review and recommend the annual budget of the DA-PCC, evaluate the implementation, efficiency, and effectiveness of the program and projects agency; and recommended the establishment or abolition of carabao centers as may be deemed necessary.

In 2021, the 22nd AdBoard meeting was held at the DA-PCC National Headquarters in the Science City of Muñoz, Nueva Ecija last September 3, 2022 through a blended



# PLANNING & INSTITUTIONAL DEVELOPMENT

approach (physical and online utilizing Zoom application). The following were the agenda as approved and deliberated upon:

- a. DA-PCC Service Contingency & Management Plan
- b. Carabao Industry Roadmap 2022-2026
- c. Approved New Undertakings: PL480 project (Intensified Community-Based Dairy Enterprise Development) and KOICA project (Dairy Herd Improvement Program and Enterprise Development)
- d. Collaboration with Academic Partners on Animal Biotechnology in Livestock Enterprises (CAPABLE)
- e. Compliance to Executive Order No. 138 Series of 2021: Full Devolution of Certain Functions of the Executive Branch to Local Governments, Creation of a Committee on Devolution, and for other purposes

## DEVELOPMENT OF THE CARABAO INDUSTRY ROADMAP 2022-2026

In order to translate the outputs of the strategic planning process and provide a framework for success and keep people on track with the direction of the organization, the DA-PCC, through the PIMD and its consultant, Dr. Libertado C. Cruz, conducted a series of consultation workshops and

meetings with its various stakeholders in order to develop the CIRM for 2022-2026.

The output of these meetings was eventually translated into the manuscripts of the CIRM which were later presented to the DA-PCC's top management and in the 22nd Advisory Board Meeting by Dr. Libertado C. Cruz. The CIRM was also presented to the DA-Management Committee Meeting last September 2021 by DA-PCC OIC Executive Director Dr. Ronnie D. Domingo and was eventually approved.

The contents of the CIRM include its background and rationale, objectives, global perspective of the industry, vision, mission, strategies, program targets, budgetary requirements, implementation schedule, responsibility matrix, monitoring and evaluation, and policies. The CIRM envisions a vibrant carabao industry by harnessing the niche markets for buffalo-derived products amid the growing human population, urbanization, increasing income, and the implementation of the Mandanas-Garcia Supreme Court Ruling (which includes full devolution of extension activities).

## ANNUAL PLAN & BUDGET

Effective and efficient program implementation and budget utilization hinge on effective and efficient planning and project management. Annually, the DA-PCC through the PIMD and Administrative and Financial Management Division

(AFMD), was able to craft the agency’s plans, schedules, and budget for the upcoming year. For 2022, the DA-PCC was able to secure a total budget of PHP423,793,507.00 for the implementation of the CDP in its areas of operations.

# INSTITUTIONAL LINKAGES

## MFO ACCOMPLISHMENT REPORT CARD

Monitoring and evaluating the agency’s accomplishments are important endeavors in tracking the success of the DA-PCC’s programs and projects. It also helps to further improve the CDP implementation, as it provides more transparency in reporting its progress and status.

With the help of the MFO Scoreboard, an IT-based tool for monitoring the agency’s performance, the real-time status of the agency’s budget utilization and accomplishments are consistently being monitored and tracked by the DA-PCC across its network. The scoreboard serves as a good governance driver for capturing a Result-Based Performance Management System (RBPMS) and summarizes the performance indicators for each of its major accomplishments.

For 2021, the MARC scoreboard shows an overall average physical accomplishment of 108% and fund utilization of 90.69% through the concerted efforts of the DA-PCC workforce in its national headquarters and regional centers.

## EXTERNALLY FUNDED PROJECTS

Funding from a variety of external sources from local and international was also secured by the PIMD for the implementation of projects related to the development of the carabao-based business enterprises in the country, which include the following:

- Strengthening Buffalo-based Enterprise
- Livelihood and Food Security through Dairy Buffalo Entrepreneurship (Carabao-Dairy Enhancement and Livelihood)
- Livelihood and Food Security through Dairy Buffalo Entrepreneurship (Alaminos, Pangasinan)
- Expanded Gatasang Kalabaw - EPAHP Convergence Project

Recognizing the value of social capital in pursuing its mandate and in strengthening its capacity as a research agency, the DA-PCC has established new linkages and maintained existing partnerships with various institutions for purposes of R&D, technical cooperation, and capability building (Table 21).

