

PCC Newsletter

Official Publication of the Philippine Carabao Center of the Department of Agriculture
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PCC improving
NATIVE CARABAO BREED
for greater productivity

Carabeef gastronomic delights
**A list of must-try carabeef dishes
from Luzon to Visayas**

NATIVE CARABAO
figures well in niche market

CARABEEF FOR EVERYONE;
but first, know the
slaughtering procedures

TAMARAW
CONSERVATION EFFORTS:
saving a rare animal from extinction

**NATIVE CARABAOS
are forever**

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The PCC Newsletter welcomes industry-related articles not exceeding 800 words, with photo(s), and corresponding caption.

Success stories of farmers, cooperatives, and other beneficiaries and stakeholders of the Carabao Development Program are preferred.

PCC encourages reproduction of articles from this publication with proper acknowledgment.

Topic suggestions and comments are also welcome.

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about the cover



The swamp-type buffalo, known locally as carabao, was like manna from heaven as it has soon become the farmers' friendly ally in myriads of agricultural works. Being a very reliable and sturdy animal, which has a docile temperament, it was also harnessed for several uses – like being a power for some transport facilities, for trudging difficult and perilous terrains, as players in cultural and sporting events, center of attention in festivals, for food and as a ready bank in case of unexpected need for some financial travails.
(Photo by: Khrizie Evert Marcelo-Padre)



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Aquino lauds Philippine livestock sector for ensuring food safety from farm to fork

By Khrizie Evert M. Padre

President Benigno Aquino III has recognized the effort of the livestock sector in safeguarding public health while ensuring enough production to meet the demand for meat and poultry products.

The chief executive took note of the twin achievements in his keynote address during the opening ceremony of Livestock 2015 Philippines Expo on June 25 at the SMX convention center in Pasay City.

As you know, the Philippines has been performing very well in terms of food safety. Our country has been free from Avian Flu since 2005, and of Foot and Mouth Disease (FMD) since 2010," he pointed out.

The three-day Livestock Expo 2015 is an international trade exhibition focusing on the farm to fork concept. Participated by local and foreign stakeholders in the livestock industry, the biennial activity is fast-gaining a reputation as one of Asia's prestigious livestock shows highlighted by exhibits of the latest livestock equipment and technical sessions by experts from various countries in Asia.

Aquino, who was formally introduced by Agriculture Secretary Proceso J. Alcala, noted that the Philippines recently attained the highest level of recognition as a country free from FMD without vaccination, which further increases the country's competitiveness in the upcoming Association of Southeast Asian Nations (ASEAN) Economic Integration this year.

"Only four ASEAN countries, the Philippines included, can boast of this recognition. The goal now is not only to maintain these standards, but also to ensure that our livestock sector continues to grow," he declared.

To fully support the industry, the administration increased the budget of the sector by 108 percent, he added.

"Our administration's increased commitment in this regard can be seen in how much we have invested in livestock and poultry. Over the course of our term, we have increased the budget of this sector by 108 percent. This has given us the wherewithal to increase focus on animal



President Benigno Aquino III delivers his keynote discourse during the opening ceremony of the Livestock 2015 Philippines Expo on June 25 at the SMX convention center in Pasay City wherein he emphasizes the country's achievements in terms of food safety.

health by providing vaccinations and undertaking disease surveillance, among other measures, to control, if not eradicate, these animal diseases," he said.

He also mentioned that key legislation have been passed to promote food safety and security with the amendment of the Meat Inspection Code.

"With the help of allies from Congress, we amended the Meat Inspection Code, which imposes stricter fines for food safety violations, perhaps most prominently the transport or sale of the so-called 'hot meat'. There is also the Food Safety Act of 2013, which strengthens our food regulatory system to better protect consumer health and facilitate our food exports," he stated.

The President said that the achievements of the Philippines in terms of food safety "make us eligible to export meat."


At present, the Department of Agriculture is pursuing two large-scale projects--a Class AAA poultry dressing plant in Bamban, Tarlac and a Class AAA slaughterhouse in Tanauan, Batangas--to maximize the country's eligibility as a meat exporter. Both of these projects are expected to be completed this year.

Aquino also highlighted the efforts being made of the livestock sector to further attract and forge new and deeper

partnerships with private investors.

"I understand that more than half the exhibitors here are visiting from other countries and looking for opportunities in the Philippine livestock industry. We continue to offer incentives for those willing to invest in these industries in non-traditional areas, and invite all visitors present today to fully explore the possibilities, and to look for opportunities through which we can amplify each other's strengths towards a more robust livestock sector," he said.

Since its inception in 2011, the Livestock Expo Philippines has drawn interest from the international agribusiness community, indicative of which was that 80% of the attendees of this year's edition were foreign companies. The expo continues to attract some 8,000 quality trade visitors from 16 countries.

More than 200 brands of meat products from 18 countries were highlighted during the three-day exhibition co-supported by the Department of Agriculture and its attached livestock agencies, namely, the Bureau of Animal Industry (BAI), National Meat Inspection Service (NMIS), Philippine Carabao Center (PCC) and National Dairy Authority (NDA), as well as the Bureau of Agriculture and Fisheries Standards (BAFS). 



Dr. Caro B. Salces (2nd from left), center director of Philippine Carabao Center at Ubay Stock Farm (PCC at USF), expressed his thanks and appreciation to the Department of Social Welfare and Development (DSWD) during the turn-over of a Php10-million starter kit training fund for dairy development in Bohol under the DSWD's Sustainable Livelihood Program. The fund was awarded in the presence of PCC Executive Director Arnel N. Del Barrio (in blue shirt), Gov. Edgar M. Chatto (3rd from right), as well as mayors and representatives of the beneficiary towns of Ubay, Mabini, Alicia, Dagohoy, San Miguel and Trinidad.

PCC-USF pioneers PCC, DSWD dairy convergence project

By Leinefe B. Libres

Continuing efforts aimed at the development of the local dairy industry has received another boost with the transfer of a P10-million starter kit training fund from the Department of Social Welfare and Development (DSWD) to the Philippine Carabao Center at Ubay Stock Farm (PCC at USF).

The fund transfer was done during a ceremony held June 8, marking the collaboration of PCC and DSWD under the latter's Sustainable Livelihood Program (SLP).

Considered a first in the country, the joint endeavor traces its origin to a Memorandum of Agreement (MOA) entered into by PCC at USF and DSWD Field Office VII in 2014 for the development a Pilot Dairy Commodity Cluster Model Project in the Bohol province under the DWSW's SLP.

"DSWD provides the fund intended for the starter kit training on dairying for 500 beneficiaries," explained Jennifer Quimno, DSWD-7 SLP regional project coordinator.

Aside from the fund, DSWD is also responsible in the validation on the eligibility of the SLP beneficiaries.

On the other hand, PCC is responsible on the procurement of carabaos as the basic resource for the starter kit training, validation on the compliance of the recipients to dairying requirements, and the provision of technical assistance and forage development.

Moreover, PCC at USF and DSWD-7 will jointly undertake provide social preparation and community-driven enterprise development (CDED) sessions and interventions that may be deemed necessary in the implementation of the project. They will establish tie-ups with other public and private partners for continuous skills and micro-enterprise development trainings as well as provision of needed common facilities in milk production or milk processing.

Aside from the DSWD fund, the Bohol provincial government headed by Gov. Edgar M. Chatto has provided a counterpart of P916,500 for the one-year insurance of the animals.

Dr. Arnel N. del Barrio, PCC acting executive director, said the convergence initiative is significant because it means income not just for the farmers but also for Bohol province.

"If lahat (500 beneficiaries) ay kukuha

ng isang liter (of milk) araw-araw, meron na kaagad kayong 500 liters of milk a day, at kung ito ay bibilhin ng P50 per liter, meron na kayong P25,000 in one day [If all of the 500 beneficiaries are going to harvest a liter of milk everyday, there will be 500 liters of milk a day. If this will be bought for P50.00 a liter, there will be P25,000 accumulated income per day.]," he explained. He further stated that with intensive care on the carabao, the farmers can milk it for 200 days, thus they can achieve an income of P5 million in a year.

Dr. Caro Salces, PCC at USF center director, expressed his appreciation for the support and trust given by the DSWD and the provincial and local government units during the turn-over ceremony.

"I'm glad that our leaders can speak of the program very well. They are better promoters of the program," he said.

"Thank you PCC at USF na pinangunahan n'yo ang magandang programang ito, baka ka 'ko ay kopyahin namin ito sa iba pang lugar (Thank you PCC at USF for spearheading this wonderful program, we might even implement this in other areas," said Dir. del Barrio. 🐄



Dr. Arnel N. Del Barrio, PCC acting executive director, discussed the importance of mineral supplementation for dairy animals during the 18th Dairy Congress and Expo (DairyConEx) held April 28-30 at Lima Park Hotel in Malvar, Batangas.

