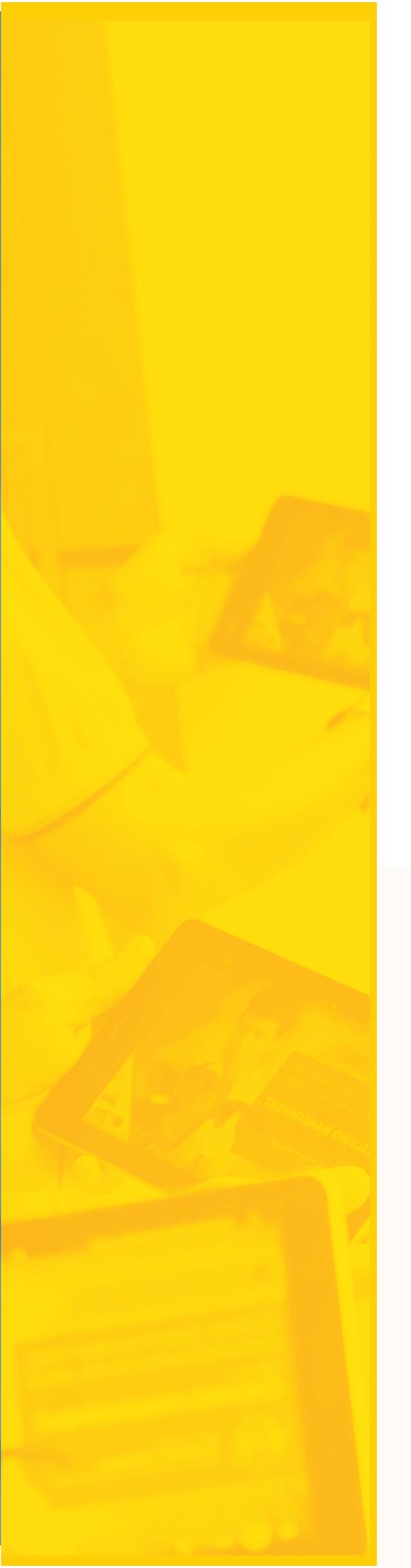


# 2020 ANNUAL REPORT

DEPARTMENT OF AGRICULTURE  
PHILIPPINE CARABAO CENTER

Rising Above Adversities:  
**Embracing the New Economy**



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# ABOUT US



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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.

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## Ensuring socio-economic empowerment for nation-building

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## VISION

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

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## 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

**61,997**

AI services rendered



**18,120**

calves produced out of AI services



**5,090**

bull services rendered to farmers out of the bull loan program

**122 hd**

bulls loaned out to farmers

**2,581**

calves produced out of bull services

**23,754**

calves produced out of AI services, Bull Loan Program and other sources



## CROSSBREEDING (UPGRADING) OF CARABAOS

The DA-PCC's GIP for native carabaos is implemented through the Artificial Insemination (AI) and Bull Loan (BL) programs, which serve as the major sources of upgraded or crossbred buffaloes in the rural areas.

## AI PROGRAM

Artificial Insemination or AI is the most effective breeding method used for widespread propagation of superior genetics. For DA-PCC, the use of AI in carabao aims to make it more productive since it is traditionally used for farm work. By upgrading, its utilization as a source of milk, meat, and hide makes it a more profitable commodity for farmers. However, despite the efforts of DA-PCC, the carabao population has been declining.

To help address this concern, AI services have been widely promoted and practiced mostly in the rural communities through the Village-based AI Technicians (VBAITs) in addition to the field technicians of the local government unit (LGU) and the DA-PCC.

Table 1 shows the three-year annual reports for AI services, whose main goal is to improve the genetics of carabao to develop specific traits such as increased milk production, good quality carcass yield, and increased efficiencies for growth, draft power, and hide. The total number of AI services have declined from 67,212 in 2018 to 61,997 in 2020 due largely to the Covid-19 pandemic, which restricted travels to the target sites to render AI services.



Enhancing productivity in terms of increased population of genetically improved carabaos that produce commercial volume of high quality milk and meat with high adaptability to local conditions as draft animal

**Table 1.** Artificial insemination services in 2020

Regional Centers' Hosts	2018	2019	2020		%
	AI Services	AI Services	Target	Accomplishment	
CSU	11,040	11,987	11,350	9,704	85.50
CLSU	10,366	11,000	10,002	10,910	109.08
UPLB	9,123	7,221	8,908	6,232	69.96
DMMMSU	5,245	4,187	5,056	6,250	123.62
USF	5,047	4,693	5,321	5,329	100.15
LCSF	4,825	4,573	5,126	5,793	113.01
CMU	4,378	3,957	4,293	3,260	75.94
VSU	4,342	3,626	4,701	3,150	67.01
WVSU	4,243	3,824	4,614	3,343	72.45
MMSU	3,695	3,123	3,696	2,892	78.25
USM	3,471	2,725	3,934	3,225	81.98
MLPC	1,437	1,353	3,025	1,909	63.11
<b>Total</b>	<b>67,212</b>	<b>62,269</b>	<b>70,026</b>	<b>61,997</b>	<b>88.53</b>

### SEMEN DISTRIBUTION FOR AI

The frozen semen distributed to various clientele (LGU, RFU, private groups) and DA-PCC Regional Centers was at least 159,487 doses resulting in 88.6 percent accomplishment. The distribution is demand driven or upon requests with 98 direct clients and 68 external clients served.

### NATURAL MATING (BULL LOAN) PROGRAM

The AI Program is complemented by the agency's Bull Loan Program, which aims at producing animals with improved productivity for milk and meat thru natural reproduction. Tables 2 and 3 present the number of bulls loaned out and monitored breeding services in 2020, respectively.

**Table 2.** Bulls loaned out to farmers in 2020

Regional Centers' Hosts/Other Service Delivery Units	Target	Accomplishment	%
CLSU	32	7	21.88%
CMU	20	12	60.00%
CSU	20	10	50.00%
DMMMSU	3	2	66.67%
LCSF	10	9	90.00%
MLPC	11	6	54.55%
MMSU	5	4	80.00%
UPLB	10	8	80.00%
USF	28	29	103.57%
USM	10	10	100.00%
VSU	29	8	27.59%
WVSU	10	10	100.00%
NIZ	14	7	50.00%
<b>Grand Total</b>	<b>202</b>	<b>122</b>	<b>60.40%</b>

**Table 3.** Natural breeding services by bulls loaned out

Regional Centers' Hosts	2019		2020		
	Accomplishment	%	Target	Accomplishment	%
CLSU	548	109.60	575	1157	201.22
CMU	36	51.43	100	95	95.00
CSU	232	40.70	151	387	256.29
DMMMSU	156	52.00	165	274	166.06
LCSF	38	19.29	200	43	21.50
MLPC	87	107.41	60	183	305.00
MMSU	210	105.00	220	258	117.27
UPLB	219	21.79	1,100	575	52.27
USF	553	122.89	636	883	138.84
USM	113	226.00	101	173	171.29
VSU	252	100.80	288	323	112.15
WVSU	80	48.19	166	739	445.18
<b>Grand Total</b>	<b>2,524</b>	<b>65.75</b>	<b>3,762</b>	<b>5,090</b>	<b>135.30</b>

## CALF PRODUCTION FROM AI AND BULL LOAN

Table 4 presents the number of crossbred buffaloes produced as a result of AI by technicians and natural services by loaned out bulls.

**Table 4.** Calves produced from AI services, Bull Loan Program, and other sources in 2020

Regional Centers' Hosts/Other Service Delivery Units	Calf Drop from AI Program		Calf Drop from Bull Loan Program		Other Sources		2020		
	2019	2020	2019	2020	2019	2020	Target	Accomplishment	%
CLSU	6,121	6,365	270	330	680	829	6,600	7,524	114.00
CMU	546	566	54	95	7	96	792	757	95.58
CSU	1,388	1,419	472	290	354	530	2,255	2,239	99.29
DMMMSU	1,476	1,436	44	89	40	1	1,320	1,526	115.61
LCSF	591	718	12	13	254	189	1,320	920	69.70
MLPC	373	409	43	119	0	37	528	565	107.01
MMSU	1,457	1,087	165	121	0	160	1,496	1,368	91.44
UPLB	1,595	1,351	703	489	210	38	2,305	1,878	81.48
USF	1,198	1,145	397	515	288	353	1,672	2,013	120.39
USM	749	715	97	118	9	131	880	964	109.55
VSU	761	730	167	100	169	295	880	1,125	127.84
WVSU	1,411	1,440	140	302	196	267	1,760	2,009	114.15
NIZ & GP	0	739	0	0	0	127	764	866	113.35
<b>Total</b>	<b>17,666</b>	<b>18,120</b>	<b>2,564</b>	<b>2,581</b>	<b>2,207</b>	<b>3,053</b>	<b>22,572</b>	<b>23,754</b>	<b>105.24</b>

## BREED DEVELOPMENT

### DAIRY BUFFALO BREEDING PROGRAM

In 2020, the GIP Laboratory (GIPL) continued the genetic evaluation with 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 2019 were included in the genetic evaluation run. There were 2,668 buffaloes in the pedigree file extending seven generations with 15,076 monthly milk test-day records as well as 9,104 and 8,985 fat and protein test day records, respectively.

Based on the MT-RRM model, there were 204 bulls with progeny performance and breeding values; 104 of which are island-born. The youngest bulls reported with progeny performance were born in 2012. Additional young bulls born in 2011 were added to the list. From the top 10 ranked bulls based on total merit index (combined EBVs for milk, fat, and protein yield traits) seven are semen donor bulls. The top two ranked bulls are among the youngest (Table 5). 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 5) and cows (Table 6) based on EBVs were reported to the concerned Centers during the GIP Coordinator's meeting and PMC Meeting in 2020. Top ranked cows came exclusively from NGP, CMU, VSU and UPLB herds. The top ranked cow in 2019 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 5.** Top 10 ranking riverine bulls based on daughter performance

ID	Sire	Dam	No. of Offspring	TMI	EBV Milk	EBV Fat	EBV Prot	Highest ranking daughter
2CM11032	2GP06055	2CM07044	8	103.9	988	81	40	2GP16167
2GP11080	2GP03026	2GP97023	8	103.4	863	67	36	2GP16068
2CM08066	2GP01102	2OS8255	8	103.2	797	72	32	2GP16085
2GP10003	2GP03026	2GP03004	18	103.1	784	63	33	2GP16116
2GP01102	MAPEL	2GP97103	67	102.9	736	66	29	2GP15113
2CM11002	2CM07007	2CM08036	10	102.6	650	62	27	2GP15142
2CM12021	2CM07036	2CM08001	3	102.1	623	44	25	2CM15050
2CM07036	2GP01102	2OS8255	7	102.0	603	41	24	2CM11047
BR092209	0	0	12	102.6	598	69	25	2GP17065
2UP10023	2GP99107	2UP98582	25	102.8	588	73	27	2GP17047

TMI - Total Merit Index, EBV - Estimated Breeding Value

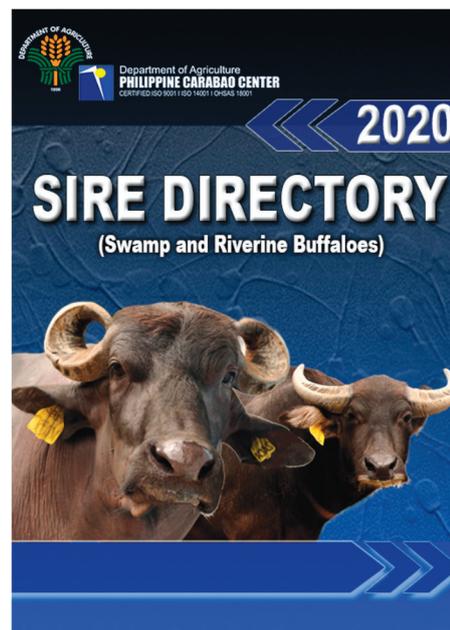
**Table 6.** Top 12 cows based on Estimated Breeding Values (EBVs)

ID	Sire	Dam	EBV Milk	EBV Fat	EBV Prot	TMI	Milk, kg	DIM	AMP	AAC Mos.
2GP16068	2GP11080	2GP10099	1076	72	43	104.0	1979.8	243 (On-going)	8.1	40.4
2GP15113	2GP01102	BR091960	916	69	37	103.5	2658.6	365	7.3	34.5
2GP17008	2GP11080	2GP14048	879	84	37	103.7	1353.4	222 (On-going)	6.1	32.6
2GP16085	2CM08066	2GP07066	848	82	36	103.6	1988.6	258	7.7	35.3
2GP16116	2GP10003	2GP12017	838	64	35	103.2	2038.5	291	7.0	34.4
2GP16167	2CM11032	BR090813	836	80	34	103.5	2197.3	337	6.5	28.7
2GP16129	2GP11080	BR090068	833	61	35	103.1	1791.3	243	7.4	35.4
2GP17065	BR092209	2GP10032	820	67	33	103.2	1230.5	154 (On-going)	8.0	27.5
2GP17042	2CM11032	2GP12108	815	61	33	103.0	883.6	167 (On-going)	5.3	30.3
2GP16106	2GP01102	2GP08095	814	59	33	103.0	1744.7	279	6.3	35.0

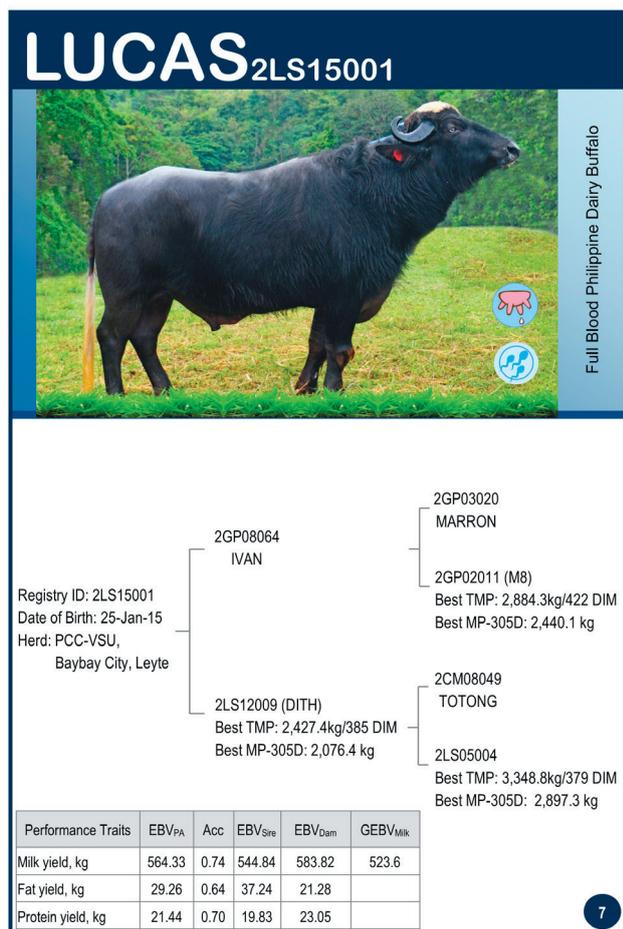
EBV - Estimated Breeding Value, AAC - age at calving

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 its printed copy (Figure 1).

**Figure 1.** Front cover of 2020 Sire Directory

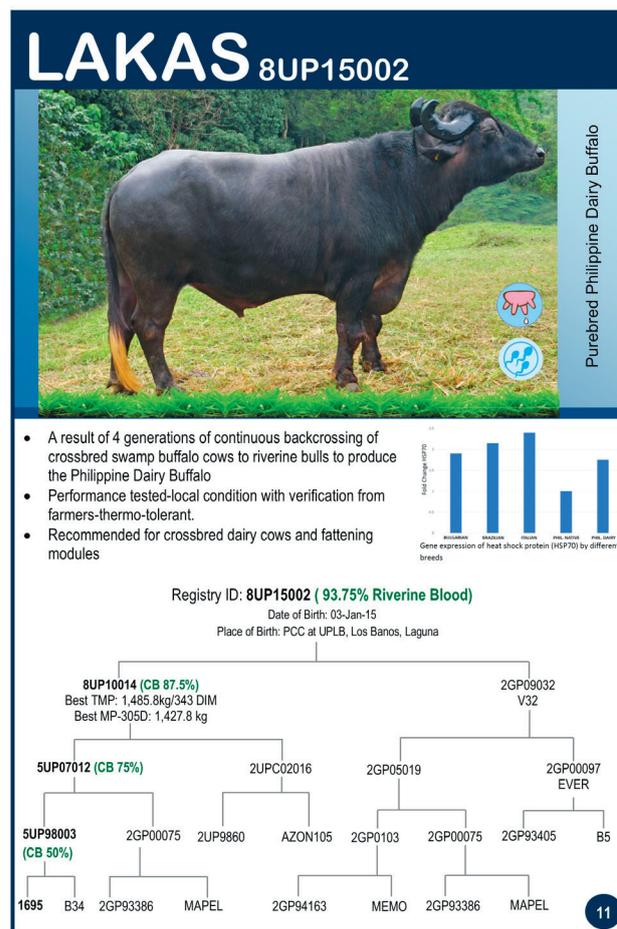


The 2020 Sire Directory edition features for the first time, the six genomically tested semen donor bulls (Figure 2).



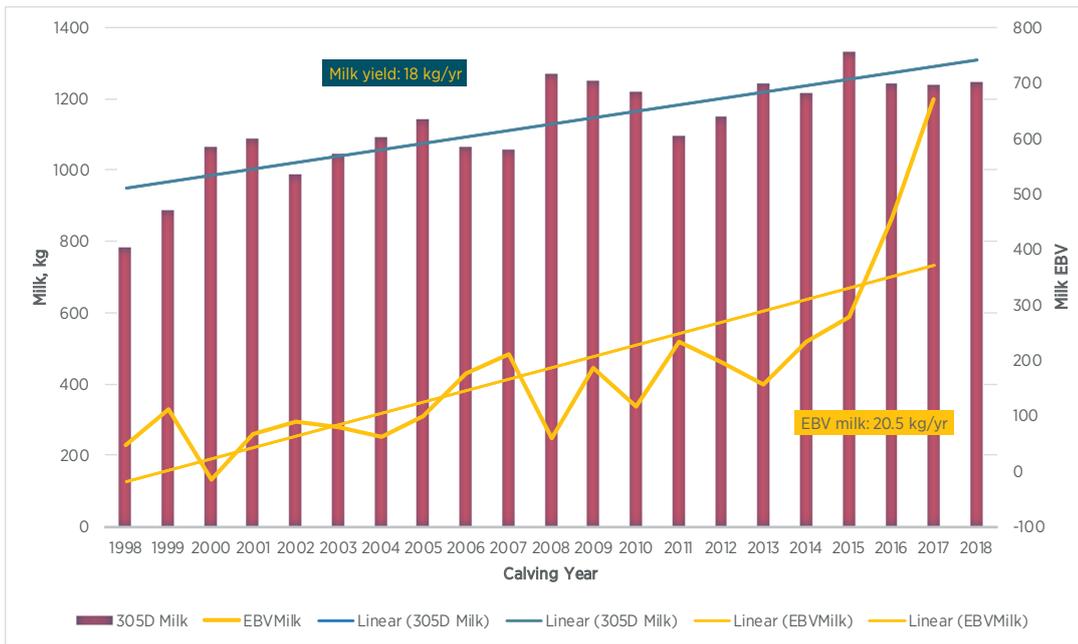
**Figure 2.** Lucas, one of the first genomically tested Philippine Dairy Buffalo bulls

Lakas, the first semen donor 94% backcrossed Philippine Dairy Buffalo is also featured in the 2020 Sire Directory (Figure 3). The bull is a product of continuous backcrossing of swamp buffalo females to riverine bulls. It combines the milk production potential of the riverine blood out of the GIP of DA-PCC, and the adaptability of the swamp buffalo blood. Lakas is highly recommended for use in dairy cooperatives with milking buffaloes including crossbred cows.



**Figure 3.** Lakas, the first 94% backcrossed Philippine Dairy Buffalo semen door bull

The phenotypic and genetic trend (Figure 4) for milk yield is positive as indicated by increasing average milk yield per cow per lactation and average estimated breeding value (EBV<sub>milk</sub>). The phenotypic trend is lower compared to the previous year, which was 19.5 kg/yr. The genetic trend is, however, significantly higher.

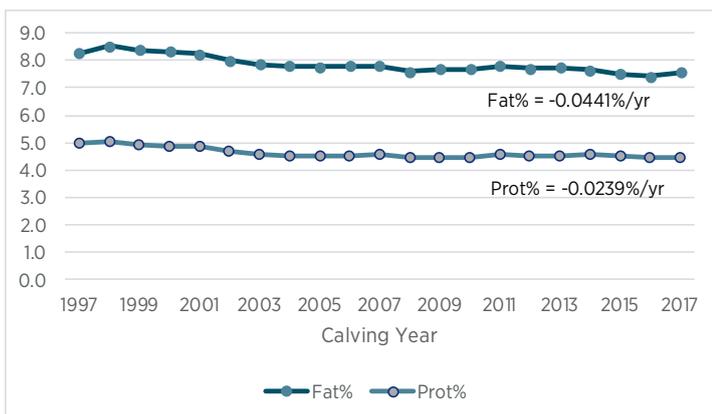


**Figure 4.** Average milk production per lactation and genetic trend of PCC dairy buffaloes plotted per calving year

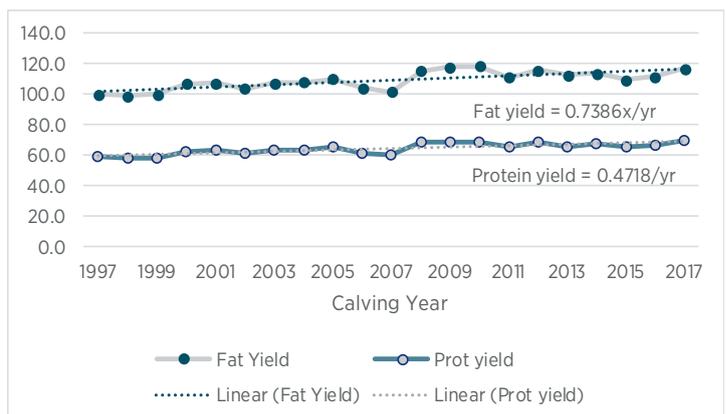
On the other hand, the average milk fat (Fat%) and milk protein (Prot%) percentages have been decreasing at a steady rate. (Figure 5A). However, the slow decrease in the milk fat and protein composition is not noticeable because fat yield and protein yield (Figure 5B) are increasing as a correlated response due to selection for higher milk yield. 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. TMI combines an individual's EBVs 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. In 2019, the daughters of these young bulls have started giving lactation performance and EBVs. The result of 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. Genetic trend for fat yield increased to 0.89 kg/yr in 2019 from 0.47 kg/yr the previous year (Figure 6). Response to selection for milk yield is still positive but slower than what was observed in 2018. This is to be expected, as more emphasis was given to fat and protein yields. However, a re-estimation of the weight on fat yield EBV may need to be reviewed given the big increase in response and the reduction in response to milk yield.

Based on parent-average EBVs, 16 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 16 young bulls' genomic breeding values (gEBV) and passing the semen quality evaluation.

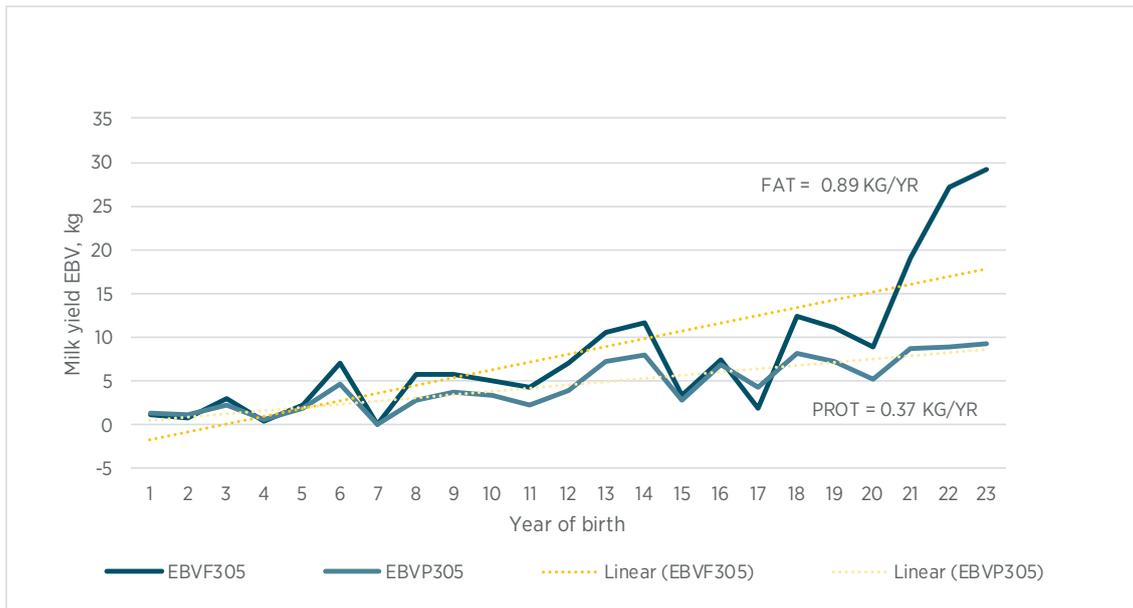


**A**



**B**

**Figure 5.** Average Fat%, Prot%, Fat Yield, and Protein Yield of Philippine Dairy buffaloes from DA-PCC institutional herds plotted per calving year



**Figure 6.** Average Estimated Breeding Values (EBV) of first parity Philippine Dairy Buffaloes plotted per calving year

## 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 in 2020. Data reported are all from male buffaloes from the National Gene Pool. 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 in swamp buffaloes. Initial results show that there are exceptional swamp bulls with large eye muscle area. The EMA measurements between swamp and riverine bull is shown in Figure 7. We find that for this particular swamp bull, the measurement is comparable with that of riverine bulls at 65cm<sup>3</sup>.