**Table 21.** List of DA-PCC’s partner institutions, CY 2021

Partner Institution	Nature of Linkages
Agricultural Training Institute	School-on-the-Air on Dairy Buffalo production
Department of Agriculture-Bureau of Agricultural Research (DA-BAR)	Development of PNS (Water Buffalo Milk-Product Standards-Specifications)
Department of Agriculture-Bureau of Agricultural Research (DA-BAR)	R&D Funding Agency (2018-2021)
Department of Science and Technology Region III (DOST Region III)	Capacity Building
Department of Science and Technology - Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD)	Funding Agency / Capacity Building
Don Mariano Marcos Memorial State University - Fisheries Research and Training Institute (DMMMSU-FRTI)	R&D and Technical Cooperation
Escuela Superior Politécnica Agropecuaria de Manabí, Ecuador (ESPAM-MFL)	R&D and Technical Cooperation
Fulbright Philippine Agriculture Alumni Association, Inc.	Scientific & Agriculture Community Services and Capability Building
Hasanuddin University, Indonesia	Technical Cooperation
HM Biogenetics	Capability Building
ICAR-Central Institute for Research on Buffaloes	Technical Cooperation
Innovation and Technology Support Offices (ITSO), Carlos Hilado Memorial State College	Capacity Building
Intellectual Property of The Philippines (IPOPIL)	Technical Cooperation /Capacity Building
Japan Society for the Promotion of Science (JSPS)	Capability Building
JSPS Alumni Association of the Philippines	Scientific Community Services
Kindai University, Narra, Japan	Technical Cooperation
Kitazato University, Towada, Aomori 034-8628, Japan	Technical Cooperation
Le Ferme Farm owner of MRL 7 Stars Beef Brand	Technical Cooperation and Capability Building
Mie University	R&D and Technical Cooperation
National Dairy Research Institute	
Karnal, Haryana-132001 India	R&D and Technical Cooperation
National Institute of Agriculture Research, Ecuador	Technical Cooperation
National Research Council of the Philippines	R&D and Scientific Community Services and Capability Building
Non-governmental organization (Grameen Foundation)	Extension and Advisory Services Information System Project
Philippine American Education Foundation	Capability Building
Professional Organizations (PSAS, PhilEASnet)	R&D and technical cooperation; extension and advisory services; capability building
University of the Philippines Marine Science Institute (UP MSI)	R&D and Technical Cooperation
Universidad Tecnica de Babahoyo, Ecuador	R&D and Technical Cooperation
San Miguel Yamamura Packaging Corporation (SMYPC)	R&D

# INFORMATION MANAGEMENT SYSTEM

The DA-PCC's Information and Communication Technologies Section (ICTS) through the approved Information System Strategic Plan (ISSP) 2021-2023 from the Medium-Term Information and Communications Technology Harmonization Initiative (MITHI) fund facilitated the development and operationalization of the Extension Advisory Services Information System (EASIS) on its 2nd phase of a 3-phase project and the development of the Administrative and Finance Information System for the monitoring of financial transactions of the agency. The Animal Genetic Resource Information System (AnGR) was developed wherein the system utilizes the animal genetic resource collection (e.g., explore inventory; request and donate for germplasm or biological samples); Integrate the inventory of collection and genetic information and be able to link it to the efficient and appropriate existing PCC information systems; traceability of sample across various types of AnGR collections, history of inputs and output of AnGR. The ICTS has continuously enhanced the online Intensified Research-based Enterprise Build-up (iREB) Dashboard System as a tool for analysis on the client/farmer aspects as well as the Major Final Output

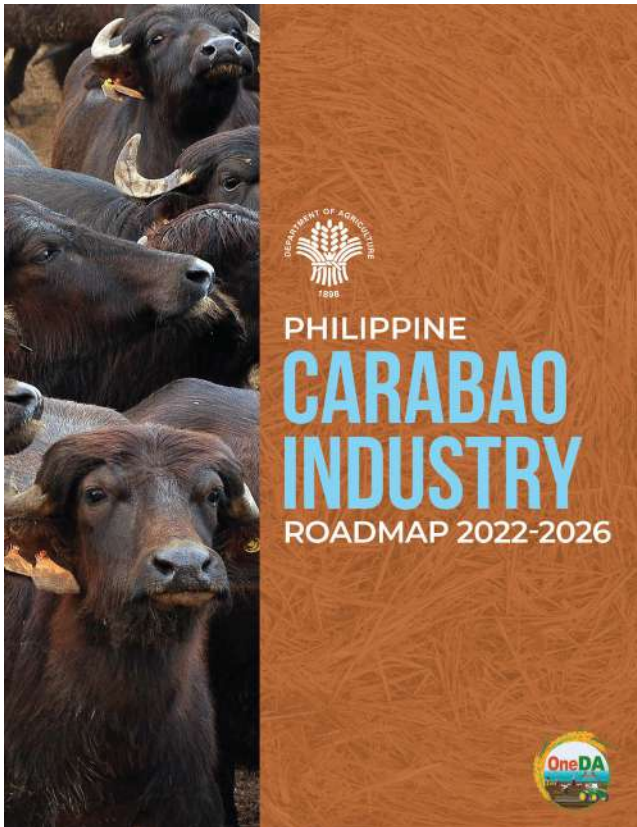
(MFO) dashboard as a means to measure the agency's physical targets and budget utilization.

The ICTS continuously enhanced and upgraded several Desktops, Central Processing Units (CPUs) and laptops, servers at the PCC operating units/section and regional centers with the assistance of (MITHI) fund. The acquisition and upgrading of 40 computers and other ICT peripherals has ensured making workstations up-to-date. Continuous maintenance and patch upgrading of Windows Server Data Center 2019 edition Operating System, SOPHOS Firewall, Secure Socket Layer (SSL) Microsoft Windows 10 32 and 64-bit Operating System and Microsoft Office 2019, Microsoft Exchange 2019 was also achieved.