18th DairyConEx showcases gains in PH dairy industry

By Chrissalyn L. Marcelo

The increasing volume of local production of milk is providing a much-needed boost for the livelihood of thousands of farmers and their families nationwide.

This was the observation aired by presenters in describing the current state of the dairy industry in the country during the 18th Dairy Congress and Expo (DairyConEx) held April 28-30 at Lima Park Hotel in Malvar, Batangas.

The congress and exposition are conducted annually by the Dairy Confederation of the Philippines (DairyCon) to serve as venue for the exchange of information on the experiences in innovations and breakthroughs in the areas of production, processing and marketing as well as cooperative development in the local dairy industry.

“It is geared toward raising productivity

and incomes of dairy farmers, augmenting the base herd, creating new market niches, and accelerating the realization of a self-reliant countryside,” Juan Lozano, national chair of the DairyConEx, said.

The theme of this year’s event was “Gatas Pinoy: Paunlarin, Tangkilikin, Palaganapin!”

In his message to the DairyConEx participants, which was delivered by Undersecretary for Livestock Jose Reaño, Agriculture Secretary Proceso J. Alcala said: “Nakita natin kung paano lumalago [dumarami] ang nakikilahok at sumusuporta sa ating dairy industry (We have seen how the increasing number of people participating in and supporting our dairy industry). Thanks to their support because we are attaining our set target as contained in the dairy roadmap from 2010 to 2016”.

Reaño said that because of this support, there are now 100,000 families involved in the dairy value chain that include those are earning income from selling milk and milk products, and selling live animals.

He added that there are now 46,000 dairy animals in the Philippines and that the annual milk production in the country now stands at about 20 million liters.

“This volume is 26% higher compared to the milk production output five years ago,” he said.

For her part, National Dairy Authority administrator Grace Cenas revealed that dairy production in the country posted its highest growth of seven percent to date compared to only five percent annual growth rate in the imported milk product in the last five years.

“Today, on the average, one out of three glasses of liquid milk in the country is produced locally,” she said.

The NDA head further added that there are now 84 dairy multiplier farms (DMFs) nationwide, with over 7,000 milking animals on the ground, that are expected to produce at least a thousand head of dairy animals this year.

“From our 2010-2016 targets of 55,000 of dairy animals, we now have 46,638 dairy animals and several thousands of families who are involved in dairying. We already have a credit facility with the Land Bank of the Philippines, set up a buy-back fund to support the crossbreeding and upgrading program, and have pushed stakeholders to improve further animal nutrition, milk production operations, and breeding efficiency,” she said.

Nevertheless, she added, much work has yet to be done and several challenges have to be met.

These include, she said, the limited number of stocks (which is being addressed through the multiplier farm program), promotion of locally produced milk, and the needed competitiveness in light of the coming ASEAN Integration.

Rep. Mark Llandro Mendoza of the 4th district of Batangas, who was the keynote speaker of the event, also pointed out that dairying has been progressing much and creating positive developments in the country.

“The dairy industry is on the right path and direction. The dairy sector is developing much its enthusiasm and vigor,” Mendoza, who is currently the chair on committee on agriculture and

(continued on page 6)

18th DairyConEx...

(continuation from page 5)

food in the House of Representatives, said.


The 18th DairyConEx was participated in by top government officials, foreign dignitaries, local government representatives and industry players from various parts of the country.

The Philippine Carabao Center (PCC), as one of the major sponsors and exhibitors in the event, displayed some of its sample dairy products from the Milka Krem dairy outlet in the Science City of Muñoz in Nueva Ecija and sample feed stuff for carabaos that included silage and urea-treated rice straw (UTRS).

A silage-making video featuring Isagani Cajucom, a farmer-cooperator based in Lupao, Nueva Ecija, who is being assisted by the PCC on his silage production project, was shown during the DairyConEx.

PCC Acting Executive Director Dr. Arnel N. del Barrio, Dr. Daniel Aquino and Dr. Ester B. Flores likewise discussed major topics on the importance of minerals supplementation for dairy animals, feeding for optimum peak and persistency among buffaloes, and the dairy genetics improvement program, respectively.

Celestino Delos Santos, a farmer-trustee of the PCC at University of the Philippines in Los Baños (PCC at UPLB), shared his experiences in dairy buffalo farming while two other farmer-representatives, Jeffrey Lim and Cornelio V. Toreja, shared their experiences in goat and cattle farming, respectively.

The 18th DairyConEx was hosted by the Batangas Dairy Cooperative (BADACO) in cooperation with the 4th Congressional District of Batangas, the Provincial Government of Batangas, the local government units of Malvar town and Lipa City, NDA, PCC, Department of Agriculture-Regional Field Unit IV-A and UPLB-ADSC (Animal and Dairy Sciences Cluster) 



(seated l-r) Nelson Baer, municipal agriculturist; Rosalinda Meliano, DA-RFO XI; Benjamin John C. Basilio, PCC-USM center director; Dr. Arnel N. Del Barrio, PCC acting executive director; Mayor Lolita A. Moral and Arturo Mosquera, Dairy Association president, sign the document covering the award of Italian dairy buffaloes to 21 farmer-members of the Braulio E. Dujali Farmers' Livestock Raisers and Dairy Workers' Association.

PCC-USM awards Italian Buffaloes to Dairy Association in Davao del Norte

By Ludivina J. Estimo

The Philippine Carabao Center at University of Southern Mindanao (PCC at USM) recently awarded 21 Italian Buffaloes to 21 qualified farmer-members of the Braulio E. Dujali Farmers' Livestock Raisers and Dairy Workers' Association in the municipality of Braulio E. Dujali, Davao del Norte.


The turn-over ceremony was held May 26 at the Farmers' Training Center, Palayamanan, Brgy. Cabayangan of Dujali town, which is part of Region XI or the Davao region.

One of the highlights of the program was the signing of a memorandum of agreement between PCC and the Dujali local government unit (LGU) stating, among others, the responsibilities of both signatories.

With the release of the Italian buffaloes through the Modified Paiwi Scheme-25 Dairy Module, PCC shall provide technical support in terms of health management, breeding, dairy production, record keeping, product development and marketing for a sustainable carabao-based enterprise.

At present, some farmers are already milking their crossbreds. With the arrival of the Italian buffaloes, the association's production and income are projected to increase when the animals reach the milking stage and the milk produce processed into various dairy products.

Dr. Arnel N. del Barrio, PCC acting executive director; Lolita A. Moral, Duhali municipal mayor, and Benjamin John C. Basilio, PCC at USM center director led the signing rites. Also present were Vice Mayor Samuel F. Pacres, Municipal Agriculturist Nelson C. Baer, Dairy Association president Arturo Mosqueza as well as representatives from the Sangguniang Bayan, Davao del Norte second congressional district, Office of the Governor, Department of Agriculture-RFO XI, Quarantine Office, Provincial Veterinary Office, officers and members of the dairy association, and staff of DA-LGU and PCC-USM.

PCC's Carabao-based Enterprise Development (CBED) envisions the improvement of the quality of life of people in farming communities through carabao dairying with strong LGU support. 



Dir. Benjamin John C. Basilio (in white t-shirt) of the Philippine Carabao Center at University of Southern Mindanao (PCC-USM) in Kabacan, Cotabato and Dr. Virgilio V. Lopez, the center's farm and livestock operations manager, light a gas burner during the biogas ceremonial test fire on April 6. With them are some of the team members of the University of Southern Mindanao-Affiliated Renewable Energy Center and Department of Energy-Mindanao Field Office.

PCC-USM showcases first biogas digester project in Region 12

By Ludivina J. Estimo

A 10-cubic meter biogas digester is now operational at the Philippine Carabao Center based at the University of Southern Mindanao (PCC-USM) in Kabacan, Cotabato.

The facility is an outcome of the collaboration between the Department of Energy-Mindanao Field Office (DOE-MFO), University of Southern Mindanao-Affiliated Renewable Energy Center (USM-AREC), the local government unit (LGU) of Kabacan and PCC at USM.

A covering memorandum of agreement (MOA) was entered into by the four entities represented by Dir. Manuel M. Laneza, DOE-MFO director; Dr. Francisco Gil N. Garcia, USM president and USM-AREC project director; Kabacan Mayor Herlo P. Guzman, Jr. and Benjamin John C. Basilio, PCC-USM center director.

PCC at USM was selected as a recipient to showcase the first biogas digester project in Region XII (Soccksargen) and serve as a demonstration model project to help in

promoting the biogas technology in the region.

As an integral part of the project, a seminar on biogas technology was also conducted for livestock growers/producers and representatives from various villages in Kabacan. Highlight of the seminar was an actual visit to the newly constructed biogas plant at PCC-USM. The project will be duplicated in selected villages and by other groups or individuals who signify interest of the technology and concur with the requirements.

Biogas production involves a fermentation process utilizing livestock manure, and liquid and solid organic waste materials. The resulting slurry is fermented anaerobically to produce methane gas, which can be utilized to power farm operations and cooking.