**Figure 7.** Ultrasound scan of eye muscle area of Enteng and Marco, a swamp and riverine bull, respectively

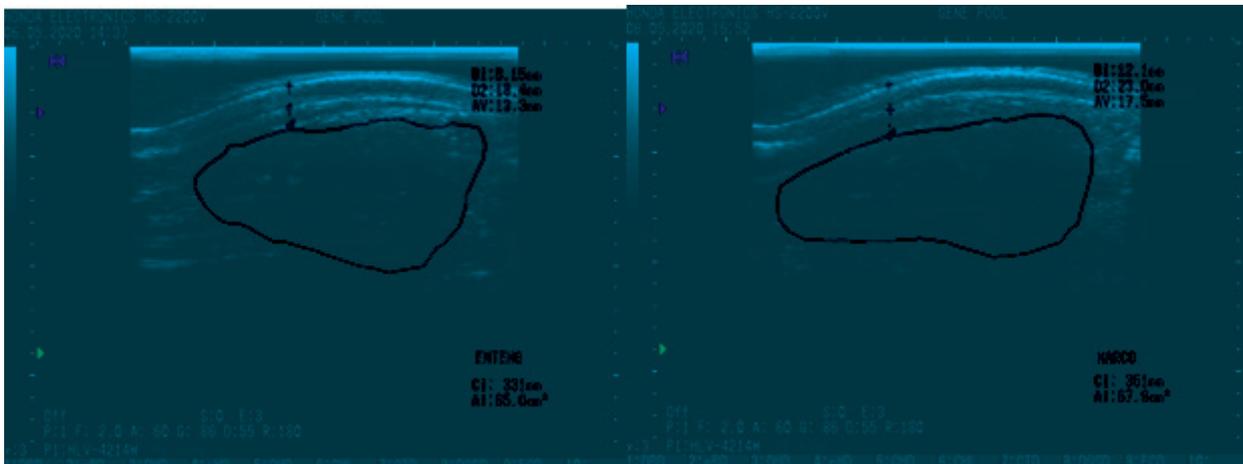


Table 7 presents the preliminary estimates of body weights, meat, and carcass characteristics of male riverine buffaloes. Slaughter age is between 24 and 36 months of age. Body weight, EMA and rib fat increases with age and appears to increase more with increasing age. However, the growth rate starts to decrease at about 24 months such that, this 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.

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 (Table 8). Heritability estimates obtained at various age categories showed moderate values. 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 mos. and 24 mos. at 0.92 indicates selection at younger age is enough. It may not be necessary to wait 24 months before selection. Thus, the preliminary estimates obtained are very encouraging for the breed development.

**Table 7.** Average body weight, ultrasound scan measure and carcass quality from male buffaloes in the National Gene Pool

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

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

**Table 8.** Genetic parameters obtained from running a multi-trait full animal model using ASReml software on body weights of male riverine buffaloes at Gene Pool

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

Multi-trait analysis between growth rate and EMA was also done at 12 and 18 mos of age. Genetic correlations were moderately high between and among traits (Table 9). 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 9.** 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 Gene Pool

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

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

## MILK TEST DAY RECORDING

### PERFORMANCE RECORDING AT THE INSTITUTIONAL HERDS

Monthly milk and milk components test day recording was not done regularly in 2020 due to the pandemic. Submission of milk samples to the laboratory from Visayas and Mindanao was discontinued starting the 2nd quarter due to absence of courier service.

There were eleven (11) institutional herds that submitted monthly milk samples from individual cows as part of their performance testing activity. The average milk test day performance of the various institutional herds is shown in Table 10.

Average test day milk yield, fat% and protein% were 5.5 kg, 6.8% and 4.2% respectively while in the previous year the averages were 5.5kg, 7.9% and 4.0% respectively. Thus, we see an increase in average values for protein% and a decrease in fat%. The highest average test day milk yield was by DA-PCC at UPLB at 6.5 kg. followed by NGP and USM at 6.2 kg and 6.0 kg, respectively. A very big decrease in average milk test yield observed from DA-PCC at VSU the previous year has now been reversed. On the other hand, the highest test day fat% was by the DA-PCC at CLSU followed by DA-PCC at LCSF with NGP dropping to third place. While these three herds had an average fat% more than 8%, DA-PCC at WVSU and DA-PCC at VSU only had an average of 5.0 and 5.6%, respectively thus, the overall average was lower

compared to last year. The overall test day protein% average increased to 4.2% compared to 4.0% last year.

It is expected that herds that are grazing will have higher milk fat and protein percentage as cows can have access to good pasture such as DA-PCC at USF with 7.5% average milk fat%. The high average fat% of NGP, DA-PCC at CLSU and DA-PCC at LCSF is not because their cows have access to pasture but is most likely due to good choice of quality forage given to the herd.

The average for the three milk components is not just a reflection of the herd performance but is also heavily influenced by the stage of lactation and parity of the herd as these is an average of all animals regardless of lactation period and age of cow. The average somatic cell count 160,800 cells/ml is a substantial decrease from the previous year at 246,000 cells/ml. This is below 200,000 cells/ml which is the industry standard. Unfortunately, 4 herds are above this standard cut-off value; DA-PCCs at MMSU, CMU, UPLB and MLPC. The DA-PCC at MMSU had 11% of milk samples that had more than 1M SCC/ml values followed by CMU, UPLB and MLPC at 9%, 5% and 4.2%, respectively. An aggressive mastitis control program should be implemented. Other herds seldom have very high scores.

**Table 10.** Average milk component parameters for 2020 monthly milk testing in different DA-PCC institutional herds

Center	N	Milk, kg	Fat, %	Prot, %	Lactose, %	SNF, %	TS, %	SCC	SCC above 200,000 cells/ml		SCC above 1,000,000 cells/ml	
									n	%	n	%
CLSU	179	5.1	8.4	4.3	4.8	9.9	17.9	108.2	23	12.8%	1	0.6%
CMU	100	5.3	6.6	4.1	4.8	9.8	16.4	315.7	14	14.0%	9	9.0%
CSU	49	5.6	6.5	4.2	5.1	9.9	15.6	71.6	2	4.1%	0	0.0%
LCSF	26	5.6	8.3	4.2	4.9	9.9	18.3	48.5	0	0.0%	0	0.0%
MLPC	24	5.4	6.1	3.7	4.9	9.3	15.6	327.3	3	12.5%	1	4.2%
MMSU	43	5.3	6.8	4.1	4.8	9.8	16.5	341.6	20	46.5%	5	11.6%
UPLB	60	6.5	6.8	4.4	4.7	10.1	16.9	304.5	16	26.7%	3	5.0%
USF	68	4.9	7.5	4.3	4.5	9.6	17.4	50.1	2	2.9%	0	0.0%
USM	56	6.0	6.3	4.1	5.2	10.1	16.6	42.1	1	1.8%	0	0.0%
VSU	28	5.3	5.6	4.2	4.7	9.7	15.5	39.6	0	0.0%	0	0.0%
WVSU	13	4.6	5.0	3.7	5.1	9.6	14.8	116.6	2	15.4%	0	0.0%
NGP	619	6.2	8.1	4.3	4.7	9.9	17.2	163.9	76	12.3%	11	1.8%
<b>Average</b>		<b>5.5</b>	<b>6.8</b>	<b>4.2</b>	<b>4.8</b>	<b>9.8</b>	<b>16.6</b>	<b>160.8</b>		<b>12.4%</b>		<b>2.7%</b>

# A2 MILK IS FOR EVERYONE

**A2-type milk is an immune-booster.**

Compared to A1 milk, A2 milk has A2 B-casein protein that helps ease digestion. It also strengthens the body with regular intake as nutrients and minerals are better absorbed. This is why A2 milk is regarded as a healthier choice. And it is good to know that the buffalo is a good source of pure A2 milk.

The study entitled “Screening for Genetic Polymorphism of B-Casein Gene in Different Breeds of Buffaloes (*Bubalus bubalis*) in the Philippines” determined that four breeds of buffaloes carry only A2 alleles such as Bulgarian Murrah Buffalo, Brazilian Murrah Buffalo, Italian Murrah Buffalo, and Philippine Native Swamp.

Due to the absence of A1 allele in buffaloes, production of A1 milk with beta-casomorphin-7 (BCM-7) is also prevented. The BCM-7 increases risk of diabetes, neurological disorder, and ischemic heart disease.

A2 milk can be identified through “A2 choice”, a DA-PCC technology. It is a “genotyping test for A1 and A2 beta casein variants in bovine and bubaline species that determine cattle and carabao’s milk type through the beta casein gene”.

A2 choice helps set apart A2 milk in the market which is saturated with cow’s (cattle’s) milk, which has A1 or combination of A1 and A2 B-casein.

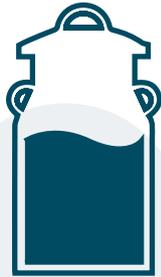
(Full story appeared in DA-PCC Bubalus Newsletter Vol. 3 No. 4)



# CARABAO-BASED ENTERPRISE DEVELOPMENT

**4,146,529.33 kg**

volume of milk produced across the PCC network



**4,685.96 mt**

volume of carabao-based products

The CBED Program showcases livelihood or income opportunities and economic benefits from raising carabaos through milk and meat and their by-products. The milk, in particular, contributes significantly to the improvement of the nutritional status of the farming families and at the same time creates market opportunities for the various value-adding products derived from it.

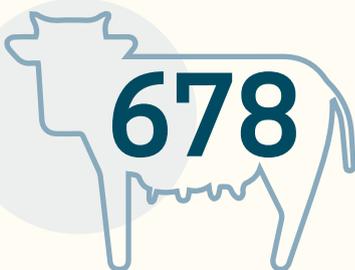
In 2020, DA-PCC-assisted groups and individuals produced 4,146,529.33 kg of milk (Table 11) and 4,685.96 metric tons of carabao-based products, which generated sales of Php421.037 million.

## PARTNERSHIPS FOR CBED

Table 12 presents major partnerships of DA-PCC with various agencies geared towards improving nutrition and enterprise development anchored on carabao's milk.

**34/29**

34 project sites covered in 29 provinces



**678**

dairy buffaloes (purebred and crossbred) entrusted to farmers in province-wide CBED areas

Forming a critical mass of farmers to engage in carabao-based enterprises and organizing communities of partners who see opportunities in supporting carabao-based enterprises and who proactively create positively reinforcing income-generating ancillary activities

**Table 11.** Total buffalo milk production in 2020

Regional Centers' Hosts/ Other Service Delivery Units	Institutional Herds (kg)	Herds Maintained by farmer-cooperatives (kg)	Total (kg)
USM	39,450.00	28,900.66	68,350.66
MMSU	20,089.85	32,045.50	52,135.35
VSU	22,630.63	68,192.55	90,823.18
CLSU	34,256.44	748,642.08	782,898.52
CMU	100,340.61	62,491.28	162,831.89
DMMMSU	-	75,367.15	75,367.15
MLPC	17,951.00	35,381.77	53,332.77
UPLB	44,113.20	499,956.50	544,069.70
WVSU	14,609.45	45,346.96	59,956.41
NIZ	-	1,715,534.00	1,715,534.00
USF	49,043.47	137,140.81	186,184.28
LCSF	13,855.40	24,611.81	38,467.21
Gene Pool	147,865.00	-	147,865.00
CSU	21,163.00	147,550.21	168,713.21
<b>Total</b>	<b>525,368.05</b>	<b>3,621,161.28</b>	<b>4,146,529.33</b>

**Table 12.** Partnerships in support of CBE

Partner-Agencies or Organizations	Nature of Partnership
Department of Education (DepEd) and Department of Social Welfare and Development (DSWD)	Memorandum of Agreement (MOA) for the implementation of the School-based Milk Feeding Program (SBMFP) per RA 11037 or the "Masustansyang Pagkain para sa Batang Pilipino Act". The agency also partnered with DSWD for the pilot nutrition and livelihood interventions through a milk supplementation program where DA-PCC-assisted dairy buffalo cooperatives fed 202,646 school and community children.
San Miguel Foundation, Inc.	Purchase of excess carabaos' milk from the farmer-dairy cooperatives affected by COVID-19, which were donated to poor communities and helped boost continuous milk production of dairy carabao entrepreneurs while ensuring their sustainable income. Another partnership with the foundation led to the donation of free flour to Catalanacan Primary Multipurpose Cooperative (CAMPC), a cooperative in Nueva Ecija assisted by the National Impact Zone (NIZ) monitoring team at the DA-PCC-OED, and Bohol Dairy Cooperative (BODACO), a cooperative assisted by DA-PCC at USF, for the production of Milkybuns to be fed also to the community and school children.
Municipal governments of Talavera, Cuyapo, and Pantabangan in Nueva Ecija	Community-based milk feeding program based on a 50:50 sharing scheme between DA-PCC and the LGU. This partnership was able to feed 2,891 community children with 200ml pasteurized carabao's milk and Milkybuns (carabao's milk-enriched bread) once a month from October to December 2020. The monthly delivery of milk products was also facilitated by DA-PCC through the use of the KADIWA Buffalo Milk on Wheels vehicle to ensure the quality of the products during transport.

Accelerating  
Livelihood &  
Assets  
Buildup

# ALAB KARBAWAN

Carabao-based Business Improvement Network

## PROVINCE-WIDE CBED

ALAB-Karbawan is an umbrella program initiative and popularized name for two province-wide CBED 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. ALAB is an acronym for Accelerating Livelihood and Assets Buildup, through CBED.

**CBIN Project.** The project aims to establish a robust carabao-based enterprise in recipient provinces through the entrustment of genetically superior dairy buffaloes, provision of processing and marketing equipment and facilities, and provision of capacity-building activities, and technical support services. The project is being implemented in 34 project sites covering 29 provinces in 12 regions. So far, the project has entrusted a total of 539 female crossbred buffaloes to farmer recipients in different provinces. Likewise, DA-PCC has entrusted a total of 139 buffaloes, including bulls, to further enhance herd build up in the provinces (Table 13).

The project capacitated a total of 487 farmers and LGU partners through the Farmer Livestock School on Dairy Buffalo Production (FLS-DBP), Social Preparation Trainings, and organizational and management trainings. The project sites in Pangasinan, Bataan, Albay, Palawan, Negros Oriental, Zamboanga del Norte, and Zamboanga del Sur were also installed with processing facilities and dairy market outlets.

Cooperative-partners were likewise engaged to supply milk and milk products in support of RA 11037 or the Milk Feeding Program. In 2020, more than 100,000 children benefited from the locally sourced milk produced by the said cooperatives. It is estimated that by 2021, more than Php50 million will be earned by the cooperatives, nationwide, through the Milk Feeding Program.

**CCDP.** This is a collaborative project between the DA-Philippine Coconut Authority (DA-PCA) and the DA-PCC, which aims to increase the income of coconut farmers by providing sustainable livelihood and business opportunities through dairy carabao enterprises. This will be achieved through the entrustment of dairy carabaos, provision of processing and marketing equipment and facilities, capacity-building activities, and technical support services.

The project also aims to ensure the availability of locally produced milk in support of RA 11037, or the Milk Feeding Program, thereby improving the health and nutrition of school children.

As of December 31, 2020, the Year 1 budget amounting to Php37,305,000.00 has been downloaded to the concerned DA-PCC regional centers. Preparatory activities have also been conducted to mobilize the provincial partners (Table 14).

**Table 13.** Number of animals entrusted for CBIN Project as of December 2020

REGIONAL CENTER	COVERED BY THE SENATE COMMITTEE ON AGRICULTURE, FOOD AND AGRARIAN REFORM'S FUND			DA-PCC INTERVENTION	Status	
	Project Site	No. of animals to be delivered	No. of animals delivered	BALANCE (No. of animals)		
DA-PCC at MMSU	Ilocos Sur	41	11	30	16	Obligated (for delivery)
DA-PCC at DMMMSU	Pangasinan	50	50	0	34	Completed
DA-PCC at CLSU	Dinalupihan, Bataan	30	19	11	10	Obligated (for delivery)
	Orani, Bataan	34	25	9	15	
	Tarlac	60	56	4	11	
DA-PCC at UPLB	Albay	50	0	50	3	Completed
	Palawan	50	0	50	11	
DA-PCC at LCSF	Negros Oriental	40	40	0	1	Completed
DA-PCC at MLPC	Zamboanga del Norte	60	60	0	2	
	Zamboanga del Sur	60	60	0	4	
DA-PCC at CMU	Misamis Oriental	51	36	15	22	Obligated (for delivery)
DA-PCC at USM	Davao Oriental	50	0	50	0	Obligated
	Davao del Sur	50	1	49	1	
	Davao de Oro	50	0	50	0	
	North Cotabato	50	1	49	9	
	South Cotabato	50	20	30	0	
Subtotal		776	379	397	139	
DA-PCC at WVSU	Antique (Cong. Legarda's Fund)	160	160	0	0	Completed
<b>Total</b>		<b>936</b>	<b>539</b>	<b>397</b>	<b>139</b>	

**Table 14.** Number of animals entrusted for CCDP as of December 2020

Regional Center	Project Site	No. of Dairy Carabaos to be Delivered	Status
DA-PCC at WVSU	Aklan 1	34	Awarded
	Aklan 2	34	
DA-PCC at LCSF	Negros Occidental (Sagay City)	34	
DA-PCC at USF	Ubay, Bohol	34	
DA-PCC at VSU	Leyte	34	
	Southern Leyte (Maasin City)	34	
	Biliran	34	
DA-PCC at MLPC	Zamboanga Sibugay	34	
DA-PCC at USM	South Cotabato	34	On-hold
Subtotal		306	
DA-PCC at UPLB	Oriental Mindoro	34	For rebidding
	Quezon 1	34	
	Quezon 2	34	
	Camarines Sur 1	34	
	Camarines Sur 2	34	
	Sorsogon	34	
DA-PCC at VSU	Northern Samar	34	
	Samar	34	
Subtotal		272	
<b>Total</b>		<b>578</b>	



**7 8 1 8 7\***

NUMBER OF INDIVIDUALS, MOSTLY CHILDREN AND SENIOR CITIZENS, WHO RECEIVED SACHETS OF PASTEURIZED CARABAO'S MILK AND MILKYBUNS FROM DA-PCC AT THE HEIGHT OF THE COVID-19 PANDEMIC.



**68,457L**  
MILK DISTRIBUTED



**2,960**  
MILKYBUNS  
DISTRIBUTED

# RESEARCH FOR DEVELOPMENT



Research and Development (R&D) helps propel the DA-PCC to work towards a better understanding of the foundation and dynamics of genetic improvement, animal health and nutrition, carabao-based enterprises, and the underlying socio-economic issues related to program implementation. The R&D agenda has been drafted and laid down since the agency's initial operations 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 DA-PCC's R&D shifted to a new paradigm, called R4D or Research for Development. The agency now works more on problem-oriented R4D, which has more relevance to the industry's stakeholders. Most recently, translations of R4D innovations into products and services have been aggressively pursued.

Various R&D sections under the Research and Development Division (RDD) of the agency performed services as summarized in the following:

## BIOSAFETY AND ENVIRONMENT SECTION (BES)

The BES carried out its Animal Health Monitoring Program amidst the COVID-19 pandemic. It prepared, organized and conducted virtual meetings and monitored 11 DA-PCC Regional Centers including the National Genepool (GP). The Livestock Biotechnology Research Animal Facility (LBRAF) at Saranay was also visited regularly by some staff. Routine testing was done in 2,733 samples (feces, blood, urine, etc.) from animals submitted by the animal owners/caretakers. The DNA of 2,320 whole blood and 183 urine samples were also extracted and subjected to molecular testing for Surra and Leptospirosis. Moreover 2,571 serum samples were also tested

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## Scaling up research for development (R4D) efforts focusing on increased farm productivity, increased adoption rate of farm-based practices, and product development

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for Brucella infection. Examination for parasites were also done in 2,254 whole blood and 637 fecal samples. All these specimens were collected by the Section and from walk-in clients.

Other technical services delivered by the Section include Tuberculosis (TB) testing for 879 water buffaloes, CAEV testing (nested PCR) for 197 goats, and California Mastitis Test (CMT) for 1,645 animals. In addition, BES performed prevention and treatments (Hemorrhagic Septicemia vaccination, Vitamin/Mineral Administration, Deworming, Antibiotic treatment, etc.) involving 2,346 animals. Overall a total of 3,806 animals were provided with Animal Health Services and assistance by the Section.

### REPRODUCTION AND PHYSIOLOGY SECTION (RPS)

The RPS supported the GIP 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.

In water buffalo, the team was able to conduct a total of 607 artificial inseminations (AI), of which, 303 were fixed-time AI, 141 were enhanced AI, and 163 were AI out of natural estrus. For pregnancy diagnosis, 924 services were carried out through transrectal-ultrasonography, 252 by rectal palpation, and 117 by Pregnancy-Associated Glycoprotein (PAG) assays. Areas covered were the National Gene Pool at the DA-PCC Headquarters; Ruminant Research Center in Saranay, San Jose City; ACDI Cooperator Farm, Lomboy, Talavera, Nueva Ecija; Buliran, San Antonio, Nueva Ecija, and other parts of the NIZ. For other livestock species, 91 animals were provided with reproduction-related services while 81 animals were

provided with health-related services.

Moreover, the team addressed the problems on non-performing and inactive bulls at the farmer cooperator areas. A total of 30 bull handlers were refreshed on proper bull management practices. Non-performing and inactive bulls (7) were treated, six of which are now performing and one was recommended for fattening and replacement. Of the six performing bulls, two are to be checked if their mating/services made will result to pregnancy. The absence of the update list of inactive and non-performing bulls and the limited movement caused by the pandemic has greatly hindered the expansion of the activities.

### PRODUCTION SYSTEM AND NUTRITION SECTION (PSNS)

The PSNS focused on research studies dealing with the application of biotechnology in improving the nutritional and physiological status of buffaloes. Recent research undertakings included forage production, preliminary establishment of seed bank, improvement of silage quality (Buro Booster) and addressing mineral deficiencies (BlockMate). Buro Booster is a lactic acid bacteria inoculant added to corn or sorghum silages to improve anaerobic stability and fermentation quality. Meanwhile, BlockMate is a multinutrient lick supplemented with legumes to reduce the concentration of urea in the feed supplement. This can cause a significant positive effect on rumen microbial growth, feed intake digestibility, live weight gain, growth rate, and milk production of water buffaloes. As of December 2020, the Section was able to produce a total of 30L of the Buro booster. Trademarks of these animal feed innovations are now being processed for protection at IPOPHIL with assistance by the DA-PCC-IP-TBM Office.

The Section has provided technical services and assistance to 441 clients and a total of 1,169,148 grasses and legume forage planting materials were distributed to farmers from different cooperatives, researchers from DA-PCC, students from state universities and colleges, clients from other government agencies, and private institutions. This effort was done to encourage farmers to establish their own forage area to support the daily nutritional requirement of their animals.

Moreover, 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 nutritional deficiencies of ruminants and other livestock species. A total of 10 clients submitted their samples coming from the DA-PCC Genepool, DA-PCC Regional Centers, and farmer cooperatives. This number was quite low compared to last year due to travel restrictions and lockdown brought about by the pandemic.

The RicestrawPh project team conducted capacity enhancement trainings for farmers, a webinar, and virtual farmers' field, which served as a platform to convey significant results and on how the farmers can adopt these technologies. It was attended by 70 people from different cooperatives, LGU personnel and representatives from DA-PCC Regional Centers. In addition, three hands-on or technology demonstration workshops on how to prepare urea molasses treated rice straw (e-Rs) were also hosted by the project team. Furthermore, the PSNS team led two lectures and hands-on training of farmers in Saranay and San Jose on urea molasses mineral block (UMMB) and forage production. The PSNS and project staff served as resource speakers during the said trainings and workshops.

## ANIMAL GENETIC RESOURCE SECTION (ANGRS)

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

### Cryobank Unit

This Unit continues to reach out and strengthen its linkages with various key players in the livestock sectors through conducting research, participating in scientific events, and publishing in local or international scientific proceedings.

The highlight of the completed Project on DABIOTECHR1506 shed light on understanding genetic diversity of Philippine Carabao (PC) (FY2015-2020). Two maternal lineages based on mitochondrial DNA and two clusters based on nuclear DNA were identified on the Philippine carabao populations. The results of this study will serve as a vital starting point in planning effective strategies and prioritizing the genetic

resources for PC conservation and management programs. In addition, this provides baseline information on PC's animal genetic resources (AnGR) that can be included in the medium-term plan for strategic ex-situ and in-situ conservation and management (FY 2021-2025).

### National Gene Pool (NGP) Farm

**Physical Inventory.** The NGP farm has an ending inventory of 494 animals as of December 31, 2020 (Table 15). There were 217 breedable females (2 years old and above) with an average A.I. conception rate of 39.64%. The farm was able to produce 127 buffalo calves (74 females, 53 males) at 76.48% calving rate and an average of 15.69 months calving interval.

**Table 15.** Animal Inventory as of December 31, 2020

Category	BMB	BrMB	Cattle	CB	Total
<b>FEMALE</b>					
Calves, < 1 yr. old	69				69
Heifer, 1-2 yrs. old	117	3	5		125
Heifer, >2 yrs. old	18	0	2	2	22
Cows, dry	81	14	9		104
Cows, lactating	85	6	3		91
<b>Subtotal</b>					<b>411</b>
<b>MALE</b>					
Calves, < 1 yr. old	48	1	1		50
Bulls, 1-2 yrs. old	24		5		29
Bulls, >3 yrs old		1	1		2
Vasectomized	2				2
<b>Subtotal</b>					<b>83</b>
<b>Total Population</b>					<b>494</b>

**Animals Released.** A total of 39 animals were released from the NGP in support of the agency's GIP. Of these, three animals were dispersed for Bull Loan program, 20 animals were given for Paiwi program, and six animals were sent to the National Bull farm as semen donors. Aside from this, 10 animals were given to farmers in San Jose City to support the refocused program of the agency in addressing those who were affected by the COVID-19 pandemic.