The ICTS in coordination with the five DA-PCC regional centers in Luzon facilitated the installation of Virtual Private Network (VPN). Likewise, it continuously assisted in the deployment and maintenance of the newly enhanced Information System of the Electronic National Government Accounting System (e-NGAS) v2.01 to the PCC headquarters and regional centers and the introduction of the COA-led Budget System v1.0.

Regular updating of Symantec End Point Protection Server and Client-based anti-virus were conducted to ensure a virus-free Local Area Network (LAN). This also ensures protection to all computer units joined in the LAN- Active Directory from any fortuitous computer viruses.

# 2021 DA-PCC MILESTONE



## Development of the **Carabao Industry Roadmap**

The Carabao Industry Roadmap supports the One DA Reform Agenda on transformative interventions that will help consolidate, modernize, industrialize, and professionalize Philippine agriculture. It is a master plan that is inclusive, stakeholder-crafted and market-driven. It is designed to help improve farmers'

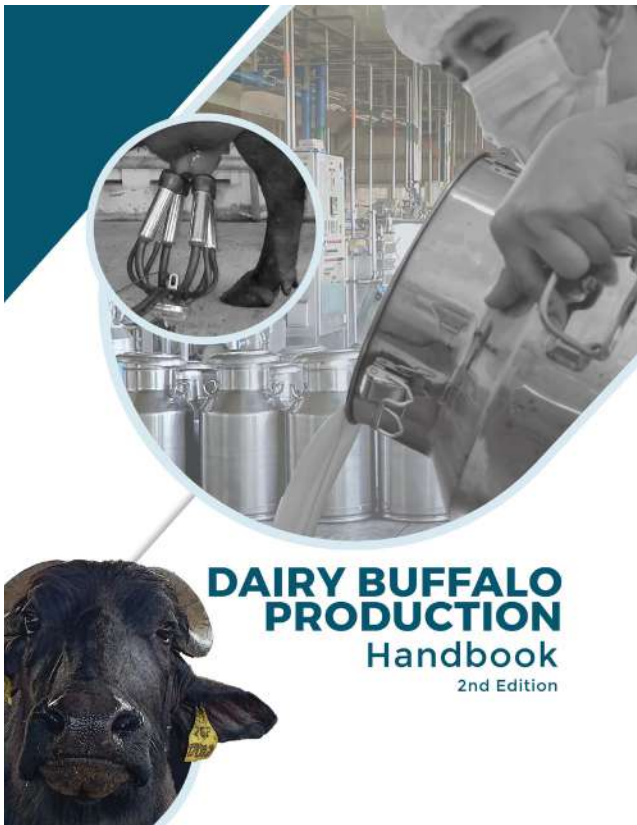
income, create jobs, and increase the number of carabaos in the Philippines to become self-sufficient.

It is a five-year plan that is geared towards accelerating herd build-up, increasing productivity and profitability of carabao-based enterprises, ensuring availability of safe and quality milk and meat products from genetically improved carabaos, and harnessing the niche market for carabao-derived products.

## Updating of the **Dairy Buffalo Handbook**

This handbook aims to provide sound, science-based standards to enhance the skills and confidence of the dairy buffalo farm manager in implementing practical yet relevant steps and processes to improve the performance, growth, production, and reproduction of dairy buffaloes.

It is a compilation of substantive, localized processes and options on dairy buffalo production based on the long years of experience of DA-PCC's technical experts and its network of regional centers. It will serve as a guide for the farm manager in screening for the appropriate breed, breeding and enhancing the herd's productive performance, feeding, managing its forage and pasture area, and managing the animals' and raisers' health. Furthermore, it provides the basic guidelines on recording and record-keeping, housing, herd operation, milk production, and waste management.





2021  
DA-PCC  
MILESTONE

## Creation of the *iHealth and iFodder mobile apps*

iHealth Application Developed to help extension officers (EOs) and field veterinarians diagnose carabao health conditions and diseases and provide farmers with appropriate recommendations that they can follow. The application will assess and present possible health issues and suggest actions that farmers can take to improve the health of the carabao/s.

The EOs can forward and send the appropriate interventions to farmers via SMS to facilitate easy information sharing. The application will also record data about the farmers and their carabaos to enable historical analysis.

iFodder Application Developed to help Nutritionist, EOs, Vet aides and farmers compute the appropriate and least cost feed composition for proper nourishment and optimum milk production of dairy buffaloes. The application will also load data on the Suggested Retail Price (SRP) of feed ingredients, which can be pulled from the online system.



CREATION OF  
**iFODDER & iHEALTH**  
MOBILE APPLICATIONS



The Philippine Carabao Center joins the  
**2021 National Women's Month Celebration**

In support of:



# GENDER & DEVELOPMENT PROGRAM

The DA-PCC recognizes the value of Gender and Development (GAD) in implementing its various programs and projects. Table 22 highlights GAD-related activities in 2021.