PCC-USM is already using this technology for the pasteurization of milk and in processing of various dairy products, thus saving the cost of using

liquefied petroleum gas (LPG).

Biogas can be used daily with continuous loading of an average of 480 kilograms of slurry per day while the sludge can be utilized as organic fertilizer in forage production. At the same time, the center addresses the waste management problem since the process itself serves as a waste treatment system, which also mitigates the odor problem. The center can now collect an average of 100 kilograms of organic fertilizer per day.

The construction of the biogas digester started on January 12 this year and was closely supervised by the DOE-MFO and USM-AREC team, both of which will also monitor its operation to ensure its sustainability. The ceremonial biogas test fire was conducted on April 6.

As a demonstration model project, PCC at USM commits to maintain, secure, operate and sustain the project, and provide technical skills and knowledge associated with the biogas technology.



Dr. Mingala is designated as livestock biotech center chief; bares center's activities

By Chrissalyn L. Marcelo

Effective last May 6, 2015, Dr. Claro N. Mingala, Scientist II from the Philippine Carabao Center (PCC), was designated by Agriculture Secretary Proceso J. Alcala as the chief of the Livestock Biotechnology Center (LBC).

Prior to his designation, he was coordinator of the center starting August 26, 2014.

The LBC, according to Mingala, was established to administer a more integrated, focused, and inclusive implementation of the R and D studies in livestock biotechnologies.

"Its primary function is to cater and administer all biotechnology researches in livestock particularly cattle, goat, sheep, poultry and swine," he said.

Located within the premises of the PCC headquarters in the Science City of Muñoz, the LBC is considered as a "center" within a center.

In accepting the designation, Mingala said that he will properly supervise,

document, monitor and evaluate all biotechnology researches in livestock that will be submitted to the LBC.

He added that along with Ryan Bismark Padiernos, his research assistant, he will promote the LBC to encourage local and international researchers to submit worthwhile biotechnology researches to the center.

Currently, Mingala said, the center is conducting collaborative works or tie-up with the National Research Council of the Philippines (NRCP) for the conduct of workshop on how to write proposals and scientific papers.

"We're also taking time slots in various conferences and conventions here in the Philippines to further promote the LBC," he said. "Aside from that we are contacting and inviting researchers abroad to submit their research proposals to the LBC," he added.

Mingala said the ultimate goal of LBC is to help the livestock industry. Research

proposals that will be submitted to the LBC will undergo a series of evaluation from technical persons and up to the DA level, he added.

The proposals, he stressed, should cover the following topics: conservation, improvement and utilization of animal genetic resource; reproductive biotechniques for the production of genetically superior animals; livestock production improvement; issues concerning food safety and food quality, animal health or public health; and products development.

"The LBC's mission is to empower the livestock biotechnology stakeholders toward the production of research and development programs for the improvement of the livestock industry in the Philippines," he said. 🐄

EDITOR'S NOTE

ERIC P. PALACPAC

The Native Carabaos are Here to Stay

Since it started its operations in 1993, the Philippine Carabao Center (PCC) has focused much of its programs on the continuous “upgrading” of the native carabaos through crossbreeding with purebred dairy buffaloes to produce offsprings with improved potentials for milk and meat production. It is a logical development intervention, as supported by previous research efforts. The success of such breeding approach is evident in many parts of the country where crossbred buffaloes (CBs) are now being used by farmers for economic activities.

But while farmers are reaping benefits from their CBs, there are concerns about possible genetic erosion within the native carabao population as a result of continuous crossbreeding. The PCC has long anticipated this possibility and thus, while crossbreeding efforts are going on, it has also instituted programs exclusively for the conservation and improvement of the native carabaos.

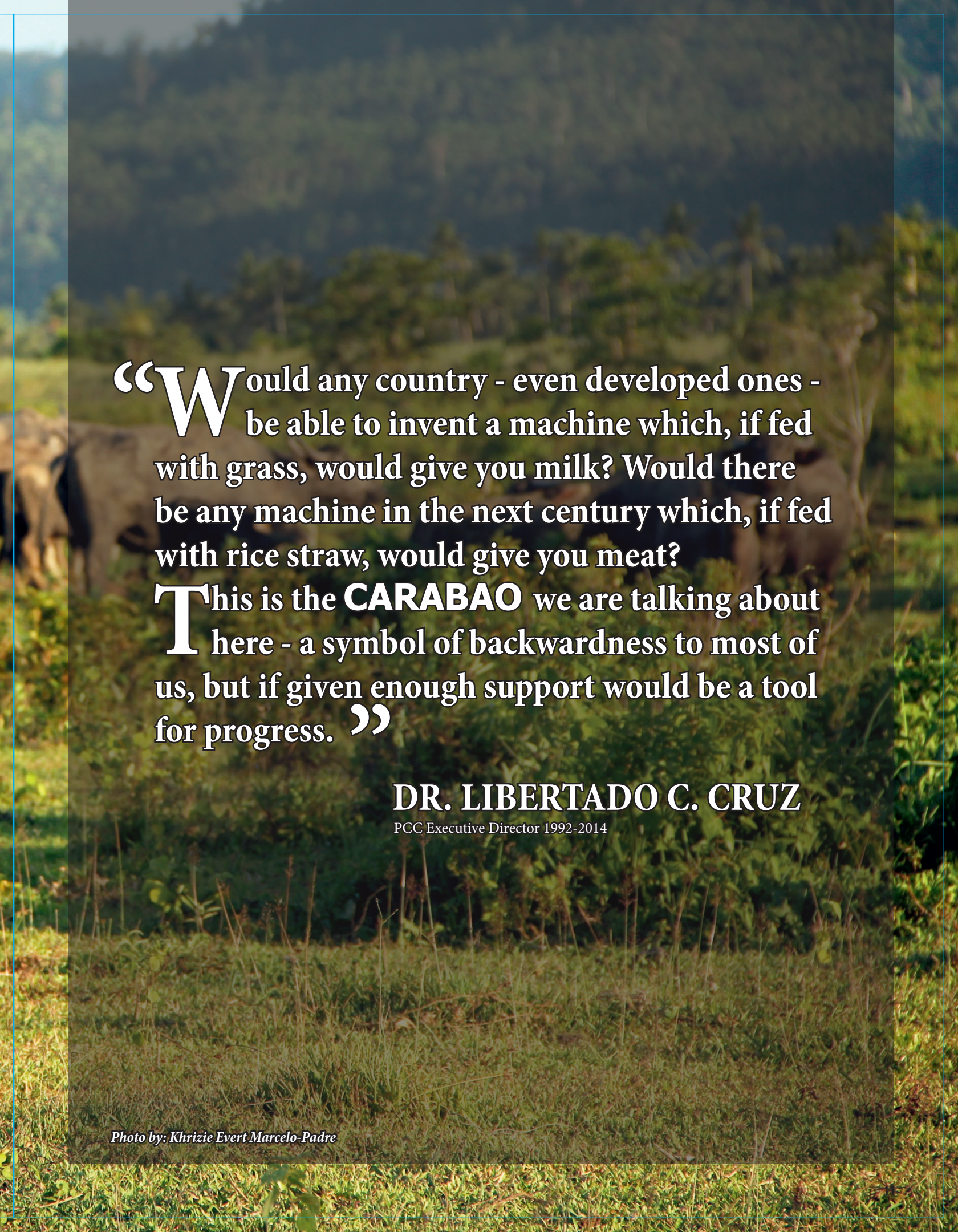
Conservation efforts for the native carabaos are being made in their natural habitat (in situ) and in controlled environment (ex situ). In situ conservation is mostly evident in the provinces of Cagayan and Batanes (Northern Luzon) and Bohol (Central Visayas). In these areas, the native carabaos are continuously undergoing performance testing and selection protocols for purposes of draft power, meat, and milk without the introduction of exotic germplasm. Ex situ conservation on the other

hand is carried out at the PCC’s institutional facilities across the country either by raising these native animals in confinement or through cryopreservation of their genetic materials (e.g., semen and embryo).

A wise and complementary strategy to conserve and perpetuate the native carabaos is by utilizing them. If there are economic benefits that can be gained from the native carabaos, then farmers will continue raising (and reproducing) them. Some good examples of economic activities are the thriving businesses of “keseo” in Samar, processed dairy products and “milky bread” in Bohol, meat dishes like “pigar-pigar” in Pangasinan, “batil patong”, “tapa”, and “longganisa” in Cagayan, “minanok” in Quezon, “paksiw kalabaw”, carabeef steak, and fried carabeef tripe in Catanduanes, among others. These businesses, anchored on native carabaos, have found their niche markets in their respective areas, thus, they subsist to this day.

It is suffice to say that with the above programs and activities, the native carabaos are here to stay. The fear of losing this indigenous animal resource has no basis. Of course, the PCC, its partners, and key stakeholders of the carabao industry have to be steadfast and proactive in seeing to it that it remains that way.