**Marketing of Buffalo-Derived Products.** The farm was able to produce 147,865 kg of raw milk for the year 2020. Around 90,275 kg of which was traded with value of Php9,509,710.00 (Table 16). The farm also produced a total of 2,704 bags of vermicast (50 kg/bag) through its waste management program and was able to sell 1,675 bags, valued at Php418,750.00.

**Table 16.** Monthly milk production

Month	Total Milk Production (kg)	Value of Milk Produced (Php)
January	17,449.00	1,046,940.00
February	16,200.00	972,000.00
March	15,224.00	913,440.00
April	13,874.00	832,440.00
May	12,457.00	747,420.00
June	9,897.00	593,820.00
July	8,614.00	613,150.00
August	8,685.00	607,950.00
September	8,504.00	595,280.00
October	12,103.00	847,210.00
November	11,958.00	837,060.00
December	12,900.00	903,000
<b>Total</b>	<b>147,865.00</b>	<b>9,509,710.00</b>

### Livestock Biotechnology Research and Animal Facility (LBRAF)

**Physical Inventory.** As of December 31, 2020, the LBRAF had an inventory of 83 animals, composed of 10 Italian Mediterranean Buffalo, 14 Native Carabao, four Brazilian Murrah Buffalo, and 55 Bulgarian Murrah Buffalo (Table 17).

**Table 17.** Animal inventory at the LBRAF

Category	BMB	BrMB	PC	ITMB	Total
FEMALE					
Calves, < 1 yr. old	1		1		2
Heifer, 1-2 yrs. Old			2		2
Heifer, >2 yrs. Old	4	3	11	7	25
Cows, dry					
Cows, lactating					
Subtotal					29
MALE					
Calves, < 1 yr. old					
Bulls, 1-2 yrs. old					
Bulls, 1-2 yrs. old	50	1		3	54
Bulls, >3 yrs. old					
Vasectomized					
Subtotal					83
<b>Total Population</b>					<b>83</b>

**Animals Released.** In 2020, 17 animals were released from the farm: seven animals were given to Bull Loan program recipients in Nueva Ecija, Bataan, and Zambales; seven were given to some farmers of San Jose City as part of the refocused program of the agency. A bull was transferred to DA-PCC at CLSU to be used as a breeder bull and one female animal to the NGP for breeding purposes.

## 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 of milk and other carabao-derived products for possible market promotions. For 2020, particularly at the height of the COVID-19 pandemic, most of the dairy buffalo farmers had surplus milk and encountered milk spoilage due to limited market. To address these concerns, the PDIS developed new carabao-milk based products with longer shelf life. These were the following:

1. Development of Yogurt from Buffalo Milk and Coconut Milk Blend (Nyogurt)
2. Development of Nutribun with Enhanced Nutritive Quality Using Carabao's Milk (Milkybun)
3. Development of Shelf Stable Carabao Milk Candies (Milk Pops)
4. Development of Retort Processed Sterilized Toned Carabao's Milk

Prototype of these products, namely Nyogurt, Milkybun, and Milk Pops were launched last July 23, 2020 during the 73rd PMC Meeting, which was attended by members of the PMC and representatives from DTI and DAR. Moreover, these three products were featured during the Virtual Technology Pitch Day held last November 27, 2020.

The Milkybun technology was transferred to various cooperatives and private entrepreneurs through conduct of hands-on trainings on Milkybun Production (Table 18).

**Table 18.** Training on Milkybun Production

Date	Participants/ Address	Number of Participants
Nov 5	Catalanacan MPC/ Science City of Munoz, N.E. (Batch 1)	4
	Bantog Samahang Nayon MPC (BSNMPC)/Asingan, Pangasinan	3
	Rosario Dairy Cooperative/ Rosario, La Union	1
Nov 6	Gabay ng Dios MPC/ Santa Rosa, N.E.	5
Nov 10	Kawanggawa PMPC/ Bongabon, N.E.	7
Nov 24	Eastern PMPC/ San Jose City, N.E.	3
	Chona Penalosa & Melanie Dource/ Guimba, N.E.	2
Nov 26	Catalanacan MPC/ Science City of Munoz, N.E. (Batch2)	6
<b>Total</b>		<b>31</b>

Two of the dairy cooperatives (CAMPC and BSNMPC), which were trained on Milkybun production, commercialized the technology and are now producing the Milkybun for the School-Based Feeding Program (SBFP) of the Department of Education (DepEd).

The Project on Retort Processed Sterilized Toned Carabao's Milk was conducted in partnership with San Miguel Yamamura Packaging Corporation (SMYPC), which has the retort facility for sterilization. Commercial run of the product will be conducted in 2021 at the SMYPC Beverage Plant in San Fernando, Pampanga for the DepEd and DSWD-funded Milk Feeding Program.

### **Support to Republic Act 11037 or “Masustansyang Pagkain Para sa Batang Pilipino Act”**

In support of the RA 11037, the DA-PCC facilitated the implementation of the DepEd-funded School Based Feeding Program-Milk Component in 14 regions (36 provinces) nationwide. For the year 2020, 30 DA-PCC-assisted dairy cooperatives were able to supply the milk requirements of 503,955 children or 26.12% of the total undernourished children from Kindergarten to Grade Six enrolled in public elementary schools (Table 19).

**Table 19.** Beneficiaries of DepEd’s Milk Feeding Program supported by DA-PCC-assisted farmer-cooperatives

Region	No. of Provinces	No. of Beneficiaries
I	4	75,517
II	2	44,776
III	6	97,428
IV A	5	67,960
IV B	2	7,284
V	1	4,446
VI	4	28,133
VII	2	53,920
VIII	1	11,648
IX	3	64,650
X	3	28,841
XII	1	13,474
CAR	1	4,249
CARAGA	1	1,629
<b>Total</b>	<b>36</b>	<b>503,955</b>

The DA-PCC focal persons on Milk Feeding Program provided technical assistance on aspects of proper and hygienic milk handling and processing to produce food safety compliant pasteurized toned carabao's milk. This Program has provided ready market for the milk produced by the dairy cooperatives, sustained their livelihood, and increased income during the pandemic.

### **Support to Republic Act No. 10611 or the Food Safety Act of 2013**

In support of the RA 10611 or the Food Safety Act of 2013, the PDIS provided extension-related activities on the Hygienic Milk Handling Practices and other Food Safety related standards through seminar-lecture series conducted by DA-PCC and other DA agencies (Table 20).

## 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 Carabao Development Program (CDP). In 2020, the team was able to develop and implement five research projects, two of which were already completed.

During the lockdown due to the pandemic, the team conducted initial impact assessment to determine the immediate effect of the COVID-19 pandemic on entrepreneurs along the dairy value chain and it showed the adverse effect of COVID-19 in the livelihood of the dairy farmers. Moreover, the team also led the technology transfer of the product innovated by the PDIS team, the Milkybun, a nutritious bread with a longer shelf life. To ensure that the recipient of the technology will be able to produce a quality product, trainings were conducted such as “Milkybun Production, Good Manufacturing Practices and Bakery Management Training”, and “Training on Packaging and Labelling of Milkybuns”. To date, Catalanacan Multi-Purpose Cooperative (CAMPC), one of the recipients of the technology, is now into commercialization of the product. They supply the demand for the feeding program of Region III.

## CARABAO BASED ENTERPRISE AND DEVELOPMENT SECTION (CBEDS)

The CBEDS is a newly created section under the RDD, which is composed of three units namely National Dairy Business Hub (NDBH), Business Development and Commercialization Unit (BDCU), and Processing & Marketing Unit (PMU).

**Table 20.** Learning events conducted in support of the Food Safety Act

Date	Title/Organizer	Participants	No. of Participants
Jan 9	Training on Milk Quality Evaluation and Processing (DA-PCC-CEDS)	Alalay sa Kaunlaran Inc. (ASKI)	6
Feb 6-7	Training on Milk Quality Evaluation and Processing (DA-PCC-CEDS)	Yamang Bukid Farm	4
Feb 27-28	Training on Milk Quality Evaluation and Processing (DA-PCC-CEDS)	SIPBU MPC	7
Sep 7	Cara-Aralan Webinar Series: Gabay sa Wastong Pag-aalaga ng Kalabaw: Hygienic Milk Handling (DA-PCC-KMD)	Online participants	41
Sep 25	Standard Seminar Series 5: Food Safety Related Standards for Dairy: Hygienic Practices in Processing of Milk and Milk Products (DA-BAFS)	Online participants	228
Oct 6-7	DA-PCC Research Innovations Webinar Series “Para sa Mataas na Ani at Kita ng mga Magsasaka” Program Title: Enhancing Milk Production of Water Buffaloes Through S&T Interventions Project 4: Milk Quality and Safety Assurance from Farm to Milk Processing Plant	Online participants	244
Dec 22	Seminar on Good Manufacturing Practices (GMPs) and Milk-based Enterprise (DA-PCC-PDIS)	Members of Co-op (CAMPC, SIPBU, Brothers Keepers MPC)	10
<b>Total</b>			<b>540</b>

**Table 21.** Name of Cooperatives, association, location, and number of newly released buffaloes and bulls

Name of Cooperative/Association	Location	Number of Animal(s) Released
A. Existing Organization		
1. Sustainable Carabao Owners of Palayan City	Palayan City	7
2. Caudillo Prutas at Gulay Producers Cooperative	Cabanatuan City	11
3. Eastern Primary Multi-Purpose Cooperative	San Jose City	15
4. Bongabon Dairy Producer Association	Bongabon	14
5. Delaen Agriculture Cooperative.	San Jose City	10
6. Catalanacan Multi-Purpose Cooperative	Science City of Muñoz	11
7. Cabisuculan PMPC	Science City of Muñoz	1
8. Licaong Agricultural Cooperative	Science City of Muñoz	8
9. Vega Agricultural Cooperative	Bongabon	6
10. San Carlos Agriculture Cooperative	Aliaga	1
11. Gabay sa Bagong Pag-asa ng Bungo	Gapan	13
12. Simula ng Panibagong Bukas MPC	San Jose City	5
13. Cinense Dairy Cooperative	Talugtug	8
14. Bibiclat Dairy Cooperative	Aliaga	13
15. Pao Producers Cooperative	Lupao	1
16. New Mamandil Dairy Cooperative	Talavera	1
17. Nag-iisang Masikap PMPC	Gen. Natividad	1
18. Sunbeam MPC	Talugtug	1
19. Bosque PMPC	Llanera	1
20. Ayos Lomboy Dairy Cooperative	Guimba	1
21. San Vicente Dairy Producers Cooperative	Llanera	1
Subtotal		130
No. of Bull Release		6
<b>Total</b>		<b>136</b>

## National Dairy Business Hub (NDBH)

**Entrustment of Purebred Dairy Buffaloes and Bulls.** In 2020, 136 female purebred buffaloes from the buy-back program and animal payment from the loaned animal in the NDBH were re-loaned to qualified members of the 21 partner dairy cooperatives, associations, and family modules under the Paiwi scheme. Likewise, six bulls were released to the different locations of Nueva Ecija for breeding and carabao upgrading. Table 21 shows the distribution of dairy buffaloes to the different cooperatives and association and family modules.

**Provision of Technical Services.** The DA-PCC provides various types of program and services to clients, specifically, the different types of animal health services such as treatment of sick animals, prevention and control of mastitis among lactating animals, and collection of blood and fecal samples for laboratory analysis. Other services to prevent the occurrence of diseases among animals are deworming, vaccination, and pregnancy diagnosis. Table 22 shows the type and corresponding number of services rendered by NDBH in coordination with Biosafety Unit and Nutrition Units.

**Table 22.** Program and services rendered by the NDBH Team in 2020

Types of Services	No. of Services Rendered
a. Animal health-related services	8,252
b. Pregnancy diagnosis	1,474
c. No. of confirmed pregnant animals monitored	718
d. No. of artificial inseminations conducted	723
e. Nutrition-related services	5,169

## Milk Production and Genetically Improved Carabaos

In line with the bountiful harvest and increase in income, as DA's twin objectives, the NDBH posted a total of 1,529,608.99 liters of milk production in 2020 with a traded value of Php114,023,337.70. It has also monitored and recorded the production of 739 genetically improved carabaos, valued at Php15,000.00 per head or a total of Php11,085,000.00. Essentially, the NDBH project had contributed an additional income to 50 cooperatives/associations and dairy farmers in Nueva Ecija with a total amount of Php125,108,337.70 (Table 23). The province of Nueva Ecija is now the major source and contributor of buffalo milk and genetically improved calves in the country.

**Table 23.** Milk Production, peso value (2020)

Source of Income	Quantity	Php
Milk production, liters	1,529,608.99	114,023,337.70
Calf production, no. of head (Php15,000/calf)	739	11,085,000.00
<b>Total</b>		<b>125,108,337.70</b>

## Milk Supplementation/Feeding Program

The RA 11037 or School-based Feeding Program is a continuing endeavor for the benefits of undernourished Filipino children. The feeding program that supposedly implemented for 2019 was successfully done in 2020.

Four cooperatives in Nueva Ecija were trained on the processing of toned buffalo's milk for the 98,293 undernourished pupils of 16 schools division offices of the DepEd in Nueva Ecija, Pampanga, Zambales, Olongapo, Tarlac, and Nueva Vizcaya. These are the Eastern Primary Multipurpose Cooperative, Catalanacan Multi-Purpose Cooperative, Licaong Agricultural Cooperative, and the Nueva Ecija Federation of Dairy Carabao Cooperatives (NEFEDCCO).

The cooperatives who participated in the program had generated substantial income as shown in Table 24. Moreover, the feeding program had created an impact in the marketing and selling of buffalo's milk in Nueva Ecija. It also promoted the buffalo's milk as an instrument in poverty alleviation and improving the nutritional aspect of the undernourished children of DepED. It has also created a regular source of income for the 36 milk processors, 35 delivery men, 12 drivers, 7 milk collectors, 28 employees and managers of the four cooperatives in Science City of Munoz, Sto. Domingo, San Jose City, and Talavera, Nueva Ecija.

**Table 24.** Income of the participating cooperatives

Name of the Cooperatives	Income Generated (Php)	Computed Return on Investment (%)
1. Eastern PMPC	782,404.84 as of Dec. 15, 2020	63
2. Catalanacan PMPC	1,708,921.13	35
3. Licaong Agricultural Cooperative	940,338.84	27
4. NEFEDCCO	4,440,316.02	110
<b>Total</b>	<b>7,871,980.83</b>	

## **Refocused Programs and Activities to Sustain Food Security amidst COVID-19**

The RDD's National Dairy Buffalo Business Hub (NDBH) Team led the implementation of the "Gatas, Gulay at Karne" (GGK) Project in helping the affected farmers during the COVID 19 pandemic. The project is in partnership with the City Government of San Jose City, Nueva Ecija. The project was launched on May 27, 2020 as one of the components of the Refocused Programs and Activities to sustain food security amidst COVID-19. 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.

A Memorandum of Agreement (MOA) was executed with San Jose City as the adopted area and partner in the implementation of the GGK project. The DA-PCC allocated a total of Php498,401.00 of support fund for the project. In addition, the agency also provided various types of vegetable seeds for backyard gardening. As a result, the project contributed 59,879 kilograms of different types of vegetables e.g., eggplant, pechay, ampalaya, string beans, mung bean, okra, tomato, green mustard, sweet potato, and corn with a total sales value of Php1,510,795.00.

The GGK project also assisted 50 dairy cooperatives and association during the lock down period when the dairy cooperatives were having difficulty in selling their milk production due to the declaration of the entire Luzon under the Enhanced Community Quarantine. The NDBBH supported the Kadiwa- Buffalo Milk on Wheels as a selling method, which generated total sales of Php754,554.60 from April 27 to May 29, 2020.

A study on "Socio Economic of Small Scale Buffalo Fattening project in Areas Affected by COVID 19" was conducted in partnership with the City Government of San Jose City, Nueva Ecija. The primary purpose of the study is to look into the viability of smallhold buffalo fattening as a possible enterprise model that can help raise the "Ani and Kita" of farmers affected by COVID-19 in Nueva Ecija. In view thereof, the agency released 13 head of buffaloes, ten of which are for fattening project for meat production and the remaining three are for dairying for the production of buffalo's milk. The study/project contributed 4,081 kilograms of buffalo meat in a 6-month fattening period.

### **Processing and Marketing Unit (PMU)**

In 2020, the Central Dairy Collecting and Processing Facility (CDCPF) received a total of 303,901.63 kg of raw milk, 57.26% of which was delivered by the dairy cooperatives and multiplier farms (Catalanacan MPC, Ayos Lomboy Dairy Producers Cooperative, Eastern MPC, Pulong Buli Primary MPC, SIPBU Dairy Cooperative, ACDI, Stephenhan Farm, Licaong Agricultural Cooperatives, Melchor Correa, Alejandro Villaviza) and 42.74% came from the DA-PCC's NGP dairy farm. A portion (23.92%) of the raw milk received was processed for delivery to Magnolia while the remaining raw milk (76.08%) was processed into various dairy products such as pasteurized milk, choco milk, non-fat milk, pastillas

de leche, white cheese, ice cream, yogurt, butter, toned milk, paneer, and mozzarella cheese. These dairy products were distributed to regular institutional buyers and resellers in Nueva Ecija, Metro Manila, Tarlac, Pampanga, Pangasinan, Bulacan, Aurora, La Union, Baguio City, Nueva Vizcaya, and Isabela. The CDCPF and Milka Krem have a combined annual gross income of Php52,896,207.00.

The CDCPF is into a toll processing partnership with private companies such as San Miguel Corporation (Magnolia Dairy), as part of market development assistance to dairy farmers and cooperatives. Also, the CDCPF provided toll processing assistance to our dairy cooperatives in Nueva Ecija in the production of pasteurized toned milk for the Milk Feeding Program.

### **Intellectual Property–Technology Business Management (IP-TBM) Project**

The implementation of the DOST-PCAARRD-funded IP-TBM Project coupled with the establishment of its Office at the DA-PCC, is hugely supportive of the recent effort of the agency to manage the technologies and products generated from its R&D activities. In its two years of operation, a growing consciousness of scientist and researchers on the importance of protecting and commercializing their technologies and innovations has become evident in the organization. Seminar orientation on the basics of IP, claim drafting, and going through actual IP application at IPOHIL are some of the foundational demonstrations of IP management program implementation at the DA-PCC. The IP potential evaluation and technology valuation are the main activities related to the institutionalization of Technology Transfer through commercialization, along with other modes, such as technology deployment and extension services. The said activities are part of the pathway towards full translation of the DA-PCC's R&D program to various innovations for the benefits of its clients, industry, and the general public.

On IP protection-related activities, important accomplishments are IP applications at IPOPHIL namely: one Patent application, six Utility Models, and six Trademarks/ Tradenames for protection. There are also four technology applications filed with the assistance of Technology Application and Promotion Institute (TAPI).

The culminating activity of the IP-TBM Project was the holding of Technology Commercialization Seminar (November 18-19) and Technology Pitch day on November 27, 2020. The seminar facilitation was led by Dr. Lily Ann Lando, an external expert and training facilitator, and was participated in by junior researchers-inventors of DA-PCC. The seminar was highlighted by Technology Pitch wherein nine DA-PCC product innovations namely: Buro Booster, Blockmate, e-Ricestraw, Verisire, A2 Choice, Prolipig, Nyogurt, Milkybun, and Milk Pops were presented and promoted virtually. Potential technology takers or investors were also invited during the Pitch day. The DA-PCC likewise participated in the National Technology Pitch Day, dubbed as: "Inventors meet Investors" together with other 15 Member-Projects of the IP-TBM Program.

## COMPLETED AND ONGOING RESEARCHES

Amid the pandemic, the DA-PCC has continued conducting researches in various disciplines and particular thematic areas as determined under the agency’s R4D Agenda. It is complemented by relevant researches that explore and address problems or issues that are being encountered in the course of the agency’s implementation of the CDP.

In 2020, 32 researches were completed while another 73 were still being conducted (Table 25 and Appendix 1 Tables 1a, 1b and 1c and Appendix 2). Some of these researches were also presented in the agency’s Evaluation of On-going Researches and DA-PCC R&D Symposium held at the DA-PCC National Headquarters.

**Table 25.** Type, number, and status of researches

Thematic Areas	Completed	Ongoing
Production Management System	3	13
Biosafety	4	10
Genetic Improvement Animal Genomics/ Genetic Diversity and Cryopreservation	4	12
Reproductive and Cryopreservation Techniques	13	18
Product Development		9
Enterprise Development		2
Socio-Economics Dimension of CDP	6	6
Technology Transfer	1	1
Environment and Climate Change		
Industry and Policy		
Institutional Development	1	2
<b>Total</b>	<b>32</b>	<b>73</b>

### R&D Symposium

For the past several years, the DA-PCC’s R4D in-house review has been held as a monitoring and evaluation tool that ensures alignment of R4D efforts with the R4D Agenda. It is a continuing activity that demonstrates and recognizes the DA-PCC’s research initiatives. Likewise, it helps create opportunities for researchers and scientists to present their notable accomplishments, and more importantly, to interact and share learnings with one another.

Evaluation of ongoing researches was held on August 17 to 20, 2020 wherein 37 researches were presented and evaluated while the R&D Symposium was held on December 3-4, 2020 wherein 15 completed researches were presented and evaluated. The researches presented covered the thematic areas on biosafety, genetic improvement-reproductive biotechnology, genetic improvement – animal genomics, socio-economics, production management system, product development, and technology transfer.

Three experts were tapped to serve as panel of evaluators, namely, (1) Dr. Virginia M. Venturina, Dean of College Veterinary Science and Medicine, Central Luzon State University; (2) Dr. Ericson N. Dela Cruz, Officer-In-Charge of Planning and Information Management Division, Philippine Carabao Center; and (3) Dr. Annabelle S. Sarabia, retired Agriculturist / former Chief of RDD, DA-PCC.

Several awards were given during the activity. The completed research paper entitled “Comparison of Progeny Testing and Genomic Selection Breeding Schemes in Dairy Buffalo” presented by Dr. Jesus Rommel V. Herrera garnered the Best Paper Award and the Best Presenter Award. Special award of Most Number of Paper Presented during the R&D Symposium was also given to DA-PCC at UPLB and DA-PCC at VSU. 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 (Table 26).

**Table 26.** Awards received by DA-PCC Employees during various R&D Symposia

Awardee	Award
Dr. Daniel L. Aquino	Best Paper Award during the CLSU In-House Review
Dr. Emerson P. Tapdasan	Best Paper Award in Agriculture and Fisheries Cluster during the CVAARRDEC
Dr. Jesus Rommel V. Herrera and Dr. Ester B. Flores	Best Paper, Completed Research during the DA-PCC In-House Review
Dr. Gabriel Alexis Tubalinal / QuickCare Team	People’s Choice Award during the DA-PCC Technology Pitch Day
Victorino A. Mayo, Jr. / BlockMate Team	3rd Place during the DA-PCC Technology Pitch Day
Teresita M. Baltazar / Nyogurt Team	3rd Place during the DA-PCC Technology Pitch Day
Sherwin D. Matias / Prolipig Team	2nd Place during the DA-PCC Technology Pitch Day
Pauline S. Pineda / A2Choice Team	1st Place during the DA-PCC Technology Pitch Day

## CONFERENCE PRESENTATIONS AND 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). There were 10 research papers published in refereed journals while 1 paper was included in scientific proceedings (Appendices 3, Tables 2 and 3).

## TECHNICAL SEMINARS CONDUCTED AND/OR FACILITATED

The RDD has also conducted or facilitated series of Technical Caucus/Seminars on various topics with the help of concerned section or unit (Table 27). 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.

**Table 27.** List of Technical Caucus/Seminars conducted

Date	Title and/or Topic Presented	Resource Speaker
February 12	Technology Valuation for Commercialization	MS. JAN CZARINA M. SALAS Project Evaluation Officer I, PIMD, DA-PCC MS. PAULINE MARAMAG Financial Analyst, BDCU, DA-PCC DR. ESTER B. FLORES Supervising Science Research Specialist, ABGS, DA-PCC
February 12	Women Empowerment for the Inclusive Development	DR. KHIN MAR CHO International Agriculture, Food and Nutrition Specialist Cornell University, New York, USA
June 15	S&T Seminar on Impact Assessment of Covid-19 on Carapreneurs' Livelihood and Food Security	MS. MA. THERESA R. SAWIT Senior Science Research Specialist/Head, Socio Economics and Policy Research Section, DA-PCC
October 16	DA-PCC RESEARCH AND INNOVATIONS WEBINAR SERIES	People's Choice Award during the DA-PCC Technology Pitch Day
	"Para sa Mataas na Ani at Kita ng mga Magsasaka"	
	Project 1. Development of Feeding Protocols and Practices to Support the Nutritional Requirements of Dairy Buffaloes	DR. DANIEL L. AQUINO Center Director / Animal Nutritionist DA-PCC at CLSU
	October 17	DR. EDWIN C. ATABAY Scientist I, DA-PCC
October 17	Project 3. Development of Health Care Technologies and Practical Farm Practices in Support of Increasing Buffalo Milk Production	DR. CLARO N. MINGALA Scientist III, DA-PCC
	Project 4. Milk Quality and Safety Assurance from Farm to Milk Processing Plant	MS. MINA P. ABELLA Head, Product Development and Innovation Section, DA-PCC
	November 16 to 17	DR. ANNABELLE S. SARABIA Agriculturist/Retired Chief of R&D, DA-PCC
November 16-17	Virtual Technology Commercialization and Pitch Seminar	MS. ABIGAIL B. GUECO Senior Science Research Specialist DOST-Technology Transfer and Promotion Division DR. LILY ANN D. LANDO Motivational Coach/Training Facilitator, CORE Consulting and Development
December 3	Guidelines in the Certification of Eligibility of Non-DOST S&T Personnel under RA 8439, as amended by RA 11312	DR. DIANA L. IGNACIO Assistant Secretary for Human Resource Management Services and Special Concerns, Department of Science and Technology
December 3	Changing Mindsets: Research to Innovations	DR. LILY ANN D. LANDO Motivational Coach/Training Facilitator, CORE Consulting and Development

## OTHER ENGAGEMENTS RELATED TO R&D

The agency has also engaged with both local and international agencies for the conduct of R&D-related programs and activities, as described below.