**Table 22.** GAD Accomplishment Report, CY 2021

Gender Issue/GAD Mandate	GAD Outcome/Results Indicator	Outcome/Result Performance	
		Target	Actual
<b>A. Client-Focused</b>			
Only few rural women have access to extension support, education and training services (ESETS)	Number of women clients provided with IEC materials	8899	10892
	Number of women clients provided with ESETS	34156	41626
Only few rural women have access to carabao production support services	Number of women clients provided with production support services	102316	167431
Limited documentation and recognition of the contribution of women and youth clients in the implementation of PCC programs	Number of women and youth clients recognized with stories documented	7	19
Few rural women clients have access to market development services	Number of women clients provided with market development services	4617	9472
<b>B. Organization-Focused</b>			
Provision of special leave benefits for women who have undergone surgery for gynecological illness pursuant to Section 19 of Magna Carta for Women and CSC Resolution 1000432 s. 2010 and Solo Parent Leave	Number of PCC women employees who availed of special leave benefits	1	1
Participation in the Annual Celebration of Women's Month in Accordance with RA 6949.	Number of participants attended	100	147
Low level of knowledge and appreciation of PCC personnel on GAD	Number of trainings conducted	6	6
Low level knowledge of PCC GAD Committee to conduct Gender Analysis and use of GAD tools such as GMEF and HGDG	Number of GFPS committee members participated of GAD seminars	21	21



**“Let us not make being a woman an excuse, what is important is that we can help our husband provide for the family.”**

**GRACE G. BOYLES**

Grace G. Boyles, 41, of Mabini, Bohol is a model dairy farmer. She joined the Mabini Dairy Multipurpose Cooperative (MADAMCO) and was granted with two American Murrah buffaloes. Five years later, she started milking the animals that are then producing an average of 4 liters of milk daily and sold at Php45 per liter. This became her family’s source of monthly income, which, usually, would average to Php5,000. Grace was then the only woman in the association who was milking her buffaloes.

Her grit qualified her to receive additional carabaos from DA-PCC until her herd grew from two head to 17. Coupled with the recommended breeding activities and good care and management, Grace’s income later hit Php27,000 a month. This gave her the leverage to finally convince her husband to support her in the business.

She has helped the community produce milk from an average of 4 liters a day to 80 liters a day. To her, being a woman should not be a hindrance to success.

# INTEGRATED MANAGEMENT SYSTEMS

The DA-PCC through its Management Systems Audit Office (MSAO) ensured that the established Integrated Management System (IMS) that has been certified to ISO 9001 (Quality Management System); ISO 14001 (Environmental Management System); and ISO 45001 (Occupational Health and Safety Management System) is maintained and effectively carried out.

In consonance with this, the office amid the pandemic managed to deliver the following:

1. successfully passing the re-certification audit on ISO 9001:2015, Quality Management System (QMS) and ISO 14001:2015, Environmental Management System (EMS) and transitioning from OHSAS 18001:2007 to ISO 45001:2018 or Occupational Health and Safety Management System (OHSMS) for its National Headquarters.

2. Complementing the above accomplishment are the following:

a. Sustained compliance to legal, regulatory and other requirements keeping the validity of necessary permits pertaining to environment and occupational health and safety;

b. Conduct of 2 batches of internal audit at PCCNHQ covering all areas. The audits were done purposely to check on the operating unit's compliance not only to the requirements of the three standards but to applicable legal, regulatory and other requirements (LOR) without compromising customer requirements;

c. Conduct of Foundation Course on QMS and EMS for the new members of Internal Audit Team with in-house resource person;

d. Effective IMS Internal Auditing Training for the new internal auditors with in-house resource person;

e. Continuous coaching to different Sections/ Units pertaining to the review and re-assessment of risks and opportunities for Quality, Environment, Health and Safety (QEHS) and corresponding control measures to mitigate the anticipated adverse impacts;

f. Conduct of 2 orientation sessions on IMS for general staff to ensure better internalization and contribution to the maintenance of IMS certification;

g. Participation to National Occupational Health and Safety convention;

h. Participation to webinar on "Establishing Safety in the Workplace".

Apart from overseeing the maintenance of IMS at the National Headquarters, the MSAO also assisted the PCC regional centers in their maintenance of certification to ISO 9001. Specifically, the following were accomplished:

1. Foundation training on QMS for PCC at La Carlota Stock Farm (LCSF);

2. Effective Internal Quality Auditing (IQA) Training for at Central Mindanao University (CMU);

3. Workshop on Root Cause Analysis and proper use of System Improvement Report (SIR) Form for PCC at University of Southern Mindanao (USM) and CMU.

These were done on top of the online consultation with the representatives of the six regional centers that have sustained their ISO 9001 certification.