“**W**ould any country - even developed ones - be able to invent a machine which, if fed with grass, would give you milk? Would there be any machine in the next century which, if fed with rice straw, would give you meat?

This is the **CARABAO** we are talking about here - a symbol of backwardness to most of us, but if given enough support would be a tool for progress. ”

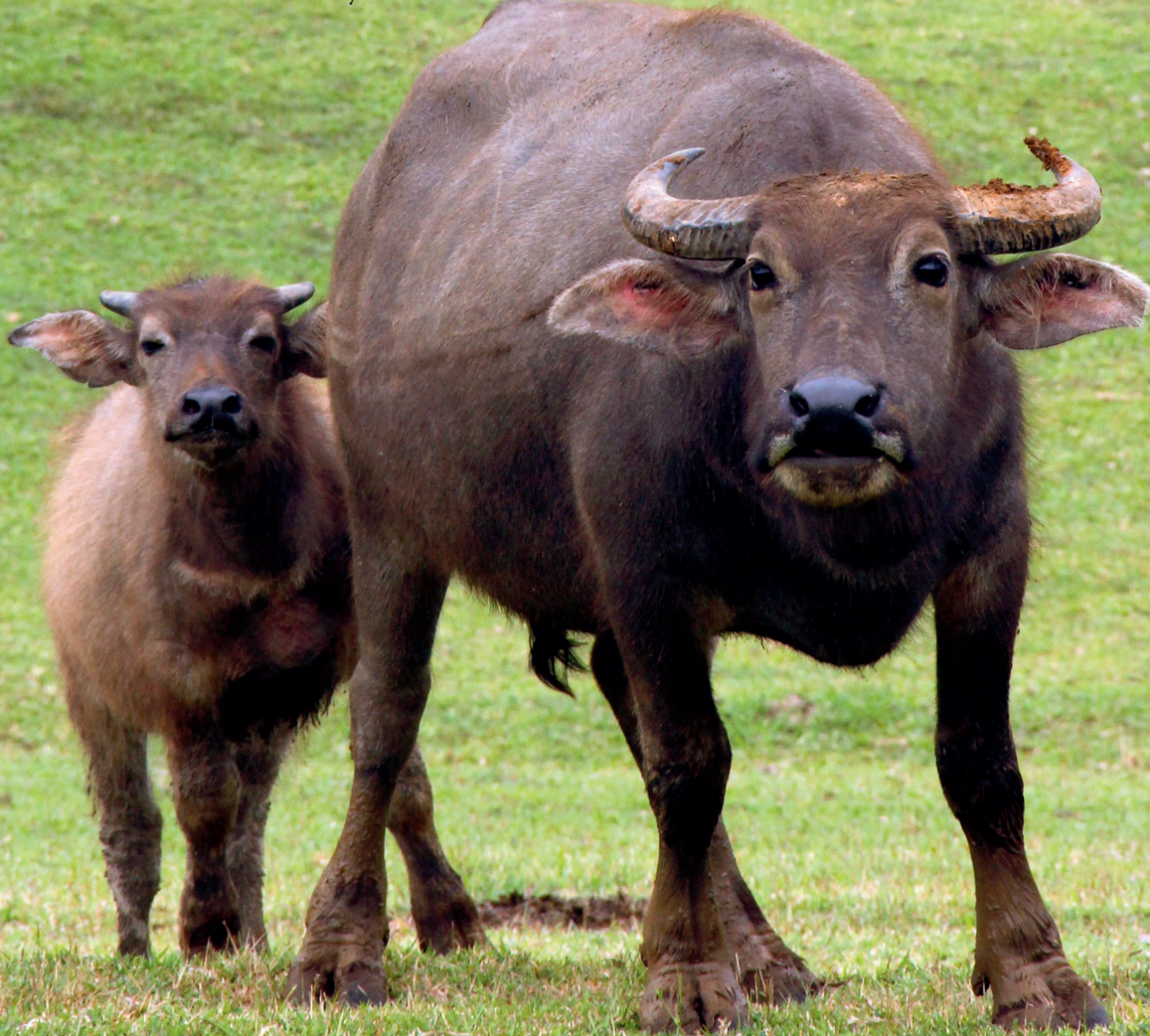
DR. LIBERTADO C. CRUZ

PCC Executive Director 1992-2014

NATIVE CARABAOS are forever

By: ANSELMO S. ROQUE, MA. CECILIA C. IRANG, and CHRISSALYN L. MARCELO

Photos by: KHRIZIE EVERT M. PADRE and CHRISSALYN L. MARCELO



Not a few animal experts have expressed the fear of losing the blood lines of the native carabaos.

Their fear is not without basis, though. The frenzy on improving the breed of native carabaos, either by way of artificial insemination or the fielding of an army of quality bulls of the imported breed, is ongoing and thousands of farmers owning them are responding favorably.

Coupled with the heightened efforts on producing more and more crossbreds is the distribution of modules of carabaos of the dairy breed, which of course is also multiplying fast. And, in the face of these

developments, the attention to the breed of the native carabaos as well as their continual development may wane and eventually cause detrimental effects on the welfare or survival of this animal.

Will it happen?

“It will not happen,” assures officials of the Philippine Carabao Center (PCC). “There are parallel efforts to conserve and use the native carabaos,” they added.

These parallel efforts are as intense. Developments indicate that the breed

of the native carabaos will forever be in the agricultural scene in the country. Institutions, private groups, as well as individuals driven by the necessity of maintaining breeds of native carabaos make sure that their animals are not mixed with the blood of the foreign breed.

Native carabaos

Accounts about this beloved of animals on the agricultural scene tell us that it is



There's a place called "Marlboro Country" in Batanes. It is in the southern part of municipality of Mahatao, in the middle section of the Batan Island, comprising 167.93 hectares which is one-third of the total land area of the town. They call the place as "Racuh a Payaman", a declared Communal Pasture Land Parcel 1, encompassed by 23 sitios belonging to either of the four barangays of Hanib, Panatayan, Kaumbakan, and Uvoy.

not indigenous or native to the country. Known worldwide as the water buffalo, having two types which are the riverine and swamp types, it was the latter type that was brought to the country by the migrants.

The swamp-type buffalo, known locally as carabao, was like manna from heaven as it has soon become the farmers' friendly ally in myriads of agricultural works. Being a very reliable and sturdy animal, which has a docile temperament, it has also harnessed for several uses – like being a power for some transport facilities, for trudging difficult and perilous terrains, as players in cultural and sporting events, center of attention in festivals, for food, as a ready bank in case of unexpected need for some financial travails, and others.

Over time, however, despite its importance to humans, particularly in the countryside, the carabao suffered neglect in terms of its breed, proper nutrition and care. It dwindled in size and weight. It also suffered decimation of its population due to the onslaught of diseases, indiscriminate slaughtering, and even massacre during the war on suspicion that they were being used by the enemies in transporting armaments and provisions.

These undeserved fate that befell on this animal prevailed for a long time. Thus many of these animals appeared to be a far cry from the big and robust animal that they used to be. Until some positive steps were undertaken by persons or authorities concerned, that is, although a little bit late in coming.

In the early 1970's, research and development works on the carabao became the seed that eventually became the impetus for more beneficial things to come the way of this animal. Then with funding from the UNDP-FAO, with counterpart funding from the national government, the strengthening of the carabao research and development project, which included upgrading of its breed, was carried out for several years. And, eventually, the Philippine Carabao Act of 1992 was enacted.

Among others, the law provides to "conserve, propagate, and promote the Philippine carabao as a source of draft animal power, meat, milk and hide." Then, as provided by law, the Philippine Carabao Center (PCC) was created with the assigned priorities to increase the carabao population and its productivity, undertake reproduction, breeding, nutrition and animal health activities, and conduct

researches to ensure economic viability and acceptance of the technologies for the farmers.

Thus, while the upgrading of the native carabaos take place, thru the introduction of the blood of the riverine-type by way of crossbreeding and back crossing, the cause of conserving and utilizing the breed of the native carabao is not forgotten.

Current practices and efforts indicate that this is true.

Conservation and use in Batanes

There's a place called "Marlboro Country" in Batanes. It is in the southern part of municipality of Mahatao, in the middle section of the Batan Island, comprising 167.93 hectares which is one-third of the total land area of the town. They call the place as "Racuh a Payaman", a declared Communal Pasture Land Parcel 1, encompassed by 23 sitios belonging to either of the four barangays of Hanib, Panatayan, Kaumbakan, and Uvoy.

The larger part of this area is occupied by the Cattle Raisers Association of Communal Pastureland No. 1, the oldest and most intact group in Batanes. Among
(continued on next page)

others, the association, as provided in its management objectives, “ensures equitable access of individuals, associations and communities to benefits derived from grazing lands through co-production sharing scheme.”

The entire area is provided with a perimeter fence.

In a separate place within the communal pasture land area, in Barangay Uvoy, about 116 hectares are devoted for the raising and use of native carabaos. Also managed by another association, its 32 members composed of farmers and fishermen have 135 native carabaos.