- MOA between DA-PCC-Philippines and Taiwan Livestock Research Institute – Republic of China on December 3, 2020
- Cooperation in the Field of Agriculture between Philippines and Bangladesh on October 10, 2020
- Alyansa ng Maggagatas Katiwala ng Pilipinas Incorporated (ALMAKAP) Project on Sustainable Supply of quality Corn Silage on September 7, 2020
- Philippine Family Farmers’ Agriculture Fishery Forestry Cooperative Federation (AGRICOOH Federation) on September 1, 2020. The project is about “Establishment of the Nueva Ecija Sustainable Dairy Hub” with the objective of operationalizing a Dairy Hub Model thru conduct of feasibility study, setting-up cooperative dairy business hub structure, formulating strategic and operational plans, development management and governance practices and resource generation.
- NDA, DA-PCC, Agriterra, and AgriCOOPh Federation on September 25, 2020. The project entitled is about development partnership in “Improving the Dairy Value Chain in the Visayas regions through Grow coop. This is to ensure the development of cooperative enterprises and growth of its members.

# ALPAS SA COVID-19

AHON LAHAT, PAGKAING SAPAT KONTRA COVID-19



## ULaP UNLAD LAHI PROJECT

### COMPONENTS

Provision of animals, incentives and/or technical and veterinary services to displaced farmers and carabao owners ▪ Incentives to VBAlTs ▪ Crop-forage integrated system for both food and feed production with technical, mechanization and market support

### OBJECTIVES

Increase milk and meat production, job creation and providing livelihood for displaced farmers

### BENEFICIARIES

Displaced farmers, village-based AI technicians (VBAlTs), carabao owners



## COVID CREATING OPPORTUNITIES THROUGH VALUE INNOVATIONS AND DEVELOPMENT

### COMPONENTS

Rolling out of technologies and innovations on food production, processing, and value-adding ▪ Impact assessment on the effects of COVID-19 to carapreneurs

### OBJECTIVES

- Enhance food productivity, availability, accessibility and sustainability through applicable technologies and value innovations
- Create livelihood opportunities thru value adding interventions to provide income for farmers affected by COVID-19 crisis

### BENEFICIARIES

Carabao owners, farmers' cooperatives, village-based technicians, and other stakeholders



## GGK GATAS, GULAY AT KARNE

### COMPONENTS

Clustered Vegetable and Livestock-Forage Production ▪ Market assistance ▪ Logistical support/farm mechanization assistance

### OBJECTIVES

- Promote integrated urban agriculture or mixed farming system in the villages
- Create livelihood opportunities as source of income in areas affected by COVID-19
- Enhance food and feed production, availability and sustainability of supply
- Ensure the value chain approach

### BENEFICIARIES

Farmer's cooperatives, associations or groups



## CARA-ARALAN

### COMPONENTS

e-learning or webinars focused on farm solutions ▪ Learning modules in video format ▪ Digitized IEC and training materials ▪ Multimedia promotions related to COVID, ULaP, GGK, etc. ▪ Communication support services

### OBJECTIVES

- Sustain access to information, education, and communication (IEC) by farmers, carapreneurs, and other carabao industry value chain actors
- Contribute to capacity development of farmers, carapreneurs, and other carabao industry value chain actors

### BENEFICIARIES

Carapreneurs in impact zones, cooperatives, associations or groups, other value chain players

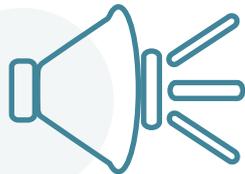
# KNOWLEDGE MANAGEMENT



**2,422**

identified DA-PCC stakeholders, visitors, clients, and partner institutions who received various knowledge products from the KMD-ACS

**129**



exposures, through articles and photo stories, on various media platforms such as social media, TV, radio, print, website and others



**1,249**

farmer-trustees of cooperatives and associations in Nueva Ecija trained in coordination with the KMD-LECS and NIZ

**998**

participants including 67 extension workers, 352 farmers, 23 LGU representatives, 85 students, 187 teachers, and 284 agri-enthusiasts trained on Dairy Buffalo Production through the 100-day SOA

**53%**

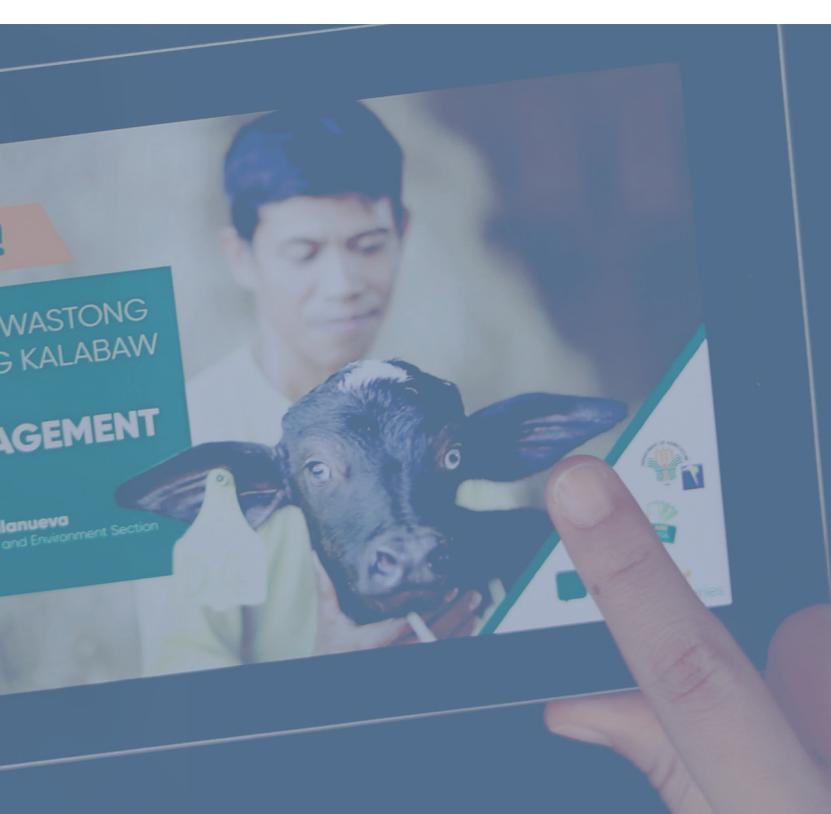
utilization rate of technologies adopted by farmer-trainees

## SUSTAIN MASSIVE INFORMATION AND COMMUNICATION CAMPAIGN

The DA-PCC through the Knowledge Management Division's (KMD) Applied Communication Section (ACS) spearheaded the development, production, and distribution of the following:

### Knowledge Products and Other Information, Education, and Communication (IEC) Materials

- 6 (bimonthly) issues of CaraBalitaan (Newsletter for the National and Regional Impact Zones written in Tagalog)
- 4 (quarterly) issues of Bubalus Newsletter (written in English)
- 4 (quarterly) issues of Karbaw Magasin (written in Tagalog)
- 1 planner and one Farmers' Calendar highlighting DA-PCC's commitment to the "New Thinking" for carabao value chain players
- 1 magazine featuring Milka Krem's milky delights
- 5 special iASK series: Urea-Molasses-Treated Rice Straw, Total Mixed Ration, Blockmate, Feeding Management, and Proper Milking and Milk Handling
- 1 manual on artificial insemination
- 1 brochure on Milk Quality Assurance



Expanding a base of informed clientele-farmers and partners through continued access on readily available knowledge products developed for enhanced learning

- 2 IEC materials were produced for the Farmers Livestock School on Dairy Buffalo Production: FLS Session Guide and Technical Handouts
- 45 audio-visual materials for aggressive promotion of various components of CDP
- 5 learning modules in video format developed for the ICT-based extension project
- 3 audio-visual presentations on government-funded activities such as Ahon Lahat, Pagkaing Sapat Kontra COVID-19 (ALPAS-COVID-19) interventions and Accelerating Livelihood and Assets Buildup (ALAB) Karbawan projects (Carabao-Based Business Improvement Network and Coconut-Carabao Development Project)

A total of 44,495 copies of IEC materials were distributed by the KMD to 2,422 identified PCC stakeholders, visitors, clients, and partner institutions.

### Other Media Forms

The KMD has facilitated 19 media exposures in diverse news platforms (TV, Radio, Press, Online, and Social Media) and has uploaded 69 articles to the PCC website and popular social media (Facebook). It also uploaded 17 photo story series of carapreneurs who managed to remain resilient and rise above adversities, which may inspire others to follow suit and 24 photo testimonials of carapreneurs on how DA-PCC has helped them improve their lives.

## ENHANCING SKILLS OF SMALL FARMERS THRU LEARNING EVENTS

### Training and Webinars

The PCC's National Impact Zone (NIZ) coordination unit facilitated 16 trainings and webinars, which were participated in by 1,249 farmer-trustees of cooperatives and associations in Nueva Ecija.

- a. Face-to-Face Training Topics (with physical distancing and COVID-19 related protocols)
  - Social Preparation
  - Choco Milk and Pastillas Making
  - Milk Quality Testing and Milk Processing
- b. Webinar Topics
  - Calving Management
  - Best Practices on AI and Breeding
  - Kwento at Kwenta sa Kalabawan ni Juan
  - Forage Production and Conservation
  - AI and Pregnancy Diagnosis
  - Basic Financial Management
  - Wastong Paraan ng Paggagatas at Pangangasiwa ng Aning Gatas
  - Hygienic Milk Handling Practices
  - Mga Karaniwang Sakit ng Kalabaw
  - Proper Housing for Calves and Adults
  - Feeding Management
  - Animal Health Program
  - CCDP Facilitators' Orientation Program

## **Farmer Livestock School on Dairy Buffalo Production (FLS-DBP)**

Since 2017, the DA-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 2019, the Learning Events Coordination Section (LECS) under the KMD facilitated five FLS-DBP season-long (34-week) sessions involving participants from Iba, Zambales; Solsona, Ilocos Norte; Dapitan, Zamboanga Del Norte; Pagadian City, Zamboanga Del Sur; and Dasol, Pangasinan. A total of 168 participants were trained during the conduct of these learning events.

Some 53% utilization rate of introduced technologies by farmer-participants in the FLS-DBP was recorded.

### **School-on-the-Air**

To continuously disseminate the DA-PCC’s programs, services, and technologies on dairy buffalo production, the DA-PCC at Central Luzon State University together with the DA-Agricultural Training Institute (ATI) Regional Training Center III, Provincial Veterinary Office, and Municipal Agricultural offices, joined forces in the radio broadcast of the School on-the Air (SoA) on Dairy Buffalo Production targeting smallholder carabao keepers in Region III, particularly Bataan.

The 100-day SoA (webinar-type) was aired over 91.1 Sikat FM Bataan and simultaneously broadcasted via the Facebook page of DA-ATI RTC III from March 25, 2020 to June 29, 2020.

A total of 998 participants (enrollees) graduated from the SoA, which included 67 extension workers, 352 farmers, 23 LGU representatives, 85 students, 187 teachers, and 284 agri-enthusiasts.

The SoA earned a 4.24 (Very Satisfactory) rating from the participants.

### **Assistance to Visitors and Customers’ Satisfaction**

Through the KMD’s LECS, a total of 717 scheduled and walk-in visitors were received, oriented on the DA-PCC’s programs and services, and toured to the DA-PCC’s facilities. The LECS earned a satisfaction rating of 4.94 (5 as the highest rating possible).

## INFORMATION MANAGEMENT SYSTEM

The Information and Communication Technologies Section (ICTS), through the approved Information System Strategic Plan (ISSP) 2018-2020 from the Medium-Term Information and Communications Technology Harmonization Initiative (MITHI) fund, facilitated the development and operationalization of the Carabao Development Program Workstation System (CDP Workstation) in coordination with the Operations Unit and the Office of the Deputy Executive Director. The ICTS, together with the KMD, collaborated with Grameen Foundation in the implementation of the Phase 1 of the Extension Advisory Services Information System (EASIS) Project. The ICTS also assisted in the development of the Animal Genetic Resource Information System (AnGRIS).

The ICTS has continuously enhanced the online Major Final Output (MFO) dashboard as a means to measure the agency’s physical targets and budget utilization.

Virtual environment in the local area network (LAN) using PROXMOX platform was acquired to seamlessly handle the active directory in a virtual and remote facility as well as hardware monitoring of the server remotely in the LAN.

Likewise, the Section has continuously enhanced and upgraded several desktops, central processing units (CPUs) and laptops, servers at the DA-PCC operating units/section and regional centers with the assistance of MITHI fund. The acquisition and upgrading of computers and other ICT peripherals have 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), as mandated by the Data Privacy Commission, Microsoft Windows 10 32 and 64-bit Operating System and Microsoft Office 2019, Microsoft Exchange 2019 were also achieved.

The ICTS continuously assists in the deployment and maintenance of the newly enhanced Information System of the Electronic National Government Accounting System (e-NGAS) v2.01 to the DA-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 LAN. This also ensures protection to all computer units joined in the LAN-Active Directory from any fortuitous computer viruses. The ICTS also helped in facilitating the agency’s virtual meetings and events realizing the need to improve the bandwidth and interconnectivity with these kinds of activities.







# GENDER AND DEVELOPMENT PROGRAM

The DA-PCC recognizes the value of Gender and Development (GAD) in implementing its various programs and projects

## GAD GOAL #1

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

- 1 Conduct Gender Sensitivity Training or GAD Orientation for both internal and external clients; Conduct consultation with GAD expert; Participation to National Women's Month celebration

**Conduct of Survey on Gender Sensitivity (100 women participants)**
- 2 Design and implement project (Admin and RDD including infrastructure) that integrate gender dimension and use GA tool(s)

**11 CBIN project sites that integrate gender dimensions**
- 3 Conduct review of existing IEC materials and Knowledge Products to ensure use of gender-fair language

**4 issues of Karbaw Magasin, 4 issues of Bubalus Newsletter and 6 issues of Carabalitaan, and 5 How-to-learning videos**
- 4 Conduct of interview with clients, preparation of write-ups, and printing of materials

**4 issues of Karbaw Magasin, 4 issues of Bubalus Newsletter, 6 issues of Carabalitaan, Farmers' Calendar, planner, Pagsusuri sa Kalidad ng Gatas brochure and 5 how-to-learning videos**
- 5 Enhancement of sex-disaggregated database management system

**Enhancement of databases being used to farmer-clients' database in major programs (CBED database & MFO Database)**



## GAD GOAL #2

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

- |   |   |  |
|---|---|--|
| 1 | Increased number of women who have access to technologies and services on the production support services | <b>6,038 women recipient of production support services and given access/information to technologies</b> |
| 2 | Increased number of women who have access to market development services                                  | <b>279 women assisted, participated, given linkage to market development services (MDS)</b>              |
| 3 | Increased number of women who have access to extension support, education and training services           | <b>3,931 women participated, provided &amp; given access to ESETS conducted by DA-PCC</b>                |

## GAD GOAL #3

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

- |   |   |  |
|---|---|--|
| 1 | Increased participation of women clients in the planning of DA-PCC programs   | <b>19 women participated in the planning/consultation session conducted by DA-PCC</b>                                |
| 2 | Increased documentation and recognition of the contribution of women and youth clients in the implementation of DA-PCC programs | <b>7 youth participated, contributed &amp; being recognized as partners in the implementation of DA-PCC programs</b> |
| 3 | Increased participation of women clients in the monitoring and evaluation of DA-PCC programs                                    |  |



# INTEGRATED MANAGEMENT SYSTEMS

The agency's Management Systems Audit Office (MSAO) endeavored to sustain compliance to International Standards for its Quality Management System (ISO 9001:2015), Environment Management System (ISO 14001:2015), and Occupational Health and Safety Management Systems (OHSAS 18001:2007).

## At the National Headquarters and Gene Pool

- Maintained validity of certificates for ISO 9001:2015; ISO 14001:2015 and OHSAS 18001:2007 by:
  1. conducting Internal Audits on all processes to measure its performance including the quality of both products and services;
  2. holding of Management Review Meeting to determine appropriateness of Policies, extent of achievement of Objectives and discuss issues that affect the performance of Integrated Management Systems. The meeting had also become the venue to review and re-assess the risks and opportunities at the agency and business process (Section/Units) level.
- Compliance to applicable Legal and Other Requirements (LOR) such as:
  1. For the employees:
    - a. Mandatory drug testing; and
    - b. Annual Physical and Medical Examination to ensure a healthy workplace
  2. For the facilities:
    - a. maintained validity of the following:
      - License to Operate from Food and Drugs Administration;
      - Permit to Operate for 6 standby gensets
      - Permit to discharge hazardous wastes (including

effluents)

- In preparation for transition to ISO 45001:2018 from OHSAS 18001:2007, MSAO facilitated the conduct of awareness sessions on the requirements of the new ISO Standard with internal auditors and Section/ Unit Heads;
- In collaboration with HRMS, established documented control measures for the mitigation of COVID 19 in the workplace.

## At the DA-PCC Regional Centers

Despite the pandemic, the MSAO has continued to assist the Regional Centers in the maintenance of their certification to ISO 9001:2015 by conducting:

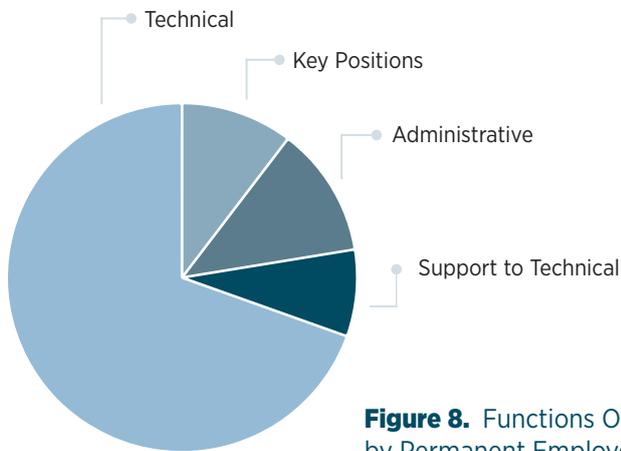
1. Virtual workshops on Risks and Opportunities Assessment with DA-PCC at UPLB; DA-PCC at LCSF; and DA-PCC at USF
2. Virtual Effective Internal Quality Auditing training to DA-PCC at UPLB; DA-PCC at LCSF; and DA-PCC at USF
3. Virtual internal quality audit to DA-PCC at CSU
4. Coaching sessions with DA-PCC at CMU; DA-PCC at LCSF; and DA-PCC at USF

Efforts of the four Regional Centers namely DA-PCC at DMMMSU; DA-PCC at WVSU; DA-PCC at VSU; and DA-PCC at MLPC towards certification to ISO 9001:2015 are still underway.

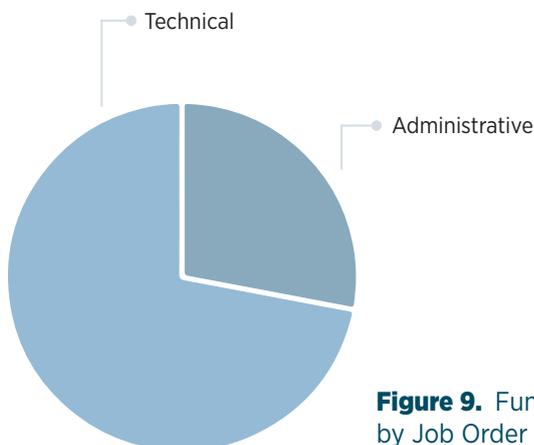


# HUMAN RESOURCE MANAGEMENT

As the lead agency in livestock biotechnology research, PCC puts premium importance on pursuing an aggressive human resource development program that redounds to the development of a competent workforce.



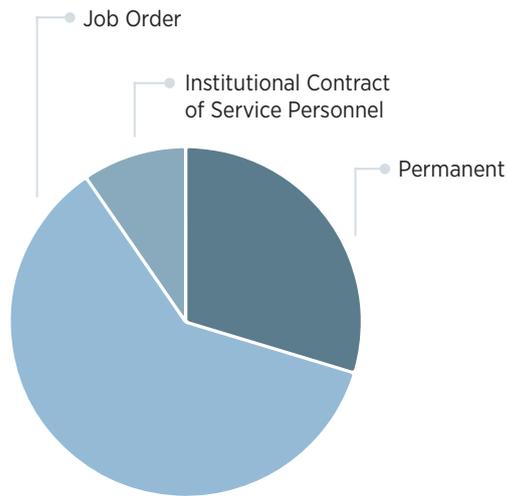
**Figure 8.** Functions Occupied by Permanent Employees



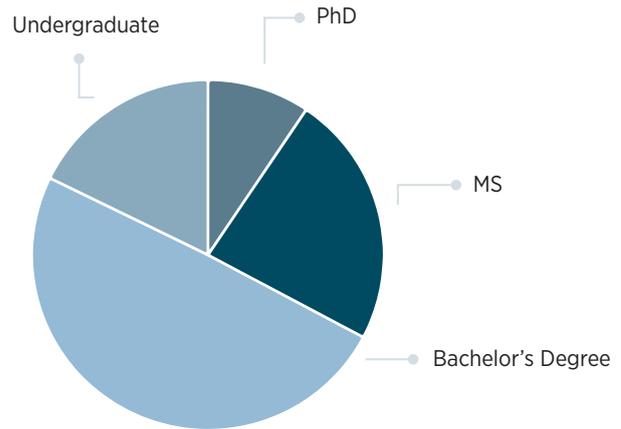
**Figure 9.** Functions Occupied by Job Order Employees

**Table 28.** Personnel Complement (as of December 31, 2020)

Category	Authorized	Filled	Unfilled
I. Permanent			
Key Positions	18	12	5
Administrative	21	15	1
Support to Technical	14	10	2
Technical	121	93	15
<b>Sub-Total</b>	<b>174</b>	<b>180</b>	<b>23</b>
II. Job Order (JO)	48	1	50
Administrative		103	
Technical		265	
<b>Sub-Total</b>		<b>368</b>	
Institutional Contract of Service Personnel		58	
<b>Total</b>		<b>606</b>	



**Figure 10.** Classification of Tenure



**Figure 11.** Educational Profile

**Table 29.** Educational Profile

Category	N	%	Target % by 2025
PhD	17	9.44	10
MS	42	23.33	40
Bachelor's Degree	89	49.44	50
Undergraduate	32	17.78	
<b>Total</b>	<b>100</b>	<b>180</b>	<b>100.00</b>

the said resolution to address the different concerns of employees in relation to their targets and accomplishments especially during the 1st semester period wherein all are adjusting in the effect of lockdowns being declared by the government.

### Recruitment, Selection, and Placement

The DA-PCC's Human Resources Merit, Promotion and Selection Board (HRMPSB) passed a Resolution Adopting Amendment on the Recruitment, Selection and Placement (RSP) Procedure during the State of Public Health Emergency. The management approved the said resolution to continue and expedite the recruitment, selection and placement activity of the Agency during the "new normal" brought about by the COVID-19 Pandemic.

The agency's Human Resource Management Section (HRMS) facilitated the appointment of 10 new permanent employees (plantilla position) and hiring of 33 Contract of Service (JO) staff assigned in the different operating units of the agency.

### Strategic Performance Management

The DA-PCC Performance Management Team (PMT) passed a Resolution to Grant Target Calibration due to the Effects of COVID-19 Program Re-allocation. The management approved

### Learning and Development

During the 72nd Performance Management Committee (PMC) Meeting, the HRMS presented and proposed the use of Educational/Provident Fund for the Human Resource Development Program starting January 2021. The proposal primarily aims to finance scholarship of DA-PCC employees for MS and PhD degrees. Consequently, the management approved the said proposal and directed the HRMS to prepare the Implementing Rules and Regulations (IRR) of the said program.

The HRMS supported the attendance of employees to relevant trainings and seminars using different on-line platforms. It also endorsed 39 training requests by employees.

List of Learning and Development Programs Participated in:

1. Food Protection Manager Certification Course (1 participant)
2. FY 2019 Updating of the Public Investment Program (PIP) as input in the FY 2021 Plan and budget preparation-harmonized planning and budgeting process capability building (2 participants)
3. Training on relief of property accountability and other procurement supply management matters (22

participants)

4. 87th PVMA Scientific Conference and Annual Convention (6 participants)
5. LEAP-IP Learn the Basics of Intellectual Property (2 participants)
6. Determination of the horizontal/vertical positions of natural and manmade features of the earth's surface to be presented on a topographic map (1 participant)
7. Basic of Autocad 2020, technical drafting and visual design (1 participant)
8. Mental Health First Aid (2 participants)
9. Public Sector Leaders and HR Forum with a theme titled Public Service Continuity and Recovery (1 participant)
10. Seminar on ISO 45001:2018-Occupational Health and Safety Management System
11. Training for front liners (2 participants)
12. Operations and Management Audit (2 participants)
13. Basic Accounting and Internal Control for Non-Accountants (3 participants)
14. The Philippine Bidding Documents (2 participants)

### **Rewards and Recognition**

- The HRMS served as Secretariat to the 2020 search for DA-PCC Best Employees. The HRMS and PRAISE Committee were able to conduct the selection and evaluation of nominees for the 5 categories (Best Center Director, Best Supervisor, Best Researcher, Best Development Officer and Best Support Staff)
- The HRMS helped in the packaging and submission of the nomination of Ms. Mina P. Abella to the CSC Honor Awards Program (HAP) Lingkod Bayan Award (Individual Category). Eventually, Ms. Abella won the Honor Awards Program (HAP) Lingkod Bayan Award (Individual Category)-Regional Level (Region III).

### **Other HR-Related Accomplishments**

- Prepared and submitted the Agency Mental Health Program in compliance with the Civil Service Commission Memorandum Circular No. 4 Series 2020. Thus, the HRMS partnered with a private firm and facilitated the administration of an Organizational Assessment of Employee Mental Health and Engagement.
- Facilitated the application and approval of Magna Carta for Scientists, Engineers, Researchers and other S&T Personnel in Government (R.A. 8439) of 100 PCC employees
- Ensured the proper implementation of the DA-PCC Service Continuity Plan to all employees during the height of declaration of community quarantines. Thus, the HRMS closely worked with the top management, the Ad Hoc Emergency Preparedness Team for the Management of COVID-19 Situation and with the different operating units of the agency.
- Spearheaded the request for the provision of milk for DA-PCC employees during the Enhanced Community Quarantine (March 17 to May 8, 2020), facilitated the release of COVID-19 Hazard Pay (Administrative Order No. 26), facilitated the release of additional rice (25 kg) benefits to PCC NHQGP staff.
- Developed the Attendance and Accomplishment Report System (AARS) for the attendance monitoring system of employees under Work-from-Home Arrangement.