# Sustained ISO Certifications

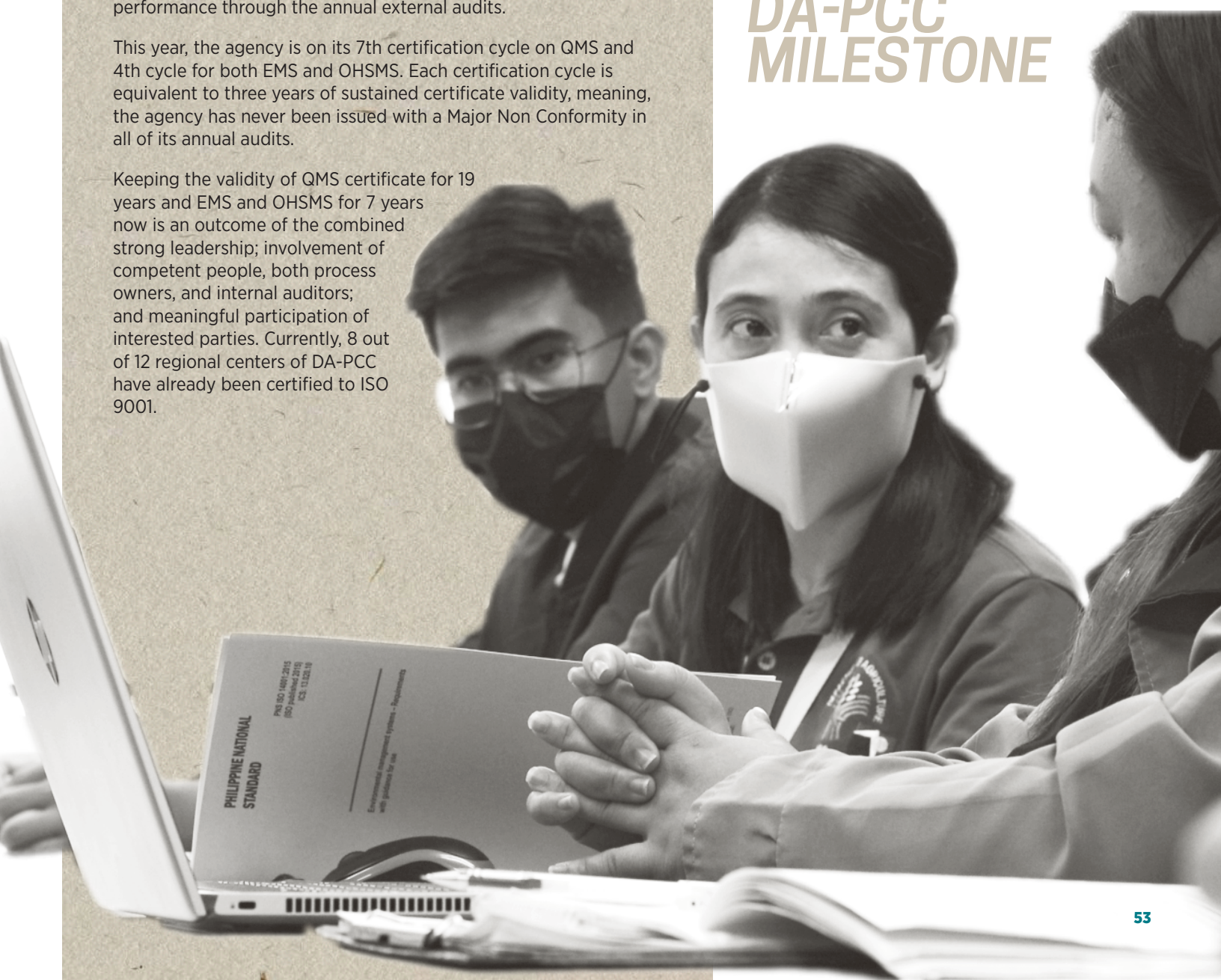
The DA-Philippine Carabao Center National Headquarters and Gene Pool (DA-PCCNHQGP) has been certified to ISO 9001 since 2003. Its commitment to create quality products and services expanded to the demonstration of ecological responsibility and prime concern for the health and safety of employees when the agency decided to integrate Environmental Management System (EMS) –ISO 14001 and Occupational Health and Safety Management System (OHSMS) - ISO 45001, all certifiable to the International Standards.

This made DA-PCCNHGP an IMS-Certified agency in 2012. Since then, the agency sustained its focus on the improvement of its overall management system and validating the effectiveness of its performance through the annual external audits.

This year, the agency is on its 7th certification cycle on QMS and 4th cycle for both EMS and OHSMS. Each certification cycle is equivalent to three years of sustained certificate validity, meaning, the agency has never been issued with a Major Non Conformity in all of its annual audits.

Keeping the validity of QMS certificate for 19 years and EMS and OHSMS for 7 years now is an outcome of the combined strong leadership; involvement of competent people, both process owners, and internal auditors; and meaningful participation of interested parties. Currently, 8 out of 12 regional centers of DA-PCC have already been certified to ISO 9001.

## 2021 DA-PCC MILESTONE



# HUMAN RESOURCE MANAGEMENT

The agency has 613 authorized personnel, of which 558 are filled while 52 are still unfilled (Table 23).