Each of the members, who own an average of six carabaos each, is given specific areas to tend his animals. He pays P60 per head annually, on top of his payment of P500 as lifetime member of the association, which amounts are used for the upkeep of the area and for the needed support for improvements.

“We bought breeder carabao bulls which we loaned out to the association to improve the genetic quality of their carabaos,” said Dr. Alberto Tabile, provincial veterinarian. “Their carabaos weigh from 300 to 400 kilograms each,” he added.

Alejandro Camacho Jr., OIC municipal agriculturist of Mahatao said the association is making sure that only native carabaos are maintained by the farmers in

the pasture land.

“We can say that their carabaos are ‘organic’. They are not vaccinated nor injected with medicine and they don’t practice deworming,” Camacho Jr. said.

He said the mortality rate is almost negligible as the members take home and confine their carabaos in their backyard when they are about to give birth. The calves are taken cared of for two to three months before they are brought to the communal pasture area.

“Our municipal government provides some assistance to the members of the association in terms of the forage materials, rain collector and others,” the OIC municipal agriculturist said. “We also see to it that the set rules and regulations of the association are adhered to,” he added.

Joenard Carzon, vice chair of the association, said the members follow strictly the rules that they have set.

“They are not allowed to take out their carabaos from their assigned grazing area without the permission of the chairman of the board or president of the association,” he said. “They are also on strict orders to make sure that their animals are confined only in the respective areas assigned to them. These must be done by fencing their respective areas,” he added.

He said there is a team assigned to check if the perimeter fences are in order.

For a carabao that is found to have gone astray, the owner is fined P200.

“Our set time for the visit of the farmers of their native carabaos is from five o’clock to seven o’clock in the morning and three in the afternoon every Sunday,” Carzon said. “But they are also allowed to visit their animal anytime provided they get the necessary permission,” he added.

The farmers normally take the animals out of the communal ranch for their work in the field from December to March for the planting of palay and root crops.

“The members are constrained to sell their animals fit for slaughtering when they need money to finance the studies of their children. They sell it for P20,000 to P25,000 each regardless of whether it is male or female,” Carzon said.

The members said they will continuously maintain their herd of native carabaos as they said the animals are very useful for their works in the field and as a ready cash when they need money.

Conservation and traits improvement

In the town of Peñablanca in Cagayan, a total of 92 native carabaos, 67 of which are females, are lodged in a secured area for conservation. The place has been designated as the National Conservation site for the native carabaos.

“We have individual records for these



In the town of Peñablanca in Cagayan, a total of 92 native carabaos, 67 of which are females, are lodged in a secured area for conservation. The place has been designated as the National Conservation site for the native carabaos.



animals,” Rubina R. Piñera, Training Specialist III of the PCC at Cagayan State University, said. “Their records are in a data base which were also given to our Genetic Improvement Program (GIP) office in our national headquarters,” she added.

The growth rate and reproductive performance of each of the native carabaos are monitored and recorded, she added.

The best of the bulls in the herd have been sent to the PCC National Bull Farm in Barangay Joson in Carranglan, Nueva Ecija as semen donors.

“Whenever we need frozen semen for the AI service of the breedable native carabaos in the conservation site, we get it from Digdig,” Piñera said. Digdig, the former name of Barangay Joson, is what PCC personnel call the National Bull Farm.

Some of the frozen semen are distributed to interested farmers elsewhere for the propagation of their native carabaos. The others are cryo-banked for conservation.

“Part of the plan for the conservation efforts of the native carabao is the development of frozen embryos which will be used when needed,” Piñera said.

The calving interval of the dam is reported to be good. The body weight of the conserved animals appeared to be good also as they weigh at an average of

350 kilograms each at 24 months in age.

“As part of the master plan for the conservation of our native carabaos, improvement of the carcass traits of the animals is studied. We are following the same plan under the GIP on what kinds of native carabaos, as to their traits, performance and other attributes, that we should develop,” Piñera said.

The outstanding animals in our conservation site will be distributed to cooperatives or farmer-cooperators who are keen on raising native carabaos for their intended purposes, she added.

Native carabaos sanctuary in the Visayas

In the island-town of Pres. Carlos P. Garcia (CPG) in Bohol, it is a “no-no” to bring in live carabaos or frozen semen of carabaos of foreign breed.

The island-town, which can be reached after 15 minutes by boat from the port of Ubay, Bohol, now boasts of about 300 native carabaos in the hands of the farmers. Some of these animals hulk to more than 500 kilograms each.

The municipality’s pursuit in preserving the native carabaos was given a necessary push thru the signing of a memorandum of agreement (MOA) with the PCC at Ubay Stock Farm (PCC at USF) in 2010 on carabao development program (CDP). The MOA is for the conservation,

improvement and use of the native carabaos in the island.

CPG is the only island-town in the country dedicated for the conservation of the native carabao, and it is but befitting, for the town is named after former President Carlos P. Garcia renowned for implementing and popularizing the “Filipino First Policy”—preferring, conserving and cherishing what the nation owns.

“That is what I want, to conserve our native carabaos and to cherish what is really ours,” CPG Mayor Tesalonica Boyboy said.

Moreover, the town has enacted a local ordinance on the prohibition of slaughtering female carabaos to preserve the local breed.

Tie-up with PCC at USF

The PCC in accordance with its mission to promote and provide direction for the development of the Philippine Carabao Industry, implements, alongside with its other responsibilities, the conservation and utilization of the Philippine Native Buffaloes and to disseminate appropriate carabao-based technologies.

As indicated in the MOA between the PCC at USF and the CPG local government unit (LGU), the residents of the municipality will raise native carabaos

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The cryobanking facility, which is located inside the Livestock Innovations and Biotechnology (LIB) complex of PCC National Headquarters and Gene Pool in Science City of Muñoz in Nueva Ecija, is considered as the national cryobank in the country.



only. It will not allow the application of the intensified artificial insemination services using Murrah buffalo semen.

As the town is isolated from the Bohol mainland, it is the most ideal area for the conservation and utilization of the native carabaos. Its surrounding areas, mostly rolling in nature with lush vegetation is very conducive to carabao production.

In order to accelerate the development and improvement of the native carabaos, the PCC at USF and the CPG LGU agreed to launch and implement a program that allows qualified cooperators access to good quality animals and technical support for carabao production and marketing activities of the native carabaos.

The PCC at USF released 11 quality native carabao bulls to service the 533 female carabaos owned by the local farmers.

“We are selecting the best bulls to continuously breed and improve the quality of the native carabaos. These bulls will be used for semen extraction and subsequent insemination,” Dr. Caro Salces, PCC at USF center director, said.

He added that the other males will be considered for the carabao meat industry.

Another goal of the CPG town and the PCC is to develop the native carabaos for dairy production specifically for cheese processing as the native carabao’s milk

has a lot of solids and contains high fat. The cheese made out of it is deemed very saleable.

At present, the PCC at USF has 101 head of native carabaos in their institutional facility.

PC gene is safe over continuous carabao upgrading

In a survey conducted by the Bureau of Agricultural Statistics (BAS) last January 2015, it showed that the country has a 2.85M carabao population. From these, the PCC stated that there were estimated 43,000 heads of milking animals, which were composed of Bulgarian and Brazilian murrah buffaloes; Italian Mediterranean breeds (imported breeds); and the crossbreds.

“From 43,000 heads of animals, we actually have 10,000 heads of our imported breeds while about 29,700 are crossbreds,” Dr. Annabelle S. Sarabia, PCC’s chief of operations said.

She added that the implementation of PCC’s program in carabao upgrading can be considered as a “dot in a bottle”. “This is because the number of crossbreds was fewer compared to the number of native carabaos,” she added.

“However, the PCC’s efforts in carabao upgrading is still creating a big impact

in the country as farmers benefits from the program and milk production in the country is continuously increasing,” she emphasized.

Beyond that, of course, the PCC also ensures everyone that the breed of native carabaos would not be lost in the frenzy of carabao upgrading. The agency is confident because of their conservation and cryopreservation efforts.

According to Dr. Arnel N. Del Barrio, PCC acting executive director, PCC’s conservation efforts can be simply seen through its established in-situ gene pool of native carabaos.

Del Barrio said that this agency have gene pool of native carabaos in PCC at CSU and native herds in PCC at USF in Peñablanca, Cagayan Valley and Ubay, Bohol, respectively.

The PCC at CSU, according to Dr. Del Barrio, served as the national site of native carabaos in the Philippines.

Cryopreservation efforts

Aside from conservation efforts, PCC also managed to cryopreserve the genes of the Philippine Carabao.

Cryopreservation, as defined by scientist and experts, was a process wherein cells, whole tissues, or any other substances susceptible to damage

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TAMARAW

CONSERVATION EFFORTS:

saving a rare animal from extinction

By: REDEN C. REYES

Photo credit: © Daniel Heuclin / www.photoshot.com



World Wide Fund for Nature (WWF), an organization dedicated for nature's protection and conservation, reported recently the boost in the population of the erstwhile threatened 'tamaraw'.