The HRMS developed the On-line Employee Health Monitoring Record to serve as source of the HRMS and Ad Hoc Emergency Preparedness Team in the regular self-assessment and symptom reporting of all DA-PCC staff in relation to COVID-19.



# BUDGET AND FINANCE MANAGEMENT

The DA-PCC has continued its commitments to public expenditures management reform objectives of the government. These commitments were translated in the operating budget of the agency for FY 2020, 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 DA-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 DA-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. DA-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/ground personnel/frontline service provider in the budget preparation process was pursued in 2020. 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.

## Highlights of FY 2020 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). The agency envisions 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 agency's 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 the agency delivers to carabao-based smallholders. As such, it engaged in education of farmers as well as training of AI technicians to increase live births and decrease mortality. Moreover, it supported this with researched-based solutions coupled with the integration of modern equipment and



knowledge-based assistance through its scientists and researchers. 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. It 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, the DA-PCC endeavored to conduct meaningful 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. The agency partnered with the DSWD and DepED to implement the milk supplementation program under RA 11037 to help address malnutrition and poverty alleviation.

Furthermore, the agency inked partnership with the Philippine Coconut Authority (PCA), as both 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.

**Table 30.** DA-PCC Sources and Utilization of Funds as of December 31, 2020 (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>456.85</b>	<b>451.00</b>	<b>408.56</b>	<b>98.72%</b>	<b>90.59%</b>
Personnel Services	151.89	150.69	144.51	99.21%	95.90%
Maintenance & Other Operating Expenses	281.61	277.00	240.82	98.36%	86.94%
Financial Expenses	0.05	0.01	0.00	20.00%	0.00%
Capital Outlay	23.30	23.30	23.23	100.00%	99.70%
<b>GAA: FY2019 Continuing Appropriation</b>	<b>0.694</b>	<b>0.407</b>	<b>0.297</b>	<b>58.65%</b>	<b>72.97%</b>
<b>Revolving Fund: Dairy Business Module &amp; Income from PCC Hostel Facilities</b>	<b>295.33</b>	<b>173.29</b>	<b>162.80</b>	<b>58.68%</b>	<b>93.95%</b>
<b>Special Projects</b>	<b>325.38</b>	<b>182.05</b>	<b>122.17</b>	<b>55.95%</b>	<b>67.11%</b>
<b>Foreign Assisted Projects</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Total</b>	<b>1,078.25</b>	<b>806.75</b>	<b>693.83</b>	<b>74.82%</b>	<b>86.00%</b>

## Sources and 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 (Table 30).

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 PHP196.3 million and PHP37.3 million for Milk Supplementation program from DepEd and DSWD, respectively. Likewise, the DA-PCC launched the PCA project named as Coconut-Carabao Development Project with a total cost of PHP37.3 million.

## Financial Condition

Table 31 presents the DA-PCC's Statement of Financial Position at the end of FY 2020. The agency's total assets as of December 31, 2020 are PHP2,038.41 million comprising mainly of the agency 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, DSWD and PCA amounting to PHP270.94 million. However, the new standard for accounting for biological assets as per Philippine Public Sector Accounting Standards affected the decrease in agency's biological assets. Likewise, the decrease is the effect of 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 accountability.

Total Liabilities and Accumulated Surplus posted PHP398.10 million and PHP1,640.31 million, respectively. The significant

**Table 31.** Statement of Financial Position as of December 31, 2020 (Php Million)

Particulars	FY 2020	FY 2019	% Change
<b>Assets</b>			
Current Assets	836.06	714.41	17
Property, Plant & Equipment	1,075.66	1,088.80	(1)
Biological Assets	124.33	153.61	(19)
Other Assets	2.36	3.47	(32)
<b>Total Assets</b>	<b>2,038.41</b>	<b>1,960.29</b>	<b>4</b>
Liabilities	398.10	187.72	112
Accumulated Surplus (Deficit)	1,640.31	1,772.57	(7)
<b>Total Liabilities &amp; Gov. Equity</b>	<b>2,038.41</b>	<b>1,960.29</b>	<b>4</b>

increase in Liabilities represents the funds received from DepEd, DSWD and PCA and the recorded due and demandable unpaid obligations reported under Accounts Payable account.

## Financial Performance

Table 32 presents the agency's Statement of Financial Performance for the year end FY 2020. Its total revenue for the year posted PHP149.02 million comprising mainly of the business income from the sales of milk, meat, live animals, and other by-products as a consequence of the operation of the institutional dairy business module of the regional centers and Milka Krem and income from DA-PCC Hostel training hall and accommodation. These incomes represent the revolving fund of the agency.

Personnel Services expenses posted PHP146 million, while total Maintenance and Other Operating Expenses including financial and non-cash expenses is PHP517.27 million giving a deficit from current operation of PHP514.25 million. The increase in Personnel Services is due to the 1st tranche implementation of the Salary Standardization Law of 2019, payment of hazard pay, longevity pay and laundry allowance for CY 2020 under RA No. 8439, and Performance-Based Bonus for FY 2018. The posted deficit of PHP113.35 million is attributed to the decrease subsidy from the national government due to the lesser amount and unreleased appropriation of locally funded project budgeted at PHP110 million, lower amount of income generated out of the revolving fund and increase in the loss of recognition of fair value less cost to sell of biological assets.

**Table 32.** Statement of Financial Performance for the period ending of December 31, 2020 (Php Million)

Particulars	FY 2020	FY 2019	% Change
<b>Revenue</b>			
Service and Business Income	111.55	121.16	(8)
Gains & Donations	37.47	85.76	(56)
<b>Total Revenue</b>	<b>149.02</b>	<b>206.92</b>	<b>(28)</b>
<b>Current Operating Expenses</b>			
Personnel Services	146.00	141.80	3
Maintenance & Other Operating Expenses	413.18	456.50	(9)
Financial & Non-Cash Expenses	104.09	135.40	(23)
<b>Total Current Operating Expenses</b>	<b>663.27</b>	<b>733.70</b>	<b>(10)</b>
<b>Surplus (Deficit) from Current Operation</b>	<b>(514.25)</b>	<b>(526.78)</b>	<b>(2)</b>
<b>Assistance and Subsidy</b>	408.91	682.96	<b>(40)</b>
<b>Gain/(Loss) of Assets</b>	(8.01)	(4.03)	<b>99</b>
<b>Surplus (Deficit) for the period</b>	<b>(113.35)</b>	<b>152.15</b>	<b>(174)</b>

As the Coronavirus took the world by surprise, businesses grapple with the economic disruptions brought about by the pandemic. Many establishments were pushed to the losing end until shutdown became imminent due to unprecedented losses. In the face of a crisis like this, a commodity's marketability in the food industry is determined by its health benefits to consumers.

Carabao's milk as a commodity remains resilient in this challenging time. Its nutritive value and noble purpose in the scheme of a social transformation presents a different story.

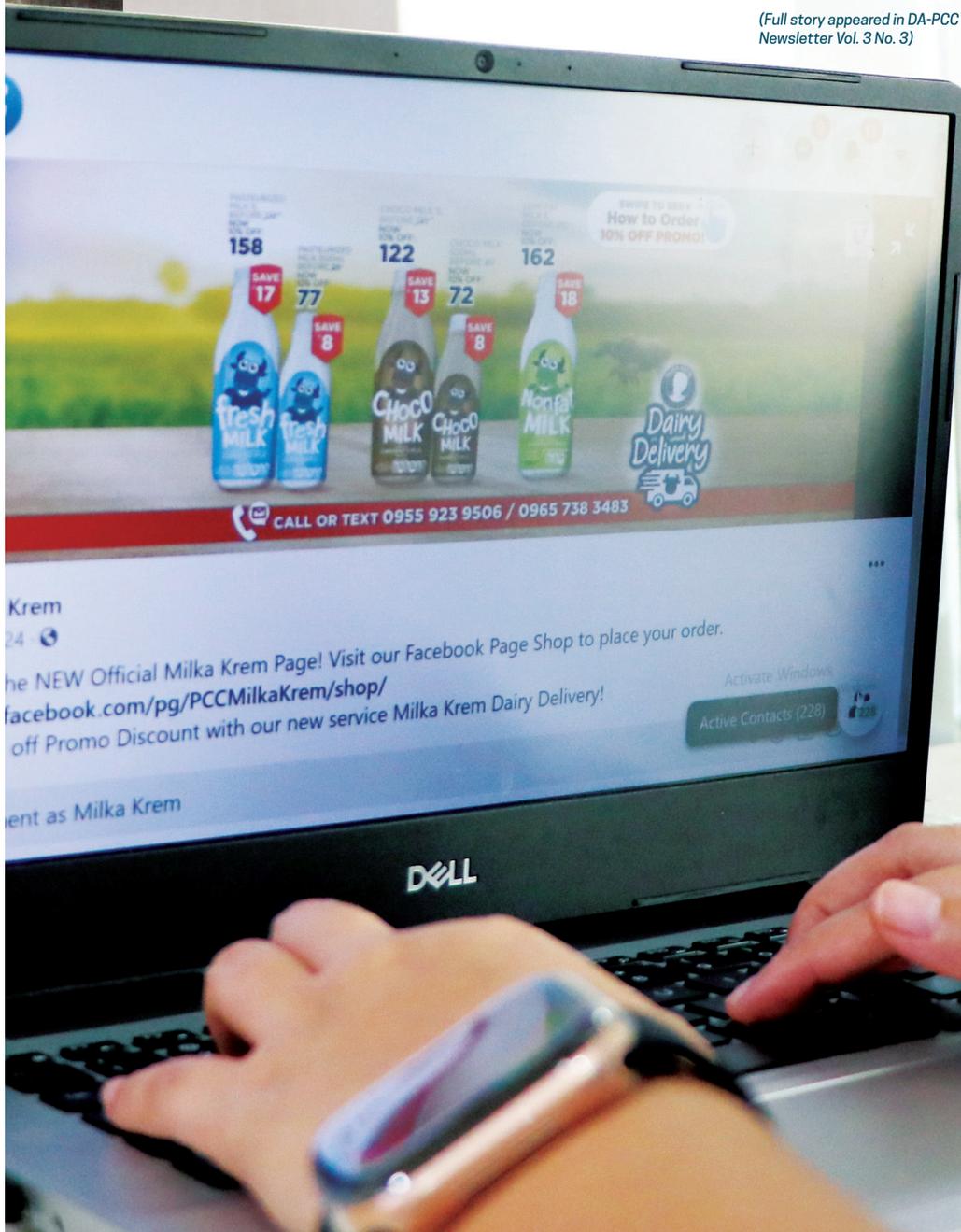
To extend the market reach of carabao's milk products elsewhere from its primary source in Nueva Ecija, DA-PCC knows it has to engage online resellers to serve as additional market channels.

Data from the DA-PCC shows that its Central Dairy Collecting and Processing Facility processed a total of 91,615.80 liters of milk from March 16 to June 20. Of this volume, 22,252.52 liters were sold by 37 online resellers amid the community quarantine due to the pandemic, which is 17% of the total milk processed.

The online resellers registered a total sale of Php1,3335,151.09. These figures represent the amount of sheer dedication contributed by the online resellers who helped in the online marketing and door-to-door delivery of dairy products in Nueva Ecija, including San Jose City, Cabanatuan City, Guimba, Palayan City, Bongabon, and Rizal. The same case ensued in other areas in Luzon, such as Metro Manila, Bulacan, Pampanga, Tarlac, Pangasinan, La Trinidad Benguet, La Union, and Aurora.

(Full story appeared in DA-PCC Bupalus Newsletter Vol. 3 No. 3)

# Dairy biz in the 'New Normal'



# APPENDIX 1

**Table 1a.** List of On-going Researches, CY 2020

<b>Production Management System</b>		
1	Effect of Chitosan on Growth, Yield and Nutrient Composition of Forage Grasses	Reynald D. Amido
2	Nutritional Evaluation of Hydroponic Corn Fodder and its Effect as Substitute for Feed Concentrates for Feeding Buffalo Calves	Charity I. Castillo
3	Feeding Evaluation of Yellow Corn Sprouts as Supplements for Dairy Buffaloes in Transition period to Peak Lactation	Manuel Gacutan/ Arnel N. Del Barrio
4	Influence of Probiotic Bacteria Supplementation in the Growth Performance of Growing Calves	Charity I. Castillo
5	Development of Legume-Based Multi-nutrient Lick Pods (MNLPS) as Milk Booster Supplement in Dairy Water Buffaloes (COVID Project)	Mary Rose D. Uy
6	Development of Lactobacillus inoculants for silage quality and aerobic stability enhancement (COVID Project)	Reynald D. Amido
7	Development of Sustainable Rice Straw Management Practices and Technologies for Ruminant Fodder in the Philippines (RicestrawPh) –DA-PCC Component	Charity I. Castillo
8	Characterization of bacterial microbiome across the gastrointestinal tract (GIT) of buffalo	Phoebe T. Llantada
9	Optimization of UMTRS in Improving Rice straw Quality and Digestibility as Feedstock for Ruminants	Charity I. Castillo
10	Performance of dairy buffaloes fed ration with baker's yeast ( <i>Saccharomyces cerevisiae</i> ) - fermented cassava pulp	Guindolino P. Bajenting
11	Growth and Reproductive Performance of Dairy Buffalo heifer with Mineral Block and Locally Formulated Mineral Supplement	Guindolino P. Bajenting
12	Herbage Yield and Nutrient Composition of Five Improved Forage Grasses Applied with Biogas Sludge as Fertilizer	Virgilio G. Lopez
13	Agronomic Characterization and In Vivo Digestibility of Mombasa Grass ( <i>Megathyrsus maximum</i> cv. Mombasa) at Different Cutting Intervals in Goat ( <i>Capra hircus</i> )	John Chamberlane L. Canatoy/ Lowell M. Paraguas
<b>Biosafety</b>		
14	Development of a Pen-side Nanosensor Diagnostic Tools for <i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i> and <i>Mycoplasma bovis</i>	Claro N. Mingala
15	Development of nucleotide-nanoparticle probe for the rapid and field detection of COVID-19 in livestock and companion animals	Claro N. Mingala
16	Upscaling of the <i>Trypanosoma evansi</i> (Surra) Nanosensor Test Kit	Marvin A. Villanueva
17	Circulation of <i>Leptospira</i> in Wild Rodent and Livestock in Philippine and Serological Investigation of Leptospirosis in Domesticated Livestock	Gabriel Alexis SP. Tubalinal
18	Identification and Seasonal Abundance of Tabanid Flies ( <i>Tabanus</i> spp.) (Diptera: Tabanidae) in Selected Dairy Buffalo Farms in Nueva Ecija, Philippines	Nancy S. Abes
19	Bovine Vaccine Trial of <i>Schistosoma japonicum</i> Paramyosin	Mario Jiz and Claro N. Mingala
20	Surveillance and Characterization of Antimicrobial Resistant <i>Escherichia coli</i> and <i>Salmonella</i> from Livestock Farms, Milk and Meat in the Philippines	Claro N. Mingala
21	Development of Highly Sensitive Immunochromatographic Test Strip using Gold Nanoflowers for <i>Staphylococcus aureus</i> Detection in Milk	Leonard Paulo G. Lucero
22	Philippines' Pilot Surveillance on the Extent of Antimicrobial Resistance of Commensal and Enteric Zoonotic Bacteria Isolated from Livestock and the Environment	Claro N. Mingala/Mildred Padilla
23	Molecular Characterization of <i>Coccidia</i> spp. in water buffaloes towards vaccine development	Lawrence P. Belotindos
24	MITHI project on establishment of CRU inventory database	Nickson M. Eclarinal
25	Molecular Characterization of White Swamp Buffaloes in Brgy. Lamac, Pinamungajan, Cebu: In Support to Conservation Management and Future Utilization	Aivhie Jhoy DS. Escuadro

Genetic Improvement		
Animal Genomics/Genetic Diversity and Cryopreservation		
26	Assessment on the Quality and Microbial Survival of Long-Term Storage of Cryopreserved Semen in the Cryobank Facility	Therese Patricia C. Cailipan
27	Development of Screening Protocol for Genetic Defects and other Economically Important Traits in Cattle and Buffaloes in the Philippines	Kristine Joy B. Prades
28	Evaluation of Mastitis Incidence in Relation to Somatic Cell Count (SCC) and Somatic Cell Score (SCS) of Dairy Buffalo (Bubalus bubalis) Breeds in Different PCC Institutional Herd and Cooperative in Nueva Ecija	Jennifer F. Maramba
29	Genome-wide association study for endocrine and classical fertility traits in Philippine water buffaloes using high density single nucleotide polymorphism (SNP) array	Connie Joyce M. Parac
30	Development of real-time ultrasound scanning and DNA marker selection protocols for meat, carcass and fertility traits of Philippine Native Pig	Ester B. Flores
31	Molecular Characterization and Screening of $\beta$ -casomorphin gene ( $\beta$ -casein milk variants) in different breeds of Buffaloes in the Philippines	Paulene S. Pineda
32	Development of a Multiplex Panel of Microsatellite Markers for Routine Parentage Testing in Buffalo and Cattle	Melinda N. Reyes
33	Association of bovine genetic markers with marbling and tenderness in cattle and buffaloes (Bubalus bubalis)	Kristine Joy B. Prades
34	SNP discovery for functional traits such as Somatic Cell Score in buffaloes	Jennifer F. Maramba
35	Evaluation of Milk Production Performance in Selected Dairy Cooperatives in Nueva Ecija	Gillanne G. Gantioque/ Jennifer F. Maramba

Genetic Improvement		
Reproductive and Cryopreservation Techniques		
36	Breeding Soundness Evaluation, Libido Assessment, And Reproduction Enhancement of Inactive/Non-Performing Bulls Entrusted To Farmer Cooperators	Danilda Hufana-Duran/ Ester B. Flores
37	Detection and management of embryonic/fetal loss in buffaloes	Edwin C. Atabay
38	Improving fixed time artificial insemination efficiency through co-synch technique	Edwin C. Atabay
39	Early pregnancy diagnosis by detection of pregnancy associated glycoprotein using various biotechnologies in water buffaloes	Eufrocina P. Atabay
40	Optimizing Artificial Reproductive Technologies (ART) in Water Buffaloes Through the Regulation of Ovarian Function	Eufrocina P. Atabay
41	Determination of Plasma Pregnancy Associated Glycoproteins (PAGs) During and Post-Pregnancy in Riverine Buffaloes (Bubalus bubalis Linn)	Edwin C. Atabay
42	Pregnancy Associated Glycoproteins (PAGs) and Progesterone Concentration in Milk as Pregnancy Indicator for Lactating Water Buffaloes	Edwin C. Atabay
43	The Use of Sex-Sorted Semen and Reproductive Biotechnologies in Enhancing Buffalo Dairy Production in the Philippines	Eufrocina P. Atabay in collaboration with Korean Researchers of TNT Research Co., Ltd., Korea
44	Networking of Heat Stress Related Genes for Thermotolerance Identification and Development of Reproduction Strategies for Climate Resilient Water Buffalo Production	Excel Rio S. Maylem
45	Characterization of FBN1 mRNA and asprosin receptor abundance in water buffalo ovarian cells and its relation to follicular development	Excel Rio S. Maylem
46	Factors Affecting Success of Artificial Insemination in the Villages	Caro B. Salces
47	Intervention in Post-Partum Management to Improve Artificial Insemination Efficiency in Water Buffaloes	Bonofacia H. Granada
48	Genome analysis and establishment of germ cell preservation for Phil native pigs	Lerma C. Ocampo
49	Utilization of epididymal sperm of slaughtered livestock for basic research using Assisted Reproductive Techniques	Lerma C. Ocampo
50	Utilization of Testicular Sperm for Gametes Preservation and Its Applicability in Species Conservation of Endangered Wildlife Ruminants in the Philippines	Lerma C. Ocampo
51	Genetic Propagation of Girolando Dairy Cattle by Reproductive Techniques	Edwin C. Atabay
52	Enhancing Production Efficiency in Goats Using Assisted Reproductive Techniques (Estrus Synchronization-Natural Bulog scheme and Fixed time AI - PAG Detection in Goats)	Lerma C. Ocampo
53	"Buck to buck" A reproductive approach under COVID 19 condition: Use of Applicable Assisted Reproductive Technologies (ART's) to enhance production	Marlon Ocampo et al

Product Development		
54	Development of Yogurt from Buffalo Milk and Coconut Milk Blend (Nyogurt)	Teresita M. Baltazar
55	Development of Nutribun with Enhanced Nutritive Quality Using Carabao's Milk (Milkybun)	Mina P. Abella
56	Development of Shelf Stable Carabao Milk Candies (Milk Pops)	Jenica C. Salazar
57	Development of Retort Processed Sterilized Toned Carabao's Milk	Mina P. Abella
58	Product Standardization Across Regional Centers of the Philippine Carabao Center	Mina P. Abella
59	Sensory, Physico-Chemical and Microbiological Assessments of Carabao's Milk Products of Dairy Box of the Catalanacan Multi-Purpose Cooperative (CAMPC)	Zosimo G. Battad II
60	Development of Coconut-Water-Infused Carabao's Milk Products	Guillerma B. Abay-Abay/CTU
61	Optimization of Taro Spread using Buffaloes Milk and Its Sensory Attributes	Eva C. Rom
62	Reduction of Salt and Nitrite Levels in Carabeef Tapa Production	Lowell M. Paraguas

Socio-Economics Dimension of CDP		
63	Establishment of "Milkybun" Production Enterprise: A Profitable Livelihood along the Dairy Value Chain	Joel F. Cabading
64	Province-wide Carabao Based Business Improvement Network "ALAB KARBAWAN"	Ma. Theresa R. Sawit
65	RA 11037 Initial Implementation: An analysis of Operational Procedures and Profitability of the Milk Feeding Program in the Philippines	Ma. Theresa R. Sawit
66	Facebook Users' Knowledge, Attitude and Practices towards Consumption of Bohol Dairy Products influenced by Facebook Page	Leinefe B. Libres
67	Analysis of Socioeconomic Dimensions Influencing the Carabao Development Program (CDP) Implementation in Southern Luzon	Thelma A. Saludes
68	Measuring Economic Efficiency of Dairy Buffalo Farms in Nueva Ecija Using Data Envelopment Analysis (DEA)	Eric P. Palacpac

Technology Transfer		
69	Extension Methods for Adoption of Dairy Buffalo Technology in Selected Barangays in Nueva Ecija and Ilocos Norte	Eric P. Palacpac

Enterprise Development		
70	Best management practices of a primary farmers' cooperative in Visayas: A case study on the organizational culture and performance of Lamac Multipurpose Cooperative (LMPC)	Leinefe B. Libres
71	Consumers' Preferences for dairy Buffalo milk and milk products in Bohol Tourism Areas: An Analysis on Market	Guillerma Abay-Abay

Institutional Development		
72	Strengthening and Maximizing the research capability of the Livestock Biotechnology Center as Lead Coordinator of the Value Chain Based Livestock Biotechnology Research, Development and Extension Agenda	Claro N. Mingala
73	Enhancing Livestock Sector Performance	Liza G. Battad

**Table 1b.** List of Completed Researches, CY 2020

<b>Genetic Improvement</b>		
Animal Genomics/Genetic Diversity and Cryopreservation		
1	Improving Growth and Meat Quality Traits – Establishing Baseline Parameters for Eye Muscle Area and Marbling by RTUS and MAS	Kristine Joy B. Prades
2	Establishment of Reference Database on Genotypes of Crossbred Buffaloes using Combined Microsatellites and SNPs: What is the Percentage of Riverine Bloodline?	Lilian P. Villamor
3	Genetic Diversity of the Philippine Carabao using mtDNA (COI) and microsatellite markers (FAO STRs)”	Lilian P. Villamor
4	Comparison of progeny testing and genomic selection breeding schemes in dairy buffalo	Jesus Rommel V. Herrera
<b>Genetic Improvement</b>		
Reproductive and Cryopreservation Techniques		
5	Improving artificial insemination efficiencies using fertility indexed bulls selected by Fourier Harmonic Analysis and Screened from environmental instabilities	Peregrino G. Duran/Danilda Hufana-Duran
6	Association of Expression of GDF-9, IGF-1, BMB-15, and FGF-10 Genes in Collected Blood on Fecundity in Bubalus bubalis	Hans Patrick Dulay/Danilda Hufana-Duran
7	The effect of season on the fertility of water buffalo bulls	Janiz Usi/Danilda Hufana-Duran
8	Factors Affecting AI Efficiencies in the Villages	Danilda Hufana-Duran
9	Early Detection of Pregnancy in Water Buffalo (Bubalus bubalis) Through Milk Progesterone using ELISA	Efren R. Cubangbang Jr./ Edwin C. Atabay
10	Comparison of Different Fixed Time Artificial Insemination Protocols on Percent Conception in Dairy Water Buffaloes (Bubalus bubalis)	Anthony V. Ferrer/ Edwin C. Atabay
11	Epididymal sperm cryopreservation by LN2 Vapor Cooling	Jerma C. Ocampo
12	Optimization of Retrograde Flushing Method of Epididymal Sperm Recovery in the Field	Jerma C. Ocampo
13	Genome analysis and establishment of germ cell cryopreservation for Philippine native pigs <ul style="list-style-type: none"> <li>• Cryopreservation of Immature Oocytes from Philippine Native Pig</li> <li>• Evaluation of epididymal sperm cells of Philippine Native Pigs Maintained Post Mortem at 5-7°C</li> <li>• Isolation and recovery of epididymal sperm cells of post mortem Philippine Native Pig Testicles Maintained at 22-25°C for 8-10 hours</li> <li>• Gross morphometry of the male reproductive organs of Philippine Native Pigs (Sus scrofa)</li> <li>• Microscopic anatomy of female reproductive organs of Philippine native pigs (Sus scrofa)</li> </ul>	Jerma C. Ocampo
14	Utilization of Testicular Sperm for Gametes Preservation and Its Applicability in Species Conservation of Endangered Wildlife Ruminants in the Philippines	Jerma C. Ocampo
15	Ejaculated sperm morphometric change on water buffalo used for artificial insemination post cryopreservation	Jerma C. Ocampo
16	Post mortem epididymal sperm characteristics of non-descript goats before and after cryopreservation	Jerma C. Ocampo
17	Establishment of dairy cattle foundation breeder herd thru ET using imported pedigreed frozen embryo	Eufrocina P. Atabay
<b>Biosafety</b>		
18	Prevalence and Molecular Characterization of Eimeria Spp. Among Caracalves in Water Buffalo Farms in Eastern Samar	Ivy Fe M. Lopez
19	Antibiotic Residue Detection and Antimicrobial Resistance Profile of Staphylococcus aureus and Escherichia coli from Raw Milk of Water Buffaloes (Bubalus bubalis) in Nueva Ecija, Philippines	Randolph B. Tolentino
20	In vivo application of mixed herbal medicine Shin Nakamori Juisan for the treatment of diarrheic domesticated animals	Gabriel Alexis SP. Tubalinal
21	Prevalence, Molecular Epidemiology and Antibiotic Resistance of Resistant Staphylococcus aureus (MRSA) from Milk and Nasal Samples of Dairy Buffaloes	Alona T. Badua/Claro N. Mingala
<b>Production System and Nutrition</b>		
22	Performance of Bulgarian Murrah Buffalo Calves Fed With Mulato II Grass (Brachiaria sp.) and Napier Grass (Pennisetum purpureum) With or Without Bakery Waste-Based Concentrate Mix	Ramon R. Soliven, Jr.
23	Chemical Composition and In-vitro Digestibility of Rice Straw Treated with Pleurotus florida	Reynald D. Amido
24	In Situ Digestibility of Cogon (Imperata Cylindrica Linn.) and Improved Grass Species with Urea Treatment and Concentrate Supplementation in Rumen-Fistulated Brahman Cattle (Bos Indicus Linn.)	Ric B. Posas