**Table 23.** Personnel Complement (As of Dec. 31, 2021)

Positions	FY 2021		
	Authorized	Filled	Unfilled
I. Permanent			
Key Positions	17	14	3
Administrative	16	13	3
Support to Technical	10	7	3
Technical	136	107	29
Total No. of Permanent Personnel	179	141	38
II. Job Order (JO)			
Administrative	112	110	2
Technical	263	251	12
Total No. of JO Personnel	375	358	17
Total No. of Institutional Contract of Service	59	59	0
<b>Grand Total</b>	<b>613</b>	<b>558</b>	<b>52</b>

## RECRUITMENT, SELECTION AND PLACEMENT

The agency's Human Resources Merit, Promotion and Selection Board (HRMPSB) continued to conduct the recruitment, selection and placement activity of the agency despite of the pandemic. The HRMS served as the secretariat of the HRMPSB and facilitated the conduct of screening of applicants virtually and in-person.

The HRMS was able to appoint 19 new permanent employees (plantilla position) and hire 60 Contract of Service (JO) staff assigned in the different operating units of the Agency (Table 24).

**Table 24.** Newly appointed, promoted, or recruited staff in 2021

No.	Name	Position Title	Plantilla Position
1	Liza G. Battad	Executive Director III	DA-PCC NHQ GP
2	Maria Dinah R. Loculan	Agricultural Center Chief IV	DA-PCC at USF
3	Thelma A. Saludes	Agricultural Center Chief IV	DA-PCC at UPLB
4	Ericson N. Dela Cruz	Agricultural Center Chief IV	DA-PCC at CLSU
5	Armando G. Racho	Senior Science Research Specialist I	DA-PCC at CMU
6	Rovina R. Piñera	Senior Science Research Specialist	DA-PCC at CSU
7	Excel Rio S. Maylem	Senior Science Research Specialist	DA-PCC NHQ GP
8	Edward C. Paragonson	Science Research Specialist II	DA-PCC at CLSU
9	Dorie D. Bastatas	Science Research Specialist II	DA-PCC at MLPC
10	Ibrahim S. Nasrola	Science Research Specialist I	DA-PCC at USM
11	Carlito F. Dela Cruz	Science Research Specialist I	DA-PCC NHQ GP
12	Paulene S. Pineda	Science Research Specialist I	DA-PCC NHQ GP
13	Teresita M. Baltazar	Science Research Specialist I	DA-PCC NHQ GP
14	Ramon R. Soliven	Science Research Specialist I	DA-PCC at CMU
15	Reynald DA. Amido	Science Research Analyst	DA-PCC at UPLB
16	Apolinario L. Salazar Jr.	Training Specialist III	DA-PCC at CLSU
17	Chrissalyn L. Marcelo	Project Evaluation Officer I	DA-PCC NHQ GP
18	Limuel B. Villazor	Administrative Officer III	DA-PCC NHQ GP
19	Aldrin P. Aricheta	Information Systems Analyst II	DA-PCC NGQGP

## STRATEGIC PERFORMANCE MANAGEMENT

The HRMS continued to monitor the submission of performance evaluation of all employees and facilitated through the Performance Management Team the request for target calibration of some operating units as well as concerns of employees in relation to their targets and accomplishments.

## LEARNING AND DEVELOPMENT

The HRMS supported the attendance of employees to relevant trainings and seminars using different online platforms (Appendix 5-Table 1). Likewise, it facilitated the request of three DA-PCC employees to undergo graduate

schooling to the Personnel Development Committee for evaluation and recommendation. The request was eventually approved by the Office of the Executive Director.

### **REWARDS AND RECOGNITION**

The HRMS served as the secretariat to the 2021 search for DA-PCC Best Employees. The HRMS and PRAISE Committee were able to conduct the selection and evaluation of nominees for the five categories (Best Center Director, Best Supervisor, Best Researcher, Best Development Officer and Best Support Staff).

The HRMS also facilitated the packaging and submission of the nominations for the 2021 Search for Outstanding Government Workers of the Civil Service Commission. Three nominations for CSC Pag-asa Award Category and one for Lingkod Bayan Category were submitted.

- |                               |                          |
|-------------------------------|--------------------------|
| 1. Dr. Ester B. Flores        | Pag-asa, DA-PCCNHQ       |
| 2. Ms. Anna Reylene J. Montes | Pag-asa, DA-PCC at UPLB  |
| 3. Dr. Eric P. Palacpac       | Pag-asa, DA-PCCNHQ       |
| 4. Dr. Claro N. Mingala       | Lingkod Bayan, DA-PCCNHQ |

All four won at the Regional Level and among them Dr. Ester B. Flores made it to the national level and bagged the CSC Pag-asa Awards for 2021.



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 PCC for FY 2021, specifically addressing the following critical areas of the agency financial management system:

**a. Fiscal discipline.** As a matter of policy, all operating units of the agency are expected to exercise due care and prudence in spending government funds. Effective measures were instituted to ensure prevention of excessive and unconscionable expenditures. All programmed expenditures are aligned to the strategic priorities of the agency.

**b. Fund management effectiveness.** Consistent with the public financial management reform roadmap of the government, the PCC has continued to enhance the adoption of the Unified Accounts Code Structure (UACS) system across the regional centers. The UACS provides a harmonized budgetary and accounting code classification that will facilitate the efficient and accurate financial reporting of actual revenue collections and expenditures of the center. The institutionalization of the UACS system across the PCC networks has improved the internal controls and risk management through streamlined and simplified financial reporting that redounds to the improvement of transparency and accountability in expenditure management. PCC implemented the electronic New Government Accounting System or eNGAS to its Central Office and regional centers.