From 345 counted head in April 2013, according to the organization's report, a total of 382 tamaraw's are now populating the island province of Mindoro. This development, it said, was "record high" for this rare animal in recent times.

Regarding the tamaraw

Tamaraw, known scientifically as *Bubalus mindorensis*, is a wild water buffalo endemic to the island province of Mindoro. There was a time, however, that this animal, during the Pleistocene era (around 1.8 million to 11,700 years ago), was believed scattered and freely roaming throughout Luzon.

The tamaraw is a close relative of the carabao (*Bubalus bubalis*) but compared to the national animal, it only stands four feet and has a very wide and triangular horn that closely resembles the letter 'V'. Its offspring is reddish-brown in color that slowly turns to grayish-black when it becomes adult.

The adult has a short tail and weighs an average of 300 kilograms.

This animal is nocturnal and mostly solitary, although the young tamaraw tends to stick to its parent until it is four years old. When cornered, it is fierce, chasing foes up to a kilometer. Its head, especially the horns, is used to signal aggression, being lowered so that the horns are vertical and then shaken from side to side.

The tamaraw tends to give birth during or slightly after the rainy season, around June to November. Although it lives in areas with mixed forest and grassland, mud-wallowing seems to be an important activity for it.

Three mountainous sites in Mindoro are known to be places where the tamaraw inhabits. They are Mt. Iglit-Baco National Park, Mt. Aruyan and Mt. Calavite.

Root cause

In 1969, the tamaraw population was estimated to be less than a hundred and, the International Union for Conservation of Nature and Natural Resources (IUCN) had categorized the "Mindoro dwarf buffalo" as critically endangered (facing a very high risk of extinction in the wild) under its Red List. The list is the most comprehensive inventory of the global conservation status of biological species.

Also, in May 2007, the Convention of the International Trade in Endangered Species (CITES) listed the Mindoro dwarf buffalo as critically endangered and threatened with extinction. CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

The decimation of the tamaraw's population was attributed to many factors, among them widespread hunting and human intrusion. Infrastructure development, logging and agriculture were pointed out as some of the causes for the habitat loss for the tamaraw. Back in the 1930's, the introduction of non-native cattle in Mindoro caused a severe rinderpest epidemic, an infectious disease of even-toed, hooved animals. It caused thousands of tamaraw casualties.

In a study conducted by the Philippine Carabao Center (PCC), in cooperation with the University of Tsukuba, Japan and the Department of Environment and Natural Resources (DENR), it said hunting posed a serious problem for the tamaraw.

It said that most hunters from the southern part of Mindoro areas target tamaraw because its meat is more expensive.

The study also said that the Mangyan people (Mindoro's indigenous group) intruded the forest, which is tamaraw's natural habitat by conducting slash-and-burn farming during the dry season and cultivating banana, cassava, sweet potato,

potato, upland rice corn, and tobacco. As a result, the tamaraw often strays into cleared and cultivated land to graze.

Conservation efforts

Due to the alarming decline of the tamaraw population, several laws, agencies and programs for the preservation of the dwarf buffalo were enacted, created or pursued.

During the Philippine Commonwealth in 1936, Commonwealth Act No. 73 was enacted prohibiting the killing, hunting, wounding or taking away of the tamaraw. Anyone caught defying the provisions of the law were subject for imprisonment and fine.

Moreover, the Tamaraw Conservation Program (TCP) which focused on breeding the tamaraw in captivity was established in 1979. The same year, then Philippine President Ferdinand E. Marcos issued Executive Order No. 544 creating a presidential committee for the conservation of the tamaraw.

Through the TCP, the Tamaraw Gene Pool Farm (GPF) was established in 1980 in Manoot, Rizal, Occidental Mindoro. From the 20 head captured, one offspring named "Kalibasib" (short for Kalikasang Bagong Sibol) was born on June 24, 1999.

The farm was then converted into Mindoro Biodiversity Conservation, Research and Education Center where Kali, Kalibasib's nickname, became the main attraction. Part of the facility was retained for research and captive breeding purposes and acts as repository to various wildlife species found in Mindoro.

On the other hand, studies on the status of the Mindoro dwarf buffalo showed that almost 40% of the tamaraw in Mt. Iglit National Park were juveniles and yearlings. This meant that the breeding of wild tamaraw living on the national park was continuing.

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PCC improving NATIVE CARABAO BREED

for greater productivity

By: MA. CECILIA C. IRANG

Photos by: KHRIZIE EVERT M. PADRE

For centuries, the Philippine Carabao, which is a swamp-type water buffalo, has been the ideal ally of farmers in their farm works. This animal, due to its unquestioned draft power abilities and its being tractable and friendly, became the farmers' handy partner in their toils that without it they feel becoming less of an effective and efficient farmer. But times have changed. In the advent of farm mechanization, the carabao's role has been diminished and it is now underutilized especially with the presence of an increasing number of its cousin – the riverine or dairy type carabaos. But all is not lost for the Philippine carabao.

The Philippine Carabao Center (PCC), true to its mandate to conserve, propagate, and promote the carabao as a source of milk, meat, draft power and hide to benefit the rural farming families, is embarking on a noble and rational undertaking of improving the breed of the native carabao. It is now committed in the task of establishing a Gene Pool for Philippine Carabao in which the selection

for economically important traits of this animal is to be done.

These traits include growth, carcass quality and reproductive abilities.

Under this program, foremost in the list of must-do for this animal is to improve its size, weight and capabilities to yield more draft power, meat, milk, and other benefits that can be derived from it.

In the genetic improvement program (GIP) of the Philippine carabao, the conservation efforts will underscore the maintenance of a viable herd and long

term storage of germplasm in the form of frozen semen, and perhaps frozen embryos, and improving its growth rate, reproductive performance and carcass trait. It shall be done by putting in place a breeding program that puts emphasis on selection for these traits.

“We are focusing on improving the meat production potential of the native or swamp buffaloes, increasing more of its growth rate and improving some of the specific muscle areas that are of high value,” Dr. Ester B. Flores, PCC national



“ We are developing our own Philippine Dairy thru backcrossing because we only have few purebreds imported from other countries which serve as our genetic resource. These are what we use in the selection for genetic improvement. They will reproduce thru continuous backcrossing of the native and riverine breed. If it reaches 93% that is almost pure and we can call it our own Philippine dairy buffalo breed. ”

- Dr. Ester B. Flores
Coordinator, PCC Genetic Improvement Program

GIP coordinator, said.

She said the breeding program is meant to increase the productivity of the Philippine carabao for meat because it already has good structure and form for draft power.

“If it will be sold for meat, then why not increase its dressing percentage?” she asked in emphasizing the importance of improving the productivity of the native carabao.

Improving growth potential

According to Dr. Flores, in terms of economic benefit, the changes in the potential growth rate of the native carabao can be translated into economic value with less efforts and just involves the use of improved genetics of the swamp buffaloes. “Through the fast growth rate of swamp buffaloes, the farmers can sell these at a younger age with market weight of 400 kg,” she said.

Write-up on the Updates on Philippine Swamp Buffalo Gene Pool and Breeding Program conducted by the team of Dr. Flores indicated that to date, there are 1,266 growth records available for analysis. In recent years, a general improvement in weight and ADG (average daily gain) especially among the younger calves was noted. This validates the selection of replacement bulls for breeding.

Growth trend indicates linear growth up to 24 months of age. ADG at 12 months had the most consistent steady increase as there was a 153% increase in 2014 relative to 2004. This was followed by ADG at 18 months.

This is translated to a slightly higher body weight at 12 and 18 months compared to 2004 prior to starting a breeding program.

By making the native carabao grow faster, she said, it will provide farmers additional income as it will attain market weight faster.

“If the native carabao will have more meat, the farmers can get bigger income,” Dr. Flores said.

The study also indicated that there is a potential for the PC to increase its meat-type breed with more formal genetic evaluation and selection program. Thus, genetic evaluation to estimate breeding values for growth rate, carcass and maternal traits should be given more emphasis as well as genetic correlations among these traits.

“We should select bulls or breeders that are fast grower to improve the whole population. In the next round, you have to match up your breeder with a female swamp buffalo then the calf will be used for breeding for the next generation. That is why the improvement is quite visible from 240g of ADG to 400g. That is the effort of selection and breeding program,” Dr. Flores said.

She added: “If farmer wants to get the semen, we have good quality semen for native carabaos with excellent conformation, faster growth rate and is definitely pure. You will see here the effort of PCC to help increase the income of farmers if ever they will sell their animals for meat. We are not developing a new breed but we are actually improving the potential of our Philippine carabao, which

we call our own swamp buffaloes.”

Meanwhile, Dr. Flores believes that the program won't affect the population of swamp buffaloes for the farmers won't sell all his animals but instead they will keep the females for reproduction purposes.