Socio-Economics Dimension of CDP		
25	Impact Assessment of COVID-19 on Carapreneurs' Livelihood and Food Security	Ma. Theresa R. Sawit
26	Development of Small Scale Buffalo Fattening Enterprise as Livelihood Intervention in Areas Affected by COVID-19 in Nueva Ecija	Wilma T. del Rosario
27	Effects of Buffalo Milk on Biochemical and Growth Indices of 10-12 year old Filipino girls	Marivic S. Samson
28	Effect of the Entrustment of Imported Italian Mediterranean Buffaloes of the PCC on the Net Farm Income of Farmer-Beneficiaries in Selected areas of CALABARZON	Annareylene J. Montes
29	Strengthening the Carabao Development Program (CDP) on Communication Campaign in Visayas and Mindanao	Eric P. Palacpac
30	Analysis of Technician and Farmer Factors Affecting Artificial Insemination Success Rate in Carabaos of Leyte Province, Philippines	Mary Jane D. Alacio

Technology Transfer		
31	Extension Method for the Adoption of Dairy Buffalo Technology in the Philippines	Eric P. Palacpac

Institutional Development		
32	Establishment of Intellectual Property and Technology Business Management (IP-TBM) in Philippine Carabao Center	Eufrocina P. Atabay

**Table 1c.** List of Externally Funded and Collaborative Researches, CY 2020

No.	Project Title	Project Leader	Funding Agency
1	Improving Artificial Insemination Efficiencies using Fertility Indexed Bulls Selected by Fourier Harmonic Analysis and Screened from Environmental Instabilities	Peregrino G. Duran	DA-Biotech
2	Development of real-time ultrasound scanning and DNA marker selection protocols for meat, carcass and fertility traits of Philippine Native Pig	Ester B. Flores	PCAARRD
3	Development of Screening Protocol for Genetic Defects and other Economically Important Traits in Cattle and Buffaloes in the Philippines	Kristine Joy B. Prades	PCAARRD
4	Utilization of Epididymal sperm of slaughtered livestock for basic research using Assisted Reproductive techniques (ART's)	Lerma C. Ocampo	DA-BAR
5	Development of Sustainable Rice Straw Management Practices and Technologies for Ruminant Fodder in the Philippines (RiceStrawPH) - PCC Component	Charity I. Castillo/ Arnel N. Del Barrio	DA-BAR
6	Genome analysis and establishment of germ cell cryopreservation for Philippine native pigs	Lerma C. Ocampo	PCAARRD
7	Strengthening and Maximizing the research capability of the Livestock Biotechnology Center as Lead Coordinator of the Value Chain Based Livestock Biotechnology Research, Development and Extension Agenda	Claro N. Mingala	DA-Biotech
8	Enhancing Livestock Sector Performance	Liza G. Battad	KOICA
9	Establishment of Dairy Cattle Foundation Breeder Herd Thru ET Using Imported Pedigreed Frozen Embryos	Eufrocina P. Atabay; NDA	PCAARRD
10	Developing the Intellectual Property and Technology Business Management (IP-TBM) Operations in Consortia Member Agencies – Batch 2 Project 5. Establishment of Intellectual Property and Technology Business Management (IP-TBM) in Philippine Carabao Center	Eufrocina P. Atabay	PCAARRD
11	Genetic Diversity of the Philippine Carabao mtDNA (COI) and microsatellite markers (FAO STRs)	Lilian P. Villamor	DA-Biotech

# APPENDIX 2

**Table 2.** Abstract of some completed researches evaluated by the Technology Board in 2020

No.	Research Title	Researchers	Abstract
1	COMPARISON OF PROGENY TESTING AND GENOMIC SELECTION BREEDING SCHEMES IN DAIRY BUFFALO	J.R.V. Herrera, E.B. Flores and J.H.J. van der Werf	<p>The objective of this present study was to compare a dairy buffalo breeding program using a progeny testing (PT) scheme with a genomic selection scheme in terms of genetic gain (units SD) and cumulative Net present value (CNPV) of costs. The PT scheme represents the present breeding program of the Philippine Carabao Center (PCC). Recording and evaluation of performance is presently limited to animals in the institutional herds, numbering - 1200 females. With the GS scheme, all animals in these institutional herds and the bull barns will be genotyped with the Affymetrix Buffalo 90k genotyping array. The accuracy of GS was based on the accuracy from the PT plus the accuracy provided by a genomic test with a reliability of 0.09. The Rendel and Robertson method of calculating genetic gain using the four pathways of selection was used. For GS, the effect of varying the number of selected bulls for elite matings was also studied. For CNPV, relevant costs considered are the maintenance costs of bulls and semen straws produced by a bull per year, and genotyping costs. The discount rate is 5% and the investment period is 15 years.</p> <p>Increase in genetic gain with accompanying savings on long-term costs is possible with the replacement of PT with a GS breeding scheme. With the shift to GS, genetic gain was increased to 144-158% compared to the PT base scheme. This is mainly due to the increase in selection intensities and shortening of the generation intervals in the male pathways. There was also a 28% reduction of bull maintenance costs since there are no more waiting bulls to be progeny tested. To decrease inbreeding, doubling of the number of bulls for elite matings (from 3 to 6) in the sire of bulls pathway is feasible but there is a slight decrease of genetic gain by 0.018 units SD. With the above results, PCC will move from PT to GS in the soonest possible time.</p>
2	ESTABLISHMENT OF REFERENCE DATABASE ON GENOTYPES OF CROSSBRED BUFFALOES USING MICROSATELLITES: WHAT IS THE PERCENTAGE OF RIVERINE BLOODLINE?	AJ Escuadro, TP Cailipan AM Paraguas	<p>Traceability of individual identification of crossbred buffalo is necessary to have value-added worth animals due to the emerging propagation and continuous upgrading of PCC programs to produce an improved breed of Philippine Carabao. Since higher riverine bloodline percentage requires much higher cost and fertility relies on good genetics. Several studies suggest that the use of genetic markers could provide a promising potential way in identifying breeds to which an individual animal belongs specifically when pedigree records are unavailable or missing. The general objective of the study is to support the effort of the genetic improvement program of the agency toward species identification of crossbred buffaloes. A total of 64 crossbred samples (CEB = 43 and NIZ = 21), 26 swamps (Pitogo Is. = 17 and Calayan Is. = 9) and four riverine (PCC-BMB) buffaloes were included in the analysis. MtDNA Cytochrome B and Twelve FAO microsatellite markers were used in this study. The NJ phylogenetic tree of Cytochrome b revealed delineation of swamp and riverine. The Bayesian iterative algorithm software was used to evaluate an individual's probability of belonging to hybrid or parental classes. In Lamac, Cebu, collected samples were putative crossbreds procured for the Herd Build-Up program and for dispersal. However, genotypic information revealed that some putative crossbreds were swamp or riverine. This situation is same with the NIZ putative crossbred buffaloes. Based on the results, additional markers are highly recommended to increase efficiency to determine breed composition of backcrosses swamp and backcrosses riverine.</p>
3	GENETIC DIVERSITY OF THE PHILIPPINE CARABAO USING MTDNA (COI) AND MICROSATELLITE MARKERS (FAO STRS)	Lilian P. Villamor, Aivhie Jhoy DS. Escuadro, Therese Patricia C. Cailipan, Alexander M. Paraguas	<p>Philippine carabao (PC) (<i>B. bubalis</i> swamp-type) is a source of meat, milk, draft power. Its manure is an excellent component of organic fertilizer. Overall concept of this project arises from a simple yet profound question "Is there really a genetic diversity in Philippine carabao?" Answers to question direct the national conservation efforts to PC. A total of 941 animals from 27 PC sub-populations were analyzed based on molecular and morphological characterizations. Results confirmed presence of genetic diversity in PC sub-populations. Mitochondrial DNA sequences in PC sub-populations using 16S, Cytochrome b, and mtD-loop sequences revealed the assignment of haplotypes to two distinct maternal lineages, A and B, while COI is an effective DNA barcode to differentiate sub-species of <i>B. bubalis</i>. STRUCTURE analysis at K=2 to K=5, Swamp 1 for Calayan Is., and Batanes Is. and Swamp 2 for Carabao Island, Gigantes Is. and Pitogo Is. still emerged as distinct clusters and purebred swamp buffaloes. Morphology and genetic clusters have similar pattern to identify two distinct clusters wherein Swamp 1 is apparently bigger, heftier, have bigger neck, head and horns than in Swamp 2. Strategic conservation and management of genetic diversity in Philippine carabao should be highly considered by giving outmost preference.</p>

No.	Research Title	Researchers	Abstract
4	REAL-TIME ULTRASONOGRAPHIC EVALUATION OF CARCASS TRAITS: A TOOL FOR IMPROVING MEAT QUALITY TRAITS IN BUFFALOES (BUBALUS BUBALIS L.)	Kristine Joy P. Castañeda, Emmanuel Bacual and Ester B. Flores	Real-time ultrasound scanning is a non-invasive technique used for evaluating and selecting animals based on carcass yield and meat quality traits. It has been incorporated in the beef cattle breeding program, however little has been done in buffaloes. Massive genetic upgrading is essential to further improve the potential of buffalo as competitive source of meat. Thus, this study was conducted to determine the accuracy of ultrasonic estimates of carcass traits, prediction of best age for slaughter, and the genetic and phenotypic correlations of parameters. Live weight (LW), ultrasound measurements of rump fat depth (UP8F), rib fat depth (URF) and eye muscle area (UEMA) in 467 riverine buffaloes at 12, 18, 24 and 36 months of age were taken using Honda® HS 2100V ultrasound machine equipped with 180mm 3.0MHz linear array transducer. The average LW of buffaloes adjusted to 12, 18, 24 and 36 months of age were 224.1kg, 312.6kg, 378.3kg and 478.7kg, respectively. The mean UEMA, UP8F and URF at 12 months were 27.6cm <sup>2</sup> , 2.7mm and 2.9mm, respectively. Whereas at 18 months, the mean UEMA, UP8F and URF were 35.1cm <sup>2</sup> , 3.4mm and 3.8mm, respectively. In months, there is an increase by 3.8 cm <sup>2</sup> in EMA however with declining rate of 0.034 cm <sup>2</sup> . Highest peak of UEMA was noted at 30 months of age. Genetic and phenotypic correlations for EMA were high at 0.94 and 0.79 for 12 months and 18 months, respectively. Correlation of UP8F, URF and UEMA at 12 and 18 months were 0.32, 0.499 and 0.67, respectively. Relationship between ultrasound and carcass fat and eye muscle area showed high positive correlation of 0.81 and 0.89, respectively. In conclusion, results indicate that ultrasound scanning is a good estimator of carcass traits and suggest that earlier evaluation is an excellent predictor of animal performance at later age, without sacrificing and able to keep the animals for reproduction.
5	ANTIBIOTIC RESIDUE DETECTION AND ANTIMICROBIAL RESISTANCE PROFILE OF Staphylococcus aureus AND Escherichia coli FROM RAW MILK OF WATER BUFFALOES (Bubalus bubalis) IN NUEVA ECIJA, PHILIPPINES	Tolentino, Randolph B., Villanueva, Marvin A., Baldrias, Loinda R., Sulabo, April Shayne L., Collantes, Therese Marie A.	In this cross-sectional study, 208 raw buffalo milk samples were randomly collected in five sampling sites consisting of three dairy collection centers and two dairy buffalo farms in Nueva Ecija, Philippines. Raw buffalo milk samples were screened for residues of commonly used antibiotics in dairy production in the province particularly beta lactams, enrofloxacin and oxytetracycline using enzyme-linked immunosorbent assay (ELISA). Isolates of Staphylococcus aureus and Escherichia coli were also recovered from milk samples and the phenotypic antimicrobial resistance profiles were determined using Kirby-Bauer disk diffusion assay. In addition, interview on the knowledge, attitude, practices and skills was conducted to characterize the social aspects of dairy buffalo farmers in relation antibiotic residues on milk and its consequences.  The prevalence of antibiotic residues on dairy buffalo milk in Nueva Ecija, Philippines was observed at 35.42%. The study observed that beta lactam antibiotics (58.17%) were present in majority of the milk samples. However, the amount of residues detected in the study were within the permissible level of the Maximum Residue Limit (MRL) of the Codex Alimentarius.
6	IN-VIVO APPLICATION OF MIXED HERBAL MEDICINE SHIN NAKAMORI JUISAN® FOR THE TREATMENT OF DIARRHEIC DOMESTICATED ANIMALS	Claro N. Mingala, Misao Onuma, Gabriel Alexis SP. Tubalinal, Toshiho Nakamori	The study assessed the efficacy of a commercialized mixed herbal medicine in alleviating diarrhea in water buffalo (Bubalus bubalis) calves. The study involved 15 diarrheic water buffalo calves regardless of sex and with less than 1-year-old from one farm divided into three treatments using randomized block design. Treatment 1 was mixed herbal medicine only; Treatment 2 was mixed herbal medicine plus probiotics and lastly, Treatment 3 was the antibiotics plus intestinal protectants. The calves were treated three times a day for seven days for treatment 1 and 2 and control was treated once a day for 7 days. The animals were observed and scoring of diarrhea were done and recorded daily for the next 7 days. Results of the study showed significant decrease in diarrhea scores on day 6 and 7 post-treatment in treatment 1 and 2 compared to control. At day 8 post-treatment, all calves showed soft to apparently normal stool. Genetic analysis of the possible causative agent of diarrhea revealed infection caused by rotavirus A, bovine coronavirus, BVDV and ETEC. Results revealed that diarrhea caused by these pathogens can be alleviated by the herbal medicine and herbal medicine in addition of probiotics parallel to antibiotic treatment.
7	PREVALENCE AND MOLECULAR CHARACTERISTICS OF EIMERIA SPP. AMONG CARACALVES IN WATER BUFFALO FARMS IN EASTERN VISAYAS, PHILIPPINES	Ivy Fe M. Lopez, Dinah M. Espina, Claro N. Mingala, Lolito C. Bestil, and Mary Rose Uy	A study assessed the prevalence, identified and genetically characterized the Eimeria spp. among caracalves in Water Buffalo Farms in Eastern Visayas, Philippines. One hundred seventy-four fecal samples from caracalves ranging 1-12 months old, regardless of sex were pre-screened to check the presence or absence of protozoan and non-protozoan parasites. All fecal samples positive with coccidian parasite were processed and prepared for DNA extraction. The universal primers for amplification of target ITS-1 region of 18S rRNA was used to detect the Eimeria spp. The prevalence of Eimeria spp was expressed as a percentage. Data were analyzed using chi-square analysis and analysis of maximum likelihood. Amplified PCR products of identified Eimerian oocysts were sent to Asiagel Malaysia for DNA sequencing, sequences aligned using MEGA 5 and compared with ITS-1 region of 128S rRNA and SSU genes from Genbank data base using Basic Local Alignment Search Tool (BLAST) program of National Center for Biotechnology Information. Result showed 46.6% prevalence rate for Eimeria spp., and Southern Leyte reflected higher prevalence rate (58.3%) compared to Leyte Province (48.5%) and Samar Province (36.7%). The overall prevalence rate of Eimeria spp. among sexes was higher in females (54.3%) than males (45.7%). Similarly, the incidence probability of coccidiosis was relatively high at 6.8 months of age, and high homology with Eimeria auburnensis.

No.	Research Title	Researchers	Abstract
8	CHEMICAL COMPOSITION AND IN VITRO DIGESTIBILITY OF RICE STRAW TREATED WITH PLEUROTUS FLORIDA	Reynald D. Amido, Renato G. Reyes, Sofronio P. Kalaw, Angeles M. De Leon and Daniel L. Aquino	The nutritive value of rice straw with and without composting treated with <i>Pleurotus florida</i> in different substrate harvesting periods (full ramification, 1st, 2nd, and 3rd flushing) were studied by analyzing its chemical composition, in vitro digestibility and scanning electron microscopy (SEM). Results showed that the chemical composition of rice straw was significantly affected ( $P < 0.05$ ) by the interaction of treated rice straw with and without composting and substrate harvesting periods. Rice straw with and without composting during the 2nd flushing had the highest dry matter (DM) content of 96.07% and 95.56%, respectively. The highest crude protein (CP) content (10.57%) was obtained in rice straw with composting on the 3rd flushing. The highest concentrations of ether extract (EE) were observed in rice straw without composting on the 2nd and 3rd flushing (3.39 and 3.53%, respectively). The highest silica content was found in treated rice straw with and without composting during 3rd flushing. Treated rice straw with composting has low organic matter (OM) content but high concentrations of ash, cellulose, and nutrient digestibility such as in vitro DM, OM, CP, NDF, and ADF digestibility. These results indicate that rice straw-based substrate with composting harvested during 3rd flushing is found to be the best in terms of sufficient degrading of ADL or lignin content, minimum loss in cellulose concentrations and enhanced crude protein content and nutrient digestibility. Therefore, it is recommended to develop spent mushroom substrate feed supplements for possible use in yielding ruminants such as lactating, growing, and breeding.
9	IN SITU DIGESTIBILITY OF COGON ( <i>Imperata</i> )	Ric B. Posas	An in situ digestibility trial was conducted in rumen-fistulated Brahman cattle fed all-Napier diet to assess the effects of urea treatment on Cogon ( <i>Imperata cylindrical</i> , L.) and commonly used improved grass species as follows: Humidicola ( <i>Brachiaria Humidicola</i> Rendle Schweick), Para grass ( <i>Brachiaria mutica</i> Forssk), African Star grass ( <i>Dichanthium aristatum</i> Forssk. Stapf), Guinea ( <i>Panicum maximum</i> Jacq.), Setaria ( <i>Setaria sphacelata</i> Schumach Stapf & Hubbard), Red Napier ( <i>Pennisetum purpureum</i> , Schumach), local or native Napier ( <i>Pennisetum purpureum</i> Schumach). Urea treatment was done by dissolving 50g urea in 1L water then spraying this onto 1 kg forage. Data gathered were analyzed using one-way ANOVA and treatment means were compared using Tukey's Honestly Significant Difference (HSD) test.  Result showed significant differences in the in situ digestibility or dry matter (DM), organic matter (OM) and neutral detergent fiber (NDF) among treatments. DM and OM digestibilities were highest with urea-treated para grass, while guinea grass and red napier showed highest NDF digestibility. Urea treatment significantly improved DM and OM digestibility of cogon grass and para grass, while improvement in NDF digestibility was significant with humidicola and guinea grass.
10	ANALYSIS OF TECHNICIAN AND FARMER FACTORS AFFECTING ARTIFICIAL INSEMINATION SUCCESS RATE IN CARABAOS OF LEYTE PROVINCE, PHILIPPINES	Mary Jane D. Alacio	This study was conducted to identify the factors that were possibly associated with the success of Artificial Insemination (AI) of carabaos in the Province of Leyte. Of the 20 randomly selected municipalities, 1049 farmer respondents and 41 A.I. technicians collaborating with the Philippine Carabao Center (PCC's) AI program were interviewed. Result showed that site of semen deposition, parity, experience of the technician in AI, the materials used in wiping semen straw and the mode of identifying heat in carabaos significantly affected success of AI. In terms of semen deposition, the odd of a successful AI is 3.958 times greater when the semen is deposited in the body of the uterus than the odds of successful AI when the semen is deposited in the mid-cervix, assuming all else are equal. This means that AI would more likely result to pregnancy when the semen is deposited in the body of the uterus than when it is deposited in the mid-cervix assuming all other factors are held constant or <i>ceteris paribus</i> . The odds of a successful AI is 1.81 times greater when a piece of cloth is used to wipe semen straw before inserting it into the semen gun/sheath than the odds of a successful AI when the edge of the shirt of the technician is used to wipe semen straw, assuming all other factors are held constant. Correlation between educating farmers after AI and allowing the animal to work during breeding is not significant.
11	EFFECT OF THE ENTRUSTMENT OF IMPORTED ITALIAN MEDITERRANEAN BUFFALOES OF THE PHILIPPINE CARABAO CENTER ON THE NET FARM INCOME OF FARMER-TRUSTEES IN SELECTED AREAS IN CALABARZON	Montes, Anna Reylene J., Laviña, Adne Marie B., Cabangbang, Jaymee A., Bituin, Blessa V.	The study was conducted to determine the effect of the entrustment of imported Italian Mediterranean buffaloes of the Philippine Carabao Center on the net farm income of farmer-trustees in selected areas in CALABARZON. Specifically, the study aimed to: (a) determine the differences in the net farm income of the farmer-trustees of imported Italian Mediterranean buffaloes and non-trustees; (b) identify the issues encountered in the entrustment of imported Italian Mediterranean Buffaloes (ItMB); and (c) provide recommendations to further improve the entrustment process.  Primary data were obtained through interview schedule of 43 farmer-trustees and 21 non-trustees of the program using a pre-tested questionnaire. Representatives from the Philippine Carabao Center (PCC), Local Government Units (LGUs), and cooperatives/farmers' associations were also conducted. Secondary data from the PCC program documents and databases were also used.  Descriptive statistics were used to describe the operations of entrustment. Cost and returns analyses were used to determine the net farm income of the respondents.  Farmer-trustees with the entrusted Italian buffaloes have lower net farm income than the non-trustees.  The most common problems encountered by the farmer-trustees were related to the maintenance of the buffaloes' health and reproduction (hard breeder), which are directly related to the trustee's capacity to provide sufficient and balance feed ration that these imported buffaloes were used to. Thus, this study recommended that the entrustment of the imported buffaloes to smallhold farmers should be reviewed and reconsidered.  Since the scope of the study is limited to the costs and returns incurred by the farmer-trustees from carabao raising, there should be a technical efficiency and productivity analysis for future studies.