**c. Operational effectiveness.** Enhancement of the engagement of the agency's program implementers/ the ground personnel/ frontline service provider in the budget preparation process was pursued in 2021. Consultative mechanism was introduced across partners and key stakeholders in the budget cycle as well during the implementation of the programs.

Budgetary requirements of the operating units of the center were provided on time and in accordance with the approved plans. Appropriate administrative policies, procedures and processes were also implemented to enhance transparency of operation and minimize lead time in the procurement of critical goods and services. Likewise, some strategies are being implemented in relation to the adoption of Cash Budgeting System.





# BUDGET AND FINANCE MANAGEMENT

## HIGHLIGHTS OF FY 2021 BUDGETARY EXPENDITURES

The DA-PCC is guided by its newly implemented 2020-2024 Medium-Term Strategic Plan, which is also known as VIPPS (Value Creation for Improved Productivity, Profitability, and Sustainability). We envision to have a robust Carabao Value Chain Development through the delivery of relevant services to the farmers, development of partnerships with stakeholders, and expansion of carabao-based enterprise impact models.

On VIPPS first year of implementation, the DA-PCC expenditures have been focused in further enhancing the existing genetic program of the agency that includes intensified production of quality frozen semen, cryobanking of genetic materials, and DNA-based screening of genetic defects in carabaos.

Artificial insemination (AI) is still one of the major services we deliver to carabao-based smallholders. As such, we engaged in capability-building of farmers as well as training of AI technicians to increase live births and decrease

mortality. Moreover, we supported this with researched-based solutions coupled with the integration of modern equipment and knowledge-based assistance through our scientists. All of these efforts have the end in view of implementing an organized and widescale delivery of extension and technology services.

Funds have also been utilized to support the carabao-based enterprise undertaking of the agency and to solidify partnerships with stakeholders for livestock development. We provided continuous support to multiplier business farms as well as created a value-chain portal to encourage convergence of ideas and strategies to make carabao-based enterprise as a viable business option.

To effectively manage program output and outcome at the sectoral level, PCC endeavored to conduct meaningful Research for Development (R4D) to provide solutions to pressing industry issues and problems. The R4D efforts are concentrated in genetic improvement, technology development, and carabao-based enterprises.

Collaborative projects have been implemented. We partnered with DSWD and DepEd to implement the milk supplementation program under RA 11037 to help address malnutrition and poverty alleviation.

Furthermore, we also inked partnership with the PCA, as we launched a two-year project named as Coconut-Carabao Development Project. The partnership hopes to increase the

income of coconut farmers through carabao's milk-based enterprises. The project complements the Milk Feeding Program of DSWD and DepEd which aims to improve the nutrition of Filipinos by making locally-produced milk readily accessible to the communities.

## FINANCIAL CONDITION

### SOURCES & USAGE OF FUNDS

The agency's 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 shown in Table 25.

Special projects are the receipts of research funds from various government agencies. Fund transfers from DOST-PCAARRD and DA-BAR are for various research projects in support of the carabao-based enterprises development and genetic improvement programs. This year, the agency received a total amount of PHP1.069 billion and PHP149.56 million for Milk Supplementation program from DepEd and DSWD, respectively. Likewise, the increase in budget is the funding requirement for the implementation of FY 2020 Locally Funded Projects with title "Establishment of Province-wide Carabao-Based Business Improvement Network (CBIN) amounting to PHP110,000,000.00 under FY2021 Continuing Appropriation. This was released through SARO no. BMB-E-2021-0000714 dated March 4, 2021.

Moreover, the DA-PCC received the allotment for the FY 2021 Locally Funded Project with title "Establishment of Carabao Dairy Centers" through SARO no. BMB-E-2021-0014333 dated December 31, 2021. This fund will become part of FY 2022 Continuing Appropriation of DA-PCC.

The agency's Statement of Financial Position at the end of FY 2021 is presented in Table 26. Total assets as of December 31, 2021 are PHP2,420.67 million comprising mainly of the agency's Property, Plant & Equipment (PPE), Biological Assets, and fund for the implementation of special projects. The significant increase of Current Assets account is because of the fund received from DepEd and DSWD amounting to PHP1,218.21 billion. However, the new standard for accounting for biological assets as per Philippine Public Sector Accounting Standards affected the increase in agency's biological assets. Likewise, there is a decreasing effect because of the transfer of animal ownership to farmer-beneficiaries, dropping of dead animals, and revaluation of the cost animals at fair value less cost to sell. Also, the decrease in Other Receivables account is because of the derecognition of accountability from various DA-PCC employees due to COA-granted decision from the relief of their accountabilities.

Total Liabilities and Accumulated Surplus posted PHP827.81 million and PHP1,592.86 million, respectively. The significant increase in Liabilities represents the funds received from DepEd and DSWD and the recorded due and demandable unpaid obligations reported under Accounts Payable account.