“They won't definitely sell their source of income. A good reason for the conservation of a species is for it to have an economic value. If it provides much benefits, it will be taken care of and make it reproduce,” she said.

Genetic conservation

Now that climate change is becoming an issue that might cause some animal species to disappear, PCC is exerting more active efforts to identify sanctuaries and increase village-based gene pools for swamp buffaloes and with cryopreservation of germplasm for future generation.

These village-based Gene Pools are areas identified by PCC where the native carabao population will be conserved and become carabao sanctuaries. Introduction of foreign breeds of buffaloes, such as the Murrah breed, will be avoided in coordination with concerned Local Government Units in areas where these carabao sanctuaries are located.

“We have active conservation efforts and we are actually cryobanking germplasms, so that is the insurance to our mandate to conserve and propagate. We have two ways of doing it, first is conservation by improving its economic value, and second is conservation by preserving, cryobanking and maintaining the good genes,” Dr. Flores said.

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TIM-3, GAL-9, NRAMP1 and NRAMP2: possible candidate genes responsible for **disease resistance, tolerance** and/or **susceptibility** in **WATER BUFFALOES**

By: MA. CECILIA C. IRANG

Photo by: KHRIZIE EVERT M. PADRE

Claims by several sectors said that swamp-type water buffaloes are more resistant to infectious disease compared to that of riverine-type water buffaloes. To confirm this, the Philippine Carabao Center (PCC), through its Animal Health Unit, has conducted a preliminary study on the “Molecular Characterization of T-cell immunoglobulin mucin domain-3 (TIM-3), Galectin-9 (GAL-9), and NRAMP1/2 (Slc11a1/a2) genes of these two types of water buffaloes”.

Initial results of study indicated that there are unique changes in amino acid between swamp and riverine-type buffalo's TIM-3, GAL-9, and NRAMP1/2 genes that can be associated to disease resistance tolerance and/or susceptibility in water buffalo.

Swamp and riverine type buffaloes are the two types of water buffalo. Swamp-type water buffaloes are the native water buffaloes or carabaos that are found in the Philippines and in the South of Southeast Asian nations while the latter are mainly found in India, Europe, and the Americas.

The importance of water buffalo to the lives of Filipino farmers is emphasized in the study as it is becoming a major source of milk that helps farmers increase their income and improve their over-all well-being. However, chronic occurrence of diseases is pointed out as a major constraint in a dynamic and progressive livestock production and even in the meat-and-milk consuming human population.

Nevertheless, thru the introduction of genomic technologies and methods, the necessary tools are now available to begin identifying the genes that contribute to disease resistance, tolerance and/or susceptibility of the animal. The genes identified by these genomic studies provide valuable insight into disease biology and represent the initial steps toward the efficient therapeutic strategies that substantially improve the animal's health.

Characterization of genes

According to the study, TIM-3 is a type-I glycoprotein which is persistently expressed on dysfunctional T-cells during chronic infection. It is typically found on dendritic cells (DC), natural killer cells, CD4+Th1 cells, monocytes, and cytotoxic T-lymphocytes (CTL). It is characterized as an immune response negative regulator. Meanwhile, GAL-9 is a versatile immune-modulator involved in a wide range of biologic activities, such as cell adhesion and migration, proliferation and apoptosis, interaction of host cells with microbial pathogens, regulatory T-cell (Treg) differentiation and function, DC maturation, and antimicrobial immunity.

Whereas, solute-linked carrier 11a and 11a2 (Slc), also referred as Natural Resistance Associated Macrophage Protein 1/2, (Nramp1/Nramp2), have been associated to disease resistance and/or susceptibility across animal species. These genes have an important mechanism in the regulation against intracellular infection.

“Most of the farmers and even technical experts claim that native carabaos are disease-resistant or tolerant. This serves as one of our basis in conducting our study,” Ryan Bismark Padiernos, lead researcher of the study, said.

He added that previous studies proved that other animals are disease-resistant but as for buffaloes, none so far had been done.

“We want to know the immunological

basis of determining disease-resistant, tolerant and/or susceptible buffalo. The first step we did was to describe the genetic characteristic of four genes (TIM-3, GAL-9, and NRAMP-1/2) in the immune system of the swamp and riverine-type water buffaloes,” he said.

The study also compared these four genes with other mammalian species and determined the unique characteristic specific in water buffalo to provide baseline information prior to the assessment of disease progression in buffalo species.

Methodologies employed

The researchers collected samples from Philippine Carabao (swamp type) and Bulgarian Murrah Buffalo (riverine type) to study the four genes.

Technically, materials and methods used in the study of these genes from swamp water buffaloes and riverine-type water buffaloes were Peripheral Blood Mononuclear Cell (PBMC) Isolation and Cultivation, Extraction of RNA and RT-PCR, Cloning, Sequencing and Homology and Phylogenetic analysis.

Sequence homology assessment and phylogenetic analyses were done to elaborate the distinctness of each species and to initiate research on the immunological basis behind the claim that swamp type buffalo could be more disease-resistant than its riverine counterpart.

“From the cDNA, we translated it into

amino acid. We compared the genes of swamp and riverine buffaloes to other mammalian species,” Padiernos explained.

Though this study showed that both swamp- and riverine-type buffaloes including other breeds had high homology, he said, they found out that there are amino acid changes between swamp- and riverine-type buffalo’s TIM-3, GAL-9 and NRAMP1/2 genes. This finding provides an insight that the claim that swamp-type water buffalo could be more resistant or tolerant to infectious disease compared to riverine-type water buffalo might be true.

But, he hastened to add, it still remains to be determined whether these changes in their genetic material are functionally

important. Thus, further investigation and thorough examination of the other contributing factors are needed to elucidate the differences concerning immunological reactions and providing solution to why a particular animal species is more disease resistant, tolerant and/or susceptible than its closest relative, he said.

Selective breeding

“Results of the study showed that the amino acid changes in both types of water buffalo could associate to disease resistance, tolerance and/or susceptibility. If so, this could be a potential gene marker that may be useful in future breeding

program for the genetic selection of animals resistant to a particular infection” Padiernos said.

He further said that based on the DNA sequence, a gene-based therapeutic protein can be developed to neutralize a specific infection. Through this study, one can establish a system for selective breeding of those buffaloes that are disease-resistant.

But to know if the animal is disease-resistant, its genetic characteristics must be studied and described.

“That’s exactly what we did,” Padiernos said.

The team is now set to conduct further studies in assessing the role of these genes in disease progression in water buffalo. 🐃



NATIVE CARABAO

figures well in niche market

By: MA. CECILIA C. IRANG

Photos by: KHRIZIE EVERT M. PADRE

Although the upgrading of the native or Philippine carabao aimed at improving its milk and meat production potentials is widespread and scoring well, there are still farmers who don't submit their animals for the purpose. Their reason: they want to sustain the niche market in their areas which prefer milk from the native carabaos.

In the province of Bohol, the “Progreso Women and Workers Multi-Purpose Cooperative (PWWMPC)” sees to it that they continuously raise female native carabaos. They want to have a continuous flow of native carabao’s “special milk” to satisfy the demand for making “milky bread” products.

With the implementation of the Dairy Enterprise Program being supervised by the Philippine Carabao Center at Ubay Stock Farm (PCC at USF) and the local government units of Alicia in partnership with the Provincial Government of Bohol, the PWWMPC, with its 150 members, was encouraged to go on with its avowed mission as it is seen to be of help to the marginalized farmers.

This cooperative, which is a big buyer of the raw milk produced by the dairy farmers, is engaged in the production of choco milk, choco milkbar and other milk-based delicacies aside from selling processed raw milk. One of its bestsellers is “milky bread”.

According to Vicente Duetes, dairy technician and milk collector of the coop, although he collects the milk harvest of the members from their native carabaos and crossbreds, he sees to it that the native carabao’s milk is placed in separate containers. He knows fully well that a big number of consumers prefer it for their processed raw milk and milk products.

For their milky bread, the milk is mixed with the flour instead of water and processed into 10 different kinds of breads. These products include enseymada, cheese breads, Spanish bread and pan de coco, which he said sell like the proverbial “hot cakes”.

Duetes said the coop members raising

native carabaos produce an average of 1.5 liters of milk a day. The coop buys the milk for P45 per liter and pays the farmers for the accumulated total value of their turned in milk every 15th and 30th day of the month.

As the coop is also engaged in food catering, it makes sure that their “best selling” milk products are included among the food served.

“We are certainly getting higher income than before,” he said.

As of March 2014, the gross income of the PWWMPC for their dairy business is P43,327.10, of which, the income revenue from their bakery was P32,401 (75%). The coop is also doing well in their other business engagements.

Two coop-members of PWWMPC narrated their story behind their dairying venture.

Wilfredo Miflores of La Hacienda, Sitio Dagohoy, Alicia, in Bohol started milking his native carabaos in December 2014. He currently has six native carabaos, two of which are lactating, three are calves and the other is a bull which he uses for draft purposes.