No.	Research Title	Researchers	Abstract
12	EXTENSION METHODS FOR ADOPTION OF DAIRY BUFFALO TECHNOLOGY IN SELECTED AREAS IN THE PHILIPPINES	Eric Palacpac, Rovelyn Jacang, Erwin Valiente, Edwin Atabay	The Farmer Livestock School on Dairy Buffalo Production (FLS-DBP) is an effective modality in delivering technological options to dairy buffalo farmers. FLS-DBP processes, from technical lessons to evaluation are highly participatory in nature. In doing so, enables sharing of factual information among farmers and able to conduct group data validation without bias. While module developers are composed of technical experts from DA-PCC, some of the learning materials i.e. storymaps, calendars, graphical presentations, problem trees and timelines used in FLS-DBP were done by participants themselves, thus learning from these materials by using their experiences and new learnings making them see their realities. FLS-DBP is different from the traditional training modality. It focuses not only on the content but also on the delivery, which is highly participatory in nature allowing participants to digest and process learning thus increase retention of information. The conduct of FLS-DBP is guided by learning principles applied to adult learners. Taking these principles into consideration, participants are happy and optimistic. The traditional training is usually held in classroom settings, While FLS is field-based. This means that some activities i.e. take-home assignments, field visit and cross visits among others are done right in the farmers' own farms and data are gathered and analyzed by using their own animals and situations. It is also season-long, unlike the usual training that lasts for days Based on the experiences shared by participants, during and after the learning activities, the FLS-DBP is a more preferable learning modality. Outputs from the project include developing of Facilitators' Guide to FLS-DBP Implementation (Volume 1 and 2), accreditation of 130 FLS-DBP facilitators, composed of LGU Provincial technicians, progressive farmers and DA-PCC staffs, and 438 FLS-DBP farmer-graduates from 17 FLS sites. Modularized sessions using FLS modality can also be employed, if training team does not want to do the season-long learning activity. Collective assessment of the processes and technologies using participatory evaluation tools gaining positive feedbacks from both facilitators and farmer-participants. Evaluation data collected from 69 from 5 FLS sites showed an overall average rating of 4.49 or Outstanding for strategies employed during the conduct of FLS-DBP. As FLS-DBP is deemed effective by farmers and facilitators there is a need to standardized learning activities across DA-PCC network using FLS modality as materials are readily available for replication.
13	STRENGTHENING THE CARABAO DEVELOPMENT PROGRAM (CDP) THRU COMMUNICATION FOR DEVELOPMENT (COMDEV) CAMPAIGN IN VISAYAS AND MINDANAO	Eric P. Palacpac, Charlene S. Joanino, Chrissalyn L. Marcelo, Rowena G. Bumanlag, Mervalyn O. Tomas, Ma. Cecilia C. Irang, Charlene P. Corpuz, and Rovelyn T. Jacang	The Department of Agriculture-Philippine Carabao Center's (DA-PCC) through its Knowledge Management Division (KMD) started the conduct of a communication for development (ComDev) campaign popularized under the banner of "Karbawan", a local term that implies "collective engagement in carabao keeping", which employed communication strategies to help address the identified issues related to Carabao Development Program (CDP) implementation in select sites in Visayas and Mindanao. Following the ComDev approach, a product mix consisting of various interventions were simultaneously conducted based on the results of participatory communication appraisal in the target areas. Where practical or applicable, interventions included radio plugs or press releases, season-long Farmer Livestock School on Dairy Buffalo Production, School-on-the Air, jingles, billboards, engagement flip charts, advocacy kits, and banners or posters. Pre- and post-Karbawan exposure comparisons showed improvement on the average scores of participants measured on a 5-point Likert scale as regards their knowledge, attitude, and practices related to CDP and dairy carabao management and technologies.
14	PERFORMANCE OF BULGARIAN MURRAH BUFFALO CALVES FED WITH MULATO II GRASS (BRACHIARIA SP.) AND NAPIER GRASS (PENNISETUM PURPUREUM) WITH OR WITHOUT BAKERY WASTE-BASED CONCENTRATE MIX	Lowell C. Paraguas, Elena s. Paraguas, Vicenta L. Canatoy & Ramon R. Soliven Jr.	CONCLUSION:  1. The initial weight, final weight, total weight gain, average daily gain, total dry matter intake, daily dry matter intake and dry matter intake as % of body weight were significantly affected by the inclusion of bakery waste-based concentrate mix to the diets of Bulgarian Murrah Buffalo yearlings fed with Mulato II grass (Brachiaria sp.) and Napier grass (Pennisetum purpureum). 2. The addition of bakery waste-based concentrate to Mulato II grass (Brachiaria sp.) resulted to increased in vivo crude protein digestibility in Bulgarian Murrah Buffalo yearlings. In vivo dry matter, neutral detergent fiber, acid detergent fiber and ash digestibility of Mulato II (Brachiaria sp.) and Napier grass (Pennisetum purpureum) were better to those with bakery-waste concentrate in Bulgarian Murrah Buffalo yearlings. 3. The lesser the % of bakery waste-based concentrate mixed with Mulato II grass, the higher is the return above feed and supplement cost.
15	CONSUMPTION OF BUFFALO MILK AND GROWTH	Marivic Sulabo-Samson	CONCLUSION:  The results suggest that milk intake provided beneficial effect to the growth of children especially on their height gain during the milk feeding period. Specifically, when children consumed buffalo milk at 200 ml daily, their monthly height increase is beyond the expected height change per WHO growth reference even at one-month milk feeding duration
16	PROJECT 1: DEVELOPMENT OF FEEDING PROTOCOLS AND PRACTICES TO SUPPORT THE NUTRITIONAL REQUIREMENTS OF DAIRY BUFFALOES	Daniel Aquino Nomer Garcia Tsutomu Fujihara Fe Venturina Christian Lacanilao Jeremy Gacusana Armie Martinez	A feeding protocol and practices for dairy buffaloes were developed and evaluated in series of experiments in two project sites at the national impact zone (NIZ) in Nueva Ecija and in the town of San Agustin, Isabela. The first activity was on the assessment on the profile, feeding and management practices of the dairy farmers including the gaps the farmers face in their dairy farming operation through a field survey. From the results of the survey, two interventions were studied: the grass-legume plantation for commercial production of seeds and planting materials and the establishment of home grown grass-legume plantation involving farmers. The fodders produced were used in the development and testing of complete nutrients diet (CND) for growing and lactating buffaloes. The project also look at the effects of milk substitute in calf rearing while the last activity evaluated the milk production performance of lactating buffaloes using the CND in TMR form for the lactating buffaloes.  Results of the field survey showed that 221 farmers from the two project sites were interviewed face to face. The respondent farmers aged 63 years and majority were males, 88.8% at NIZ and 95.7% in Isabela. At the NIZ, 64% of the farmers owned < 5 breedable buffaloes; 21% owned 6-10 buffaloes and 11.9% were nearly on semi-commercial scale of dairy operation. The farmers in Isabela owned 2 to 3 crossbred buffaloes. On feeding management, 59.5% and 72.6% of the farmers at NIZ and Isabela practiced cut and carry system and 22% of the farmers still practiced the rearing of animals by tethering.  (Continued on next page)

No.	Research Title	Researchers	Abstract
16	PROJECT 1: DEVELOPMENT OF FEEDING PROTOCOLS AND PRACTICES TO SUPPORT THE NUTRITIONAL REQUIREMENTS OF DAIRY BUFFALOES	Daniel Aquino Nomer Garcia Tsutomo Fujihara Fe Venturina Christian Lacanilao Jeremy Gacusana Armie Martinez	<p>(Continued from previous page)</p> <p>In rearing and weaning of calves, the farmers in NIZ still practice natural suckling weaning of calves is at 3-4 months of age but in Isabela 10-12 months weaning was noted. In milking of buffaloes, 91.07% and 97.78% of the farmers at the NIZ and Isabela practiced hand milking once a day and milking starts at 7-15 days from calving and the farmers followed 10-12 months (N. Ecija) and 7-9 months (Isabela) lactation, respectively. Feed scarcity was the main problem the farmers experienced during summer and when paddies were planted with rice in July to September.</p> <p>The established 10 ha grass-legume plantation had produced seeds after one year from planting. The seeds produced from legumes and the planting materials/cuttings were valued at P93,315.00 on the first year of harvest. The 60 farmers at NIZ and 30 farmers in Isabela established home-grown forages with a total area planted of 31.8 hectares involving 257,000 legume seedlings and 630,000 Napier cuttings planted. Data on DM yield for Indigofera planted with irrigated areas showed significantly higher DM yield per hectare of compared to rensonii and ipil-ipil. with 8.02 tons/ha and 10.1tons/ha at 60 and 90 days intervals, respectively. The rensonii has tons/ha, 6.7tons/ha and 8.4tons/ha while for ipil-ipil this yielded (3.1tons/ha and 3.3tons/ha) on the same intervals of cutting. The %CP contents of indigofera was also higher with 23.39% compared to 22.96 and 21.13% for rensonii and ipil-ipil, respectively.</p> <p>The feeding of milk replacer did not significantly influence the ADG of the fed calves at NIZ but in San Agustin ADG of 622g was significantly observed compared to 330g ADG for calves fed with dams' milk. The influence of feeding milk replacer to calves was significantly noted with a feed cost savings of P8,793.90 (42.8%) and P8,074.90 (40.72%) for three months rearing compared to the pure milk fed calves from NIZ and San Agustin. No negative effects were observed on the health conditions of the milk replacer fed calves.</p> <p>The feeding of CNF to growing buffaloes at the NIZ revealed significant (<math>P &lt; 0.05</math>) effect over the control diet with an ADG of 0.416kg vs. 0.300g, respectively. This significant finding at NIZ on ADG however; did not hold true in feeding of CNF growing buffaloes in Isabela. The CNF also reduced the feed cost to produce a kg gain in weight of P93.91 compared to the recorded value of P137.00 for the control diet. The benefit of feeding CNF to growing buffaloes gave an income of P13,770.00 for 120 feeding days.</p> <p>The CNF feeding to lactating buffaloes at the NIZ results to significantly higher <math>P &lt; 0.5</math> daily milk production with 6.0kg/day compared to the control diet with 4.49kg/day. A difference of 1.51 kg milk/day implied that CNF increase milk yield by 33.63% with equivalent value of P19,026.00 than the control. The use of CNF in Isabela also led to higher milk production with a difference of 1.06kg/day (3.23kg vs 2.17kg). This finding did not show significantly different result due to limited replicate animals at the project site. The farmers from NIZ and Isabela, spent P16.85 and P26.10 to produce a kg/milk as against P20.83 and P40.25 with the control diet, respectively. At the NIZ, the feeding of CNF in the form of TMR to lactating buffaloes resulted to higher milk production of 1,648.52 kg/lactation. The 60 dairy buffaloes given CNF gave total milk production 98,491kg that generated a total income of P6,894,370.00 in 284 days lactation. In Isabela with 20 dairy buffaloes fed with CNF produced 17,967kg milk which also generated an income of P1,257,690.00. To date, there were more than 300 adapters of production and utilization of home grown forages using grasses and legumes for the buffaloes. A total of 115 hectares was reported to have been planted with and legumes in the provinces of Nueva Ecija and San Agustin providing sustainable supply of fodders for dairy buffaloes.</p>
17	PROJECT 2: DEVELOPMENT OF REPRODUCTIVE MANAGEMENT PROGRAM FOR INCREASED EFFICIENCY OF AI IN DAIRY BUFFALOES	Edwin Atabay Eufrocina Atabay Erwin Encarnacion Jessica Gay Ortiz Jhon Paul Apolinario Alfred Sayson	<p>Series of experiments were conducted by the Project 2. First, the study on the "Characterization of Follicular Response and Endocrine Profile during Estrus Cycle in Philippine Water Buffaloes" was conducted. In three-wave cycle animal, the 1st, 2nd, and 3rd-wave cycle occurrence were noted by ultrasound on day 5, 12, and 20, respectively. While in two-wave cycle group, the 1st wave was captured on day 5, and the 2nd wave was first recorded on day 16. Present findings likewise showed that in 3-wave cycle, the maximum diameter of ovulatory follicle was 11.8 mm, while in two-wave cycle, the maximum ovulatory follicle size was 13.2 mm. It is interesting to note that follicle waves within estrous cycle can occur either in just one or alternately in both ovaries and the growth and persistence, except ovulation, are not hampered by the presence of CL. In the present study, one wave was not observed in animals monitored thus far, though it was reported in other buffalo breeds. The size of ovulatory follicles varied in different buffalo breeds, with the Philippine native buffaloes considerably smaller. Secondly, progesterone and estradiol concentrations in blood were determined through enzyme-linked immunosorbent assay (ELISA). Simultaneous measurements of follicular growth and corpus luteum development through ultrasonography were done during blood collection in order to define the precision of the two events during estrous cycle. Correlation analysis on the measurements of ovarian structures and hormone profile during estrous cycle was done to constitute the basic reproductive physiological data for dairy buffaloes.</p> <p>Thirdly, the effect of different prostaglandin (<math>\text{PGF}_2\alpha</math>) analogues during ovulation synchronization in dairy buffaloes (<i>Bubalus bubalis</i>) were tested. Two experiments were conducted to determine the effects on progesterone level, follicular growth, estrus manifestation and pregnancy in dairy buffaloes under Fixed-Time Artificial Insemination (FTAI) program - CIDR Synch Protocol. The work demonstrated the effectiveness of these analogues in inducing luteolysis and estrus, indicating likewise that chloprostenol can be an alternative synchronizing agent for estrus synchronization both in conventional and enhanced AI Program. Fourthly, the team identified four estrous synchronization/ovulation protocols namely: (a) Estrous Synchronization using <math>\text{PGF}_2\alpha</math> alone; (b) Enhanced <math>\text{PGF}_2\alpha</math>-based Estrous Synchronization (Enhanced AI); (c) Ovsynch, (CIDR + GnRH on day 9); and (d) FTAI (CIDR-Synch + hCG on day 9) respectively. Pregnancy diagnosis was conducted by ultrasonography and hormone assay. The results showed that at NIZ, 43.77%, 38.57% and 37.23% were achieved in FTAI, Ovsynch and Enhanced Artificial Insemination protocols, respectively. The expected output of 30 to 35% conception rate in the present study was surpassed.</p> <p>(Continued on next page)</p>

No.	Research Title	Researchers	Abstract
17	PROJECT 2: DEVELOPMENT OF REPRODUCTIVE MANAGEMENT PROGRAM FOR INCREASED EFFICIENCY OF AI IN DAIRY BUFFALOES	Edwin Atabay Eufrocina Atabay Erwin Encarnacion Jessica Gay Ortiz Jhon Paul Apolinario Alfred Sayson	<p>(Continued from previous page)</p> <p>The high conception rate obtained was due to the hormonal treatment that enhances the production of competent oocytes for fertilization and the subsequent formation of good quality corpus luteum that lead to the production of sufficient progesterone that maintains pregnancy. In San Agustin, Isabela, the data indicated that 46.79% and 37.00% pregnancy rates were achieved in FTAI and E-AI, respectively. Lastly, the study of enhancing prostaglandin-based estrus synchronization protocol for artificial insemination in water buffaloes (E-AI) was conducted to evaluate pregnancy rates following four estrus synchronization protocols aimed at improving reproductive efficiencies.</p> <p>Four treatment groups with the following protocols were studied: T1, control – ES with single injection of prostaglandin (PGF2<math>\alpha</math>, 25 mg i.m.) and inseminated after 3 days; T2 – as in T1, except with the administration of gonadotropin releasing hormone (GnRH;100 <math>\mu</math>g i.m.) a day before AI; T3 – as in T2, except with the administration of GnRH at AI; and T4 – as in T3, except with the administration of human chorionic gonadotropin (hCG; 1500 IU i.m.) at AI. Results of the present study revealed a significant difference (P&lt;0.05) between the control and the treatment groups; however, no significant difference among the three treatments. This finding concluded that administration of ovulatory hormones improved pregnancy rate in water buffaloes and the use of GnRH or hCG at the time of AI is advantageous and cost-effective in the conduct of AI activities in the field.</p> <p>Fixed Time Artificial insemination (FTAI) following synchronization of ovulation has been proven as an effective strategy to improve AI efficiency in water buffaloes and cattle species. In an attempt to use FTAI in water buffaloes in the Philippines, two experiments were conducted as presented herein. Experiment 1 validated the efficacy of original FTAI protocols. Experiment 2 compared the effects of ovulatory hormones: GnRH and human Chorionic Gonadotropin (hCG), to optimize the efficiency of CIDR-synch protocol. To sum, the pregnancy rate achieved with Ovsynch can be improved with CIDR-synch, and the substitution of GnRH with hCG in CIDR-synch protocol resulted in highest pregnancy rate. As a result, the CIDR-synch-hCG has been used in the expanded FTAI activities in buffaloes in many locations in the country.</p> <p>Key findings showed that CIDR-Synch-hCG, therefore, is so far our best ovulation synchronization protocol for ovulating large size follicles and ultimately resulted in increased pregnancy in water buffaloes. With this optimized ovulation synchronization protocol, FTAI services in buffaloes have been intensified with huge potential application to other livestock reproduction.</p> <p>The project was also able to establish early detection of pregnancy through ultrasonography at 35-40 days post-AI, and through detection of pregnancy-associated glycol- protein in serum and milk samples at 25- days post. Likewise, at day 18, post AI, pregnancy was detected using progesterone as pregnancy indicator. The calving interval was reduced from 22 months to 15.8 months.</p>
18	PROJECT 3: DEVELOPMENT OF HEALTH CARE TECHNOLOGIES AND PRACTICAL FARM PRACTICES IN SUPPORT OF INCREASING BUFFALO MILK PRODUCTION	Claro Mingala Michelle Balbin Marvin Villanueva Ermyrn Ermitanio	<p>Reduction of disease prevalence of Fasciolosis, Surra and Mastitis in Nueva Ecija and San Agustin, Isabela was achieved through S&amp;T interventions of Project 3. The Fasciolosis prevalence decreased from 52% to 22%, following Surra prevalence from 18.8% to 3.3%, and Mastitis from 11.05% to 10.58% at the end of the project implementation. Several farm management practices were also introduced namely, (1) the implementation of PCC Animal Health Program such as: (a) regular deworming, (b) use of Nzi trap, and (c) use of insecticide-impregnated blue cloth that is hanged at the ceiling area of the animal house; (2) complete confinement; (3) provision of clean forage and water; and (4) implementation of proper milking. For the animal health program, deworming schedules were developed depending on farm management type. Furthermore, the use of Nzi trap was introduced at a certain cooperative in Nueva Ecija. Laboratory test results on samples found that cases of Surra was reduced from 51.72% to 2.78%, which can be attributed to the concerted efforts of prophylactic treatment and setting-up for insects that are carriers of infection. The cost of preparing the Nzi trap is P300.00, excluding the stakes. Protocols developed were discussed to the farmers during seminars and farm visits, especially during sample collection and animal health monitoring. The project also conducted a series of seminars to dairy cooperatives and associations such as (1) Basic Buffalo Management, (2) Training on Animal Health Care and Management, and (3) Strengthening the understanding and capability of dairy farmer partners on animal health in San Agustin, Isabela. Lastly, the team was able to develop a quick and reliable diagnostic protocols for early detection of infectious pathogens affecting milk production.</p> <p>The test kit was already finished, but warrants further trials for field testings. The production of the kit that is to be used in the field trial is currently on-going. This test is a DNA-based kit that used gold nanoparticles as sensors. This method does not require DNA amplification and can be used for field. The test kit comprised gold nanoparticle solution (GNP) bio-functionalized by a thiolated oligonucleotide designed specifically to bind with a certain region of the T. evansi gene. The bio-functionalized GNP (or GNP-Probe) binds specifically to the target gene of the extracted DNA from animal samples suspected or showing clinical signs of infection. The kit showed visible response, distinct color changes, to both positive or negative results and thus eliminating the use of highly technical equipment. Using the test kit as a preliminary diagnosis to detect infection eliminates the use of PCR, which is undeniably the gold standard of detection but expensive and tedious. The kit aims to provide preliminary diagnosis using only much simpler laboratory equipment (heat block and centrifuge) and aid in giving conclusive results in addition with other methods of diagnosis. Improvements to the kit will make it available for use by local farmers and other non-technical people to help improve animal health management.</p>

No.	Research Title	Researchers	Abstract
19	PROJECT 4: MILK QUALITY AND SAFETY ASSURANCE FROM FARM TO MILK PROCESSING PLANT	Mina Abella Patrizia Camille Saturno Jasmin Mallig Ewy-Joe Antipuesto Jenica Salazar	<p>The existing milking and milk handling practices of dairy farmers and other key actors in the milk supply chain in the National Impact Zone (NIZ) in Nueva Ecija and San Agustin, Isabela were assessed. These were done through interview and actual farm visits.</p> <p>Farm level milk quality in terms of conformance to milk quality parameters such as alcohol test, specific gravity, % titratable acidity, antibiotic residues, somatic cell count, coliform count, and aerobic plate count were evaluated. Water quality and hygiene sanitation were also determined. Most farmers in NIZ in Nueva Ecija and in San Agustin, Isabela do not use stainless milk cans (92% in NIZ, 100% in San Agustin, Isabela), do not practice disinfection of milking utensils (63% in NIZ; 51% in San Agustin, Isabela), do not practice pre-teat disinfection (68% in NIZ; 91% in San Agustin, Isabela), do not practice cooling of milk (62% in NIZ; 78% in San Agustin, Isabela). Majority of milk collectors use plastic containers (62% in NIZ; 80% in San Agustin, Isabela) with no cooling (71% in NIZ, 100% in San Agustin, Isabela) during transport of milk. Most of milking utensils used by farmers in NIZ and San Agustin, Isabela have low conformance in coliform count. Conformance to microbial standards (aerobic plate count) decreased from 95% to 76% (NIZ) and 85% to 57% (San Agustin, Isabela) for aerobic plate count as milk is transported from milk collection point to milk processing plant. Support facilities such as stainless milk cans, insulated boxes, freezers, weighing scales and milk testing kits were provided to the dairy farmers and cooperatives. Similarly, technical support services such as conduct of trainings, seminars, coaching and mentoring were provided. Improved milking and milk handling practices were observed in the following: pre-teat disinfection (from 34% to 88% in NIZ; 9% to 66% in San Agustin, Isabela), use of stainless milk cans (from 1% to 79% in NIZ; 0% to 23% in San Agustin, Isabela), disinfection of milking utensils (from 40% to 91% in NIZ; 49% to 90% in San Agustin, Isabela) and post teat disinfection (from 76% to 87% in NIZ; 11% to 66% in San Agustin, Isabela). Increased conformance of milk samples in NIZ to milk acidity (65% to 79%); pH (60% to 89%) and absence of antibiotic residues in all milk samples. Milk rejection was significantly reduced from 7.94% in 2016 to 1.46% in 2019. This is an indication of increased adoption of hygienic milking and milk handling practices resulting to increased milk quality and safety and consequently reduced milk rejection, thus increased income for the farmers. The information gathered from the project will be used as reference data in the development of Philippine National Standards (PNS) for buffalo milk quality.</p>
20	PROJECT 5: STRENGTHENING THE SAN AGUSTIN CROSSBRED CARABAO-BASED ENTERPRISE DEVELOPMENT (CBED) MODEL	Annabelle Sarabia Honorato Baltazar Franklin Rellin Ma. Theresa Sawit Joel Cabading Hannah Flor Jalotjot Kevin Dave Cho Armando Reyes Jr. Johnrey Orejana	<p>The strengthening of San Agustin crossbred carabao-based enterprise development (CBED) model was made possible through the project interventions implemented based on the needs of the stakeholders. Project interventions were subdivided into two themes: stakeholder engagement strategy and technology adoption capacitation strategy. Stakeholder engagement strategy includes the reorganization and clustering of the dairy associations, reorganization of the SADACO, organization and mobilization of youth group, establishment of internal control systems (proper recording and auditing), institutionalization of pricing and incentive schemes, and formation of convergence team for monitoring and evaluation. The technology adoption capacitation strategy, on the other hand, includes technical trainings, follow through activities such as mentoring and coaching, and provision of equipment and supplies to be able to immediately adopt the technologies. These activities resulted to revitalization of the 12 organized dairy groups and the San Agustin Dairy Cooperative (SADACO). It was the active engagement of 103 dairy buffalo farmers in milk production that led to creation of a viable dairy enterprise. Furthermore, introduction of S&amp;T based technologies on feeding, breeding and reproduction, disease control, milk collection and handling and farm management has effectively enrolled 1,782 breedable crossbred females into the dairy loop that resulted to 212 animals in the milk line that produced a total of 202,474.12 liters of milk at the end of the project implementation. Four (4) milking barns and two milk consolidation centers were established managed by cooperating dairy associations. Although still underutilized due to limited milk production, the capacity of SADACO facility to store and process more milk had increased from 300L to 500L per day. SADACO had also improved by having 3 regular market resulting to a total four (4) market links by the end of project implementation. One of the best highlights of the project was the establishment of the Youth Engagement for Sustainable Dairy Industry (YESDI) that serve as info-mediaries by providing the latest science-based information/best practices to farmers and served as second liners to the aging farmers.</p>

# APPENDIX 3

**Table 1.** Conferences, Seminars, Symposia, Workshops, and Trainings, CY 2020

Title	Venue	Date	No. of DA-PCC participants
Technical Seminar and Workshop on Technology Valuation for Commercialization	Conference Room 3rd Floor, LIB Complex, DA-PCC NHQ	Jan 13	3 (Speakers)
Hands-on training on ELISA kit for aflatoxin detection in milk (by Glenwood)	DA-PCC NHQ, Munoz, Nueva Ecija	Jan 17	3
Leaders in the Leaders in Innovation Fellowship (LIF) Program- Batch 6	Asian Institute of Management (AIM)	Jan 23	1
Learn, Be Empowered, Adapt and Profit from IP (LEAP IP) series	Intellectual Property Office, McKinley Hill, Taguig City	Feb	2
CASA Technical Operation	Marinduque State College	Feb 10	7
Technical Caucus: Technology Valuation for Commercialization	3rd Flr, LIB Complex	Feb 12	4
Consultative Review and Planning Workshop on the UNAIP Implementation IN Region 2 and CAR	Tuguegarao City, Cagayan	Feb 19	10
87th Philippine Veterinary Medical Association Annual Conference	SMX, Davao City	Feb 19-21	3
University Science High School Science Fair and Exhibits 2020	University Science High School, CLSU	Feb 29	1 (Invited Speaker)
Leaders in Innovation Fellowship Program 2020	United Kingdom	Mar 10-20	1
Webinar on UPLC by AGILENT	Virtual	May 3	1
Webinar on UPLC by WATERS	Virtual	May 6	1
Webinar on COVID-19 Veterinarian's Perspective Series: Hard Lessons of Biodiversity	Virtual	May 11	1
Lecture Series on Animal Science	Virtual (Universitas Hasanuddin, Indonesia)	May 14	2 (1 Invited Speaker)
Webinar on COVID-19 Veterinarian's Perspective Series: Pets, Vets and COVID-19: How the Virus changed the way I practice	Virtual	May 20	1
Lecture Series on Animal Science	Virtual (Universitas Hasanuddin, Indonesia)	May 23	2 (1 Invited Speaker)
Webinar on COVID-19 Veterinarian's Perspective Series: How to Adapt: Veterinary Pharmaceutical Distributors Coping with Coronavirus Pandemic	DA-PCC NHQ	May 27	1
DA-PCC Cara-Aralan Webinar Series on Gabay sa Wastong Pangangalaga ng Kalabaw, Topic: Calf Management	Virtual	May 29	1
ICTPH Webinar on Epididymal Sperm Research (Boar Commodity and Ruminant Species)	Virtual	June	1
3rd DOST-PCAARRD Intellectual Property Master Class	Virtual	June 6	2
National Webinar Series on Technology Commercialization entitled: Fundamentals of Innovation, Intellectual Property, and Technology Commercialization (DOST PCIEERD IMPACT)	Virtual	June 25-26	2
Webinar on COVID 19 Veterinarian's Perspective Series: Lessons from the South Korea's COVID-19 Response and Implication of SARS-CoV-2 on Veterinary Research	Virtual	June	1
Newton Agham Webinar Series on International Research Collaboration	Virtual	June 4	2
Webinar on S&T Seminar on Impact Assessment of COVID-19 on Carapreneurs' Livelihood and Food Security	Virtual	June 17	50
Seminar on ISO 45001:2018 – Occupational Health and Safety Management System (Former OHSAS 18001:2007)	DA-PCC NHQ	June 23	2
Webinar on TB Management	Virtual	June 27	7
Workshop on Conservation Road Map for the Tamaraw	Webinar (MAARRDEC)	July 7-8	1 (Invited as Speaker)