**Table 25.** DA-PCC Sources and Utilization of Funds as of December 31, 2021 (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>621.769</b>	<b>502.458</b>	<b>454.035</b>	<b>80.81%</b>	<b>90.36%</b>
Personnel Services	150.700	150.591	145.047	99.93%	96.32%
Maintenance & Other Operating Expenses	386.000	343.199	300.953	88.91%	87.69%
Financial Expenses	0.050	0.004	0.002	8.20%	48.78%
Capital Outlay	85.019	8.664	8.033	10.19%	92.72%
<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 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>

**Table 26.** 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>

## 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 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 27.** 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%)
<b>Total Current Operating Expenses</b>	<b>781.24</b>	<b>663.27</b>	<b>18%</b>
<b>Surplus (Deficit) from Current Operation</b>	<b>(580.52)</b>	<b>(514.25)</b>	<b>13%</b>
<b>Assistance and Subsidy</b>	<b>551.12</b>	<b>408.91</b>	<b>35%</b>
<b>Gain/(Loss) of Assets</b>	<b>(4.06)</b>	<b>(8.01)</b>	<b>(49%)</b>
<b>Surplus (Deficit) for the period</b>	<b>(33.46)</b>	<b>(113.35)</b>	<b>(70%)</b>

## 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 2021. This is the second time that the agency received this award. It was given during the FY 2021 DA Year-End Financial Evaluation and Assessment Workshop last March 9-11, 2022 held in Quezon City.



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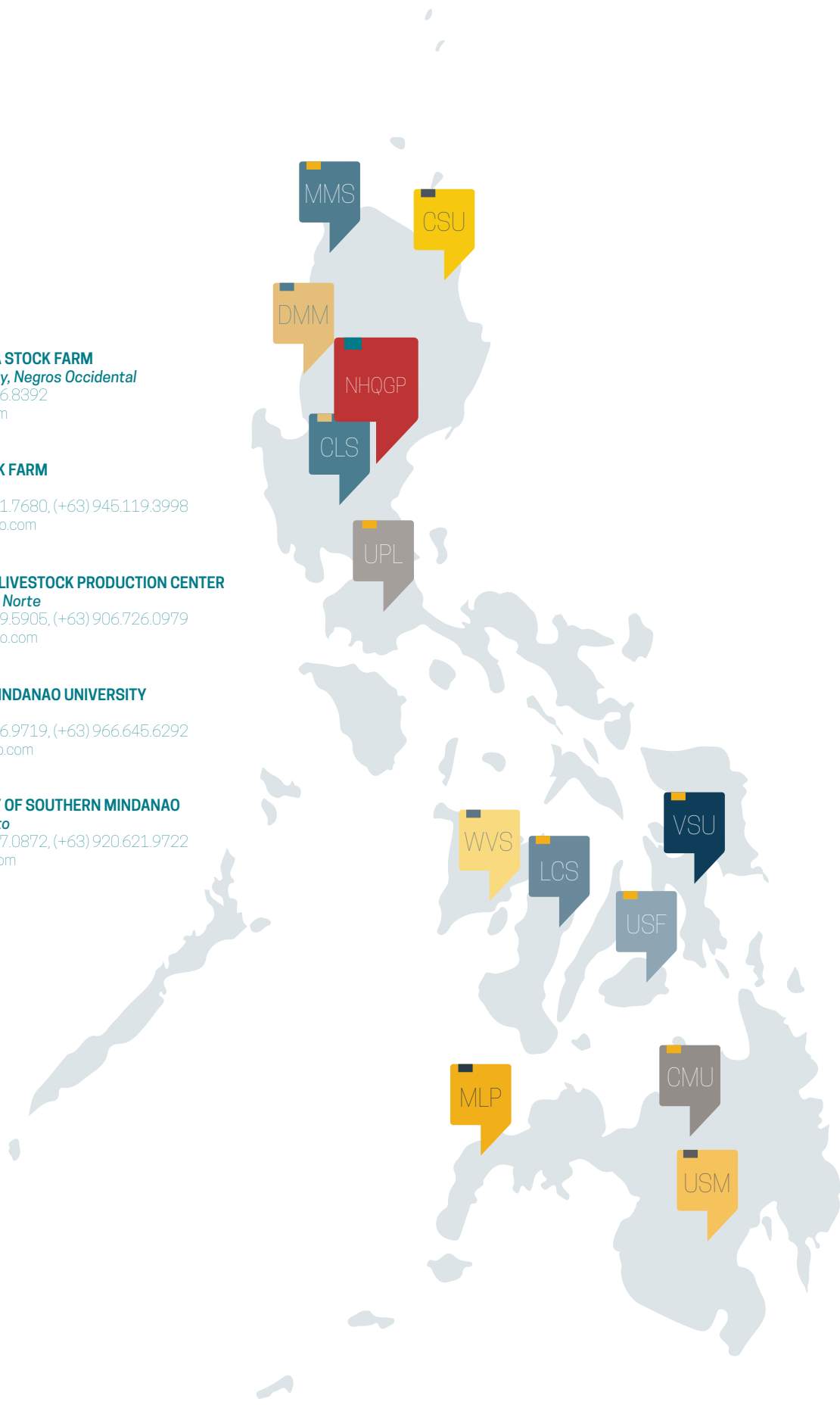
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