Title	Venue	Date	No. of DA-PCC participants
DA-PCC Livestock Biotechnology Center Webinar Series: COVID-19 Health and Socio-economic Impacts on the Livestock Industry	DA-PCC NHQ	Jul 28-29	40
Basic course on ultrasound scanning operation	Virtual (DA-PCC at VSU/ DA-PCC at MLPC)	Aug	3 (Speakers)
Evaluation of On-going Researches	DA-PCC NHQ	Aug 17-20	60
Webinar on Fundamentals of Strategic Planning	Virtual	Aug 17	1
Webinar on Leadership and Supervision in Times of Crisis	Virtual	Aug 17	1
GMMS V3 Online Training	Virtual (Facilitated by Philippine Commission on Women)	Aug 18	3
Webinar on Basic Management Program for Emerging Leaders	Virtual	Aug 19 & 21	1
Association of Phil. Parasitology Webinar	Virtual	Aug 20	1
Webinar on Managing Multigenerational Workforce	Virtual	Aug 26	1
Webinar on GAD Legal Mandates Part 1: Magna Carta of Women and Related Laws	Virtual (Facilitated by FOR A Communications)	Aug 26	3
Webinar on GAD Legal Mandates Part 2: Laws on Gender-Based Violence	Virtual (Facilitated by FOR A Communications)	Aug 27	3
BAI-PCC Special Animal Welfare Webinar	Virtual	Aug 27	7
DA-PCC Cara-Aralan Webinar Series on Gabay sa Wastong Pangangalaga ng Kalabaw, Topic: Wastong Paraan ng Paggagatas at Pangangasiwa ng Aning Gatas	Virtual	Aug 28	1 (Speaker)
Webinar on Peoples Management Skills Training	Virtual	Aug 28	1
GAD Webinar: Introduction to Gender and Development Concepts (GAD) and Sexual Orientation, Gender Identity and Expression, and Sex Characteristics (SOGIESC)	Virtual (Facilitated by Philippine Commission on Women)	Sep 1	3
Basic Training Course on Artificial Insemination and Pregnancy Diagnosis in Water Buffaloes	DA-PCC NHQ and Livestock Research Facility	Sep 7 - Oct 9	15
Public Sector Leaders and HR Forum (CSC-CSI)	Virtual	Sep 10	1
Webinar on Bovigam Tb Kit	Virtual	Sep 16	4
PRC-CPD's Seminar	Virtual	Sep 17	1
Webinar Series 2020: Coping with COVID-19 Pandemic "Buck to Buck project (B2B) Paiwi System: Bulugang Kambing Tulong sa Magsasaka"	Virtual (JSPS Alumni Association of the Philippines & CLSU)	Sept 26	3 (Invited Speaker & Panelist)
Webinar on Managing Conflict in the Workplace	Virtual	Sep 28-29	1
DA-PCC Research and Innovations Webinar Series: Enhancing Milk Production of Water Buffalo through S and T Interventions	Virtual (DA-PCC NHQ)	Oct 6-7	45
Webinar on Orientation and Training Rollout for the Coconut Carabao Development Program (CCDP)	Virtual	Oct 8	7
Webinar on Leaders in Innovation Fellowship (LIF) Batch 6 Demo Day,	Virtual	Oct 8	1
International Biotechnology: Global State of Animal Biotechnology (ISAAA)	Virtual	Oct 10	6
CININGEC 2020: I Congreso Internacional de Investigacion, Innovacion y Geston del Conocimiento (Universidad Tecnica de Babahoyo)	Virtual	Oct 12-16	1 (Invited as Speaker)
Food Safety and GMP	Virtual	Oct 12	2
GMP Documentation and SSOP	Virtual	Oct 13	2
Workplace and Food Manufacturing Disinfection	Virtual	Oct 13	2
Food Fraud and Food Defense Awareness	Virtual	Oct 14	2
Cara-Aralan Webinar Series on "Gabay sa Wastong Pangangalaga ng Kalabaw" with the topic "Karaniwang Sakit ng Kalabaw Part II"	Virtual (DA-PCC NHQ)	Oct 14	5 (2 invited speakers)
Packaging and Labelling Awareness	Virtual	Oct 15	2
Mandatory Labelling Requirements	Virtual	Oct 15	2
FDA Licensing and Product Registration	Virtual	Oct 16	2
Hazard Analysis and Critical Control Point (HACCP)	Virtual	Oct 16	2
Food Innovation and Development	Virtual	Oct 19	2

Title	Venue	Date	No. of DA-PCC participants
Webinar Series on Intellectual Property and	Virtual	Aug 17	1
Technology Transfer: Introduction to	Virtual (Facilitated by Philippine Commission on Women)	Aug 18	3
Valuation, participant, Philippine Council for	Virtual	Aug 19 & 21	1
Health Research and Development (PCHRD)	Virtual	Oct 20	2
PSAS Annual Convention	Virtual	Oct 21 & 22	30
BAFS Tutorial session on DA Laboratory Profiling System via Zoom	Virtual	Oct 23	2
FAO Strengthening the country capacities to control and monitor residues of veterinary drugs in food	Virtual	Oct 27	2
Cara-Aralan Webinar Series on "Gabay sa Wastong Pangangalaga ng Kalabaw" with the topic "Animal Health Program and Services"	Virtual (DA-PCC NHQ)	Oct 28	7 (2 invited speakers)
5th International Symposium on Livestock Biotechnology: "Research-Driven Innovations Addressing and Mitigating the Impacts of Global Pandemic in the Livestock Industry"	DA-PCC NHQ	Oct 27-28	40
Title: Cara-Aralan Webinar Series: "Gabay sa Wastong Pangangalaga ng Kalabaw"	Virtual	October 30	10
Basic Training Course on AI and PD	DA-PCC National Bull Farm, Carranglan NE	Oct 30-Nov 27	10
PSAS Lecture Series	Virtual	Nov 11 & 18	25
6th National Carabao Conference "Pag-asa Karbawan, Lahat Aahon, Susulong, Aasenso"	Virtual (DA-PCC NHQ)	Nov 17	65
Virtual Technology Commercialization Seminar, PCC-Intellectual Property and Technology Business Management	Virtual (DA-PCC NHQ)	Nov 18-20	30
National AMR One Health Summit Webinar Series Part 3: Infection, Prevention and Control and Antimicrobial Stewardship	Virtual	Nov 20	1
PSM 2020 Cluster 1 Symposium, SHIFTING GEARS: Addressing Global Challenges of the Pandemic Through Microbiology and Biotechnology Webinar	Virtual	Nov 21	1
Webinar on "World antimicrobial Awareness" FAO Thailand	Virtual	Nov 23	1
ASTHRDP: Science, Technology and Innovation Towards Achieving Sustainable Development Goals Year 9	Virtual	Nov 26-27	1
PCC Technology Pitch Day	Virtual (DA-PCC NHQ)	Nov 27	30
47th Philippine Society for Biochemistry and Molecular Biology Annual Convention	Virtual (PhilRice)	Dec 1-4	10
A virtual international conference. THEME: "Responding to health and environmental issues through biochemistry and molecular biology"			
PCC R&D Symposium: Presentation of Completed Researches	DA-PCC NHQ	Dec 3-4	80
Livestock Biotechnology Center: Research, Development and Extension Agenda - Technical Caucus Webinar Series (Part III)	Virtual	Dec 10	35 (1 Speaker)
DOST-PCAARRD IP-TBM Batch 2 National Pitch Day	Virtual	Dec 11	30
Primeras Jornadas de Capacitaciones Internacionales en Ciencias Agricolas y Pecuarias (Secretaria de Educacion Superior, Ciencia, Tecnologia e Innovacion; Instituto Superior Tecnologico Ciudad de Valencia; Centro de Formacion Integral y Servicios Especializados)	Virtual	Dec 10-12	1 (Speaker)
1st International Symposium on Infectious Diseases (ISID)	Virtual	Dec 21-22	3

**Table 2.** Research articles published in refereed journals, CY 2020

No.	Authors	Title of Paper	Title of Journal
1	Jaypee Abenoja, Christopher Rivera, Michelle Balbin, Marvin Villanueva, Virginia Venturina, Claro Mingala	Trypanosoma evansi and Neospora caninum among water buffaloes (Bubalus bubalis) in the Philippines	Archives of Veterinary Science. v.25, n.1, p.10-19, 2020
2	Claro N. Mingala, Gabriel Alexis SP. Tubalinal, Misao Onuma	Antidiarrheal effect of a commercialized mixed herbal medicine and in conjunction with probiotics in diarrheic water buffalo (Bubalus bubalis) calves	Philippine Journal of Veterinary Medicine. Jun 2020, Vol. 57 Issue 1, p27-40. 14p.
3	Claro N. Mingala, Alona Badua	Antibiotic resistance and molecular characteristics of mecA positive methicillin-resistant Staphylococcus aureus (MRSA) from milk and nasal carriage of dairy water buffaloes (Bubalus bubalis)	Journal of Advanced Veterinary and Animal Research. 2020 Sep; 7(3): 397-406
4	Lilian Villamor	Genetic Diversity of Philippine Carabao (Bubalus bubalis) of MtDNA D-loop: Implications to Conservation and Management	Philippine Journal of Science (waiting for the accession number)
5	Atabay EC, Atabay EP, Maylem ERS, Encarnacion EC and Salazar RL.	Enhancing Prostaglandin-base Estrus Synchronization Protocol for Artificial Insemination in Water Buffaloes.	Buffalo Bulletin 39: (1). 53-60.
6	Peregrino G. Duran, Danilda Hufana-Duran, Matt Daniel B. Peralta, Emma V. Venturina, Hernando V. Venturina and John J. Parrish.	Efficiency of Fourier Harmonic Analysis of Sperm Nuclear Shape in Predicting Fertility in Water Buffalo Bulls.	Philipp J Vet Anim Sci 2020 46(2):124-135
7	Danilda Hufana-Duran and Peregrino G Duran.	Animal reproduction strategies for sustainable livestock production in the tropics.	IOP Conf. Series: Earth and Environmental Science 492 (2020) 012065 doi:10.1088/1755-1315/492/1/012065
8	Excel Rio S. Maylem, Leon J Spicer, Isadora Batalha, Luis Schutz	PSIV-5 Developmental and hormonal regulation of gene expression of fibrillin-1 (FBN1) and the asprosin receptor, olfactory receptor family 4 subfamily M member 1 (OR4M1), in bovine ovarian cells	Journal of Animal Science 2020: (Supp. 4):283-284
9	Excel Rio S. Maylem, Leon J Spicer, Isadora Batalha, Luis Schutz	Discovery of a possible role of asprosin in ovarian follicular function	Journal of Molecular Endocrinology 2020; 66(1): DOI: 10.1530/JME-20-0218
10	Breanne C Morrell, Maria Chiara Perego, Excel Rio S. Maylem, Leon Spicer	Regulation of the transcription factor E2F1 mRNA in ovarian granulosa cells of cattle	Journal of Animal Science December: 98(12A) DOI: 10.1093/jas/skz379

**Table 3.** Research articles published in scientific proceedings, CY 2020

No.	Authors	Title of Paper	Title of Proceedings
1	Lilian P. Villamor, Aivhie Jhoy DS. Escudro, Therese Patrickka C. Cailipan and Alexander M. Paraguas	Molecular Characterization of Genetic Population Diversity of Philippine Native Carabao and Its Application for In-situ Conservation	42nd NAST Annual Scientific Meeting at Manila Philippines. July 8-9, 2020

# RISING ABOVE ADVERSITIES

Dream big and work hard. These exemplify how carapreneurs became successful in their own ways by surpassing even the worst of circumstances without giving up. DA-PCC shares their unyielding spirit through their stories on how they managed to remain resilient and rise above challenges, which may inspire others to follow suit.

This photo story series were uploaded to DA-PCC's official Facebook page in hopes of inspiring readers with bits of wisdom from our carapreneurs.

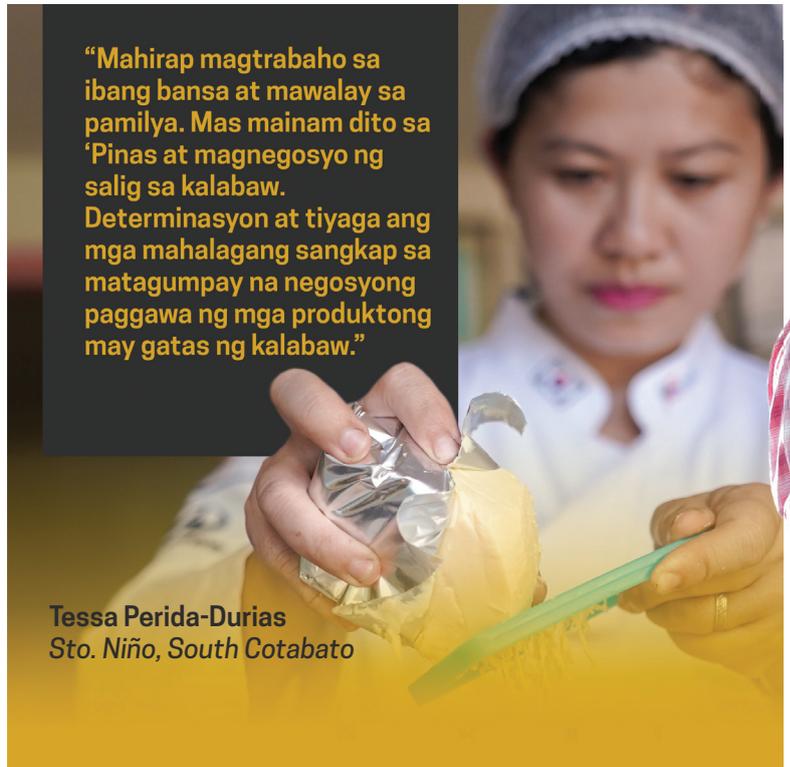
**“Libre naman ang mangarap kaya lakihan mo na. Pero huwag kang titigil doon, kailangan may gawin ka para maabot mo ‘yon. Manalig ka rin sa’yong sariling kakayahan para hindi kailangan na laging nakaasa sa tulong ng gobyerno.”**

**Moises Alfonso**  
San Jose City, Nueva Ecija



**“Mahirap magtrabaho sa ibang bansa at mawalay sa pamilya. Mas mainam dito sa ‘Pinas at magnegosyo ng salig sa kalabaw. Determinasyon at tiyaga ang mga mahalagang sangkap sa matagumpay na negosyong paggawa ng mga produktong may gatas ng kalabaw.”**

**Tessa Perida-Durias**  
Sto. Niño, South Cotabato



**“Hindi dapat maghirap ang mga Pilipino. Basta’t masakap, marunong mag-ipon, at may mahusay na pangangasiwa sa kinikita, ang lahat ay may pag-asang umunlad.”**

**Bernardino Dela Cruz**  
San Rafael, Bulacan





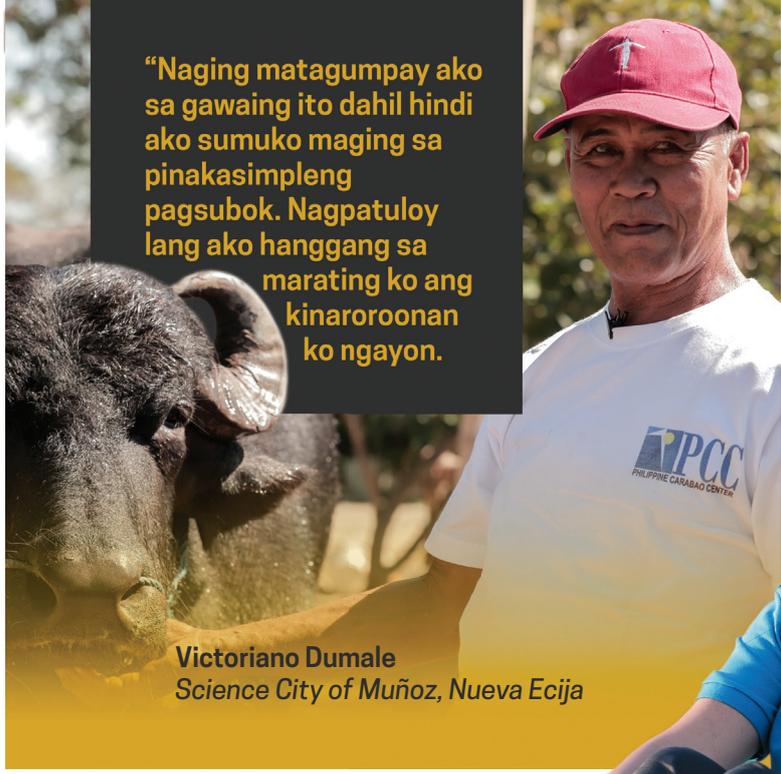
“Kaakibat ng pag-aalaga ng kalabaw ay ang tiyaga at mahabang pasensiya. Kailangan ito para magtagumpay sa ganitong gawain at magkaroon ng maginhawang buhay.”

Samuel Mercader  
San Jose City, Nueva Ecija



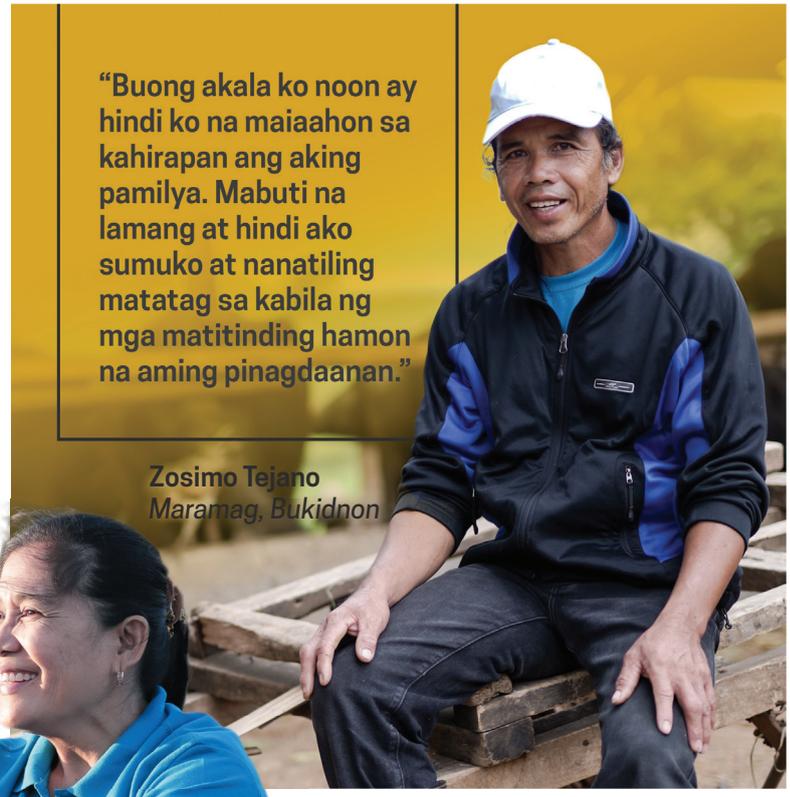
“Ang pag-aalaga ng kalabaw ay hindi parang laro lang na puwedeng gawin ng kahit sino dahil lang sa nakikiuso. Sa gawaing ito, kailangan ng sipag, tiyaga, at sikap para magtagumpay.”

Nida Abellanosa  
Don Carlos, Bukidnon



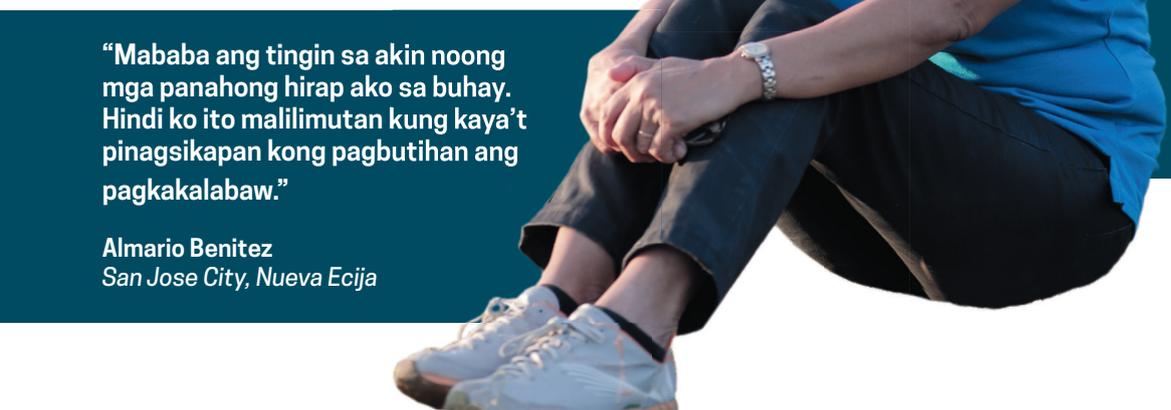
“Naging matagumpay ako sa gawaing ito dahil hindi ako sumuko maging sa pinakasimpleng pagsubok. Nagpatuloy lang ako hanggang sa marating ko ang kinaroroonan ko ngayon.”

Victoriano Dumale  
Science City of Muñoz, Nueva Ecija



“Buong akala ko noon ay hindi ko na maiaahon sa kahirapan ang aking pamilya. Mabuti na lamang at hindi ako sumuko at nanatiling matatag sa kabila ng mga matitinding hamon na aming pinagdaanan.”

Zosimo Tejano  
Maramag, Bukidnon



“Mababa ang tingin sa akin noong mga panahong hirap ako sa buhay. Hindi ko ito malilimutan kung kaya’t pinagsikapan kong pagbutihan ang pagkakalabaw.”

Almario Benitez  
San Jose City, Nueva Ecija

“Ang babae ay hindi pahuhuli sa paggagatas ng kalabaw. Hindi natin dapat hayaan na maging balakid ang ating limitasyon sa pagkamit ng ating tagumpay.”

Emily Velasco  
San Jose City, Nueva Ecija



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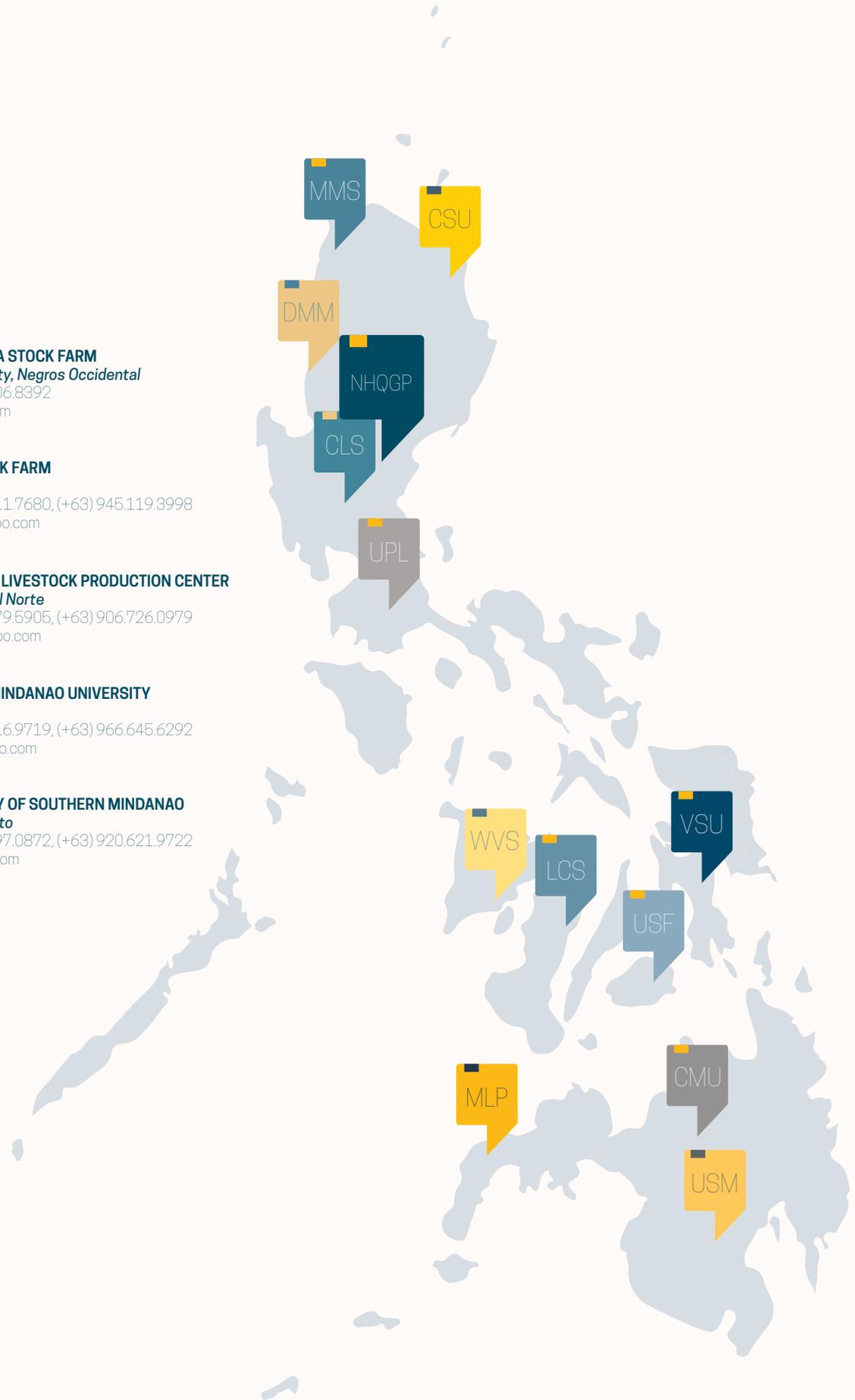
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