He is collecting an average of three liters from his lactating carabaos, turning over an average earning of P3,000 a month.

“The income from my lactating native carabaos helps me provide some of the needs of my family,” Miflores said.

For Imelda Acaso of Putlongcam, Alicia, Bohol, she considers milking as a family bonding activity. Imelda, together with her husband, Felix, and son, Johnfel, are joining forces in milking their two native carabaos every six in the morning. They collect an average of one liter per

carabao.

They underwent proper management and proper milking training conducted by PCC at USF.

The family, however, doesn't own the native carabaos. They only serve as caretakers of the carabaos owned by their cousin who provided them a sharing scheme of 75%-25% from the milk sales. They get 75% from milk sales.

According to Floriano Bernales, an agricultural technician of the PCC at USF, they have model dairy farmers for each of the municipalities in their area to encourage people in dairying, whether it is for native, purebred or crossbred carabao dairying.

“We make sure that the farmers know first how to milk properly their native carabaos before we lend them purebred dairy buffaloes,” Bernales said.

He said the farmers' family consumption of milk has been noted to be increasing as indicated by the number of liters sold. The average consumption is now 28 liters of milk of native and crossbred buffaloes per day from five municipalities of Bohol, which was a big leap from the total volume before.

“We know that the farmers here are earning more than P2,000 from the sales of milk of their native carabaos alone,” he added.

PCC at USF ties-up with DSWD

As a big boost to the dairy enterprise in Bohol, the Department of Social Welfare and Development (DSWD) transferred a P10-million starter kit training fund to PCC at USF for the development of a Pilot Dairy Commodity Cluster Model Project. It is carried out under the DSWD Sustainable Livelihood Program (SLP).

The DSWD provides the fund intended for the starter kit training on dairying for 600 beneficiaries in Bohol. Aside from the fund, DSWD is also responsible in the validation on the eligibility of the SLP beneficiaries. On the other hand, PCC is responsible for the procurement of 600 native carabaos as the basic resource for the starter kit training, validation on the compliance of the recipients to dairying requirements, and the provision of technical assistance and forage development.

“The beneficiaries should have area for milking and forage, interest in raising carabao, and animal shed. We will procure

native carabaos for crossbreeding either through artificial insemination service or the bull loan program. We will distribute the carabaos in six municipalities and hopes that each will get 100 carabaos,” Bernales explained.

Aside from the DSWD fund, the Bohol provincial government, headed by Gov. Edgar M. Chatto, has provided a counterpart fund of P916,500 for the one-year insurance of the animals.

“We recently had a meeting with Usec. Emerson U. Palad and it was agreed that the government will provide funds for the milk feeding program here, which is expected to be implemented this year. A budget of P13 per child was allotted,” Bernales said.

“Under the plan, each child will be provided with 150mg of milk costing Php10, he said. The remaining Php3 is for the milky bread to be given also to the child,” he added.

He also emphasized that later on, the center will organize cooperatives with pure stock of native carabaos in CPG Bohol for the Native Carabao Development Program.

Keseo production

In Gandara, Samar, the farmers are milking their native carabaos to sustain the needs of the niche market for “keseo”, a kind of cheese.

The newly-established Keseo Processing Center in Gandara makes sure that there is always an available supply of the much sought-after “keseo” (also known as Queso) by “Samarnons” (folks from Samar province). This kind of cheese has a big following in the area.

Under the administration of Gandara Mayor Eufemio S. Oliva, with help from partners and the Department of Trade and Industry (DTI), the processing center for Keseo was established to cope with the increasing demand for this local cheese.

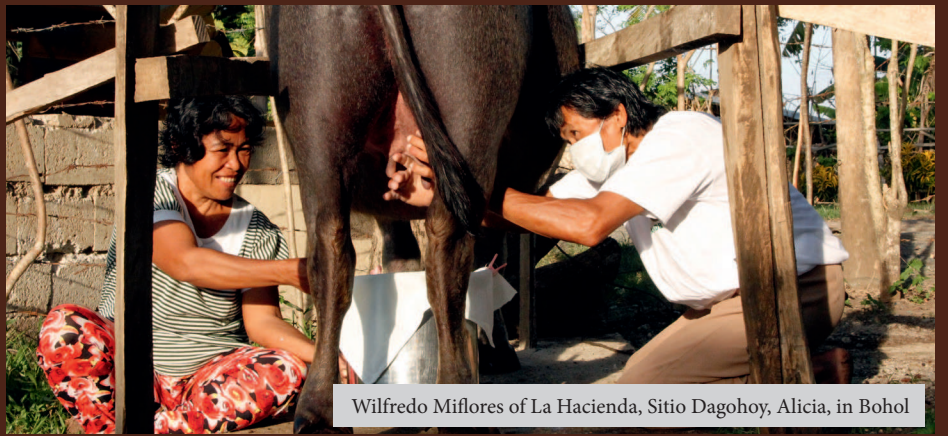
Keseo is described as a soft, unaged, homemade white cheese made from whole carabao’s milk, salt, and rennet. It has a soft close texture and slight salty taste. Some commercial versions are slightly sour due to the use of vinegar in place of rennet as a coagulant. Its production has long been a livelihood undertaking of the many residents and can be considered as one of the oldest home-based industries that made Gandara popular.

In the country, the white cheese is a

(Continued on page 34)



Acaso Family and other dairy farmers of Putlongcam, Alicia, Bohol



Wilfredo Miflores of La Hacienda, Sitio Dagohoy, Alicia, in Bohol



Members of Progreso Women and Workers Multi-Purpose Cooperative (PWWMPC)



“Milky breads” produced by Progreso Women and Workers Multi-Purpose Cooperative (PWWMPC)

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FOR EVERYONE;

but first, know the
slaughtering procedures

By: **CHRISSALYN L. MARCELO**
Photo by: **KHRIZIE EVERT M. PADRE**

There's no doubt that “carabeef”, or carabao's meat, has become a beloved “beef” by the public because it is healthy and delicious.

Carabeef has the following nutritional qualities according to studies: It is 10% lower in fat, 40% lower in cholesterol, 55% lower in calories, 11% higher in protein and 10% higher in minerals over the cattle's beef.

It is also comparable with the cattle's meat, the studies say and cheaper in its market price.

These goad many people to have a preference for it especially in many restaurants that mushroomed in many areas of the country.

There are various ways in preparing carabeef food on the table (Please see page 26 in this issue.)

But for now, let us focus on the correct slaughtering procedure of the carabao for the desired carabeef. This is meant to aid the public as it has been noticed that the number of slaughtered carabao has been increasing. For the last two years, it has posted an increase of four percent in the country. The Philippine Statistic Authority (PSA) showed in its website that 209,307 head of carabao were slaughtered in 2013 and 217,342 in 2014.

Standard slaughtering procedure

According to the Food and Agriculture Organization (FAO), the following are the step-by-step procedures in the conduct of slaughtering the carabao:

1. Stunning of the animals using either of the three ways: (1) percussion or captive bolt pistol stunning, (2) electrical stunning; and (3) gas stunning;
2. Bleeding of the animals after it has been stunned;
3. Flaying or skinning;
4. Hoisting the meet on the line rail;
5. Evisceration;
6. Splitting the meat; and
7. Hanging the meat quarter on rail

Above all, the FAO, including the National Meat Inspection Service (NMIS), requires the need for slaughtering the animal in slaughterhouses in a hygienic way.

The NMIS, an agency under the Department of Agriculture (DA), implements the guidelines and policies on the proper handling, and inspection, processing, storage and preservation of meat and meat by-products. It conducts accreditation of slaughterhouses which are classified as follows: “AAA” or abattoirs that are qualified to export produced meat; “AA” which are establishments qualified for domestic trade, and “A” classification which can only trade its products within the

respective municipality or city.

Though, most of the slaughterhouses in the Philippines lacked updated equipment and facilities necessary in the performance of an optimum and hygienic slaughter process, according to Maranan et. al. study.

Although, there are serious issues involved, slaughtering of the animal is still continuous. This is because of the noted increase on the public's demand for carabeef.

Variations in slaughtering procedure of some slaughterhouses in PH

There are also some differences in terms of how a particular slaughterhouse conducts slaughtering of carabao.

The following are the results of interviews from people involved in the slaughtering of animals in different places:

1. Prior to the slaughtering of the animal, meat dealers are required to submit the following: permit to slaughter, ownership of the carabao, certificate of transfer, transport permit, veterinary permit, among others;
2. Conducting ante-mortem examination to determine if the animal is stressed, had discharges and if the animal is healthy;
3. Confinement of the carabaos for 24 hours before slaughtering; and
4. Bathing the animals before the actual slaughtering procedure.

The following were the major differences and some noted activities of the slaughterhouses in terms of slaughtering the carabao:

1. The slaughterhouses have different ways of stunning the carabao to make it unconscious. In some slaughterhouses, such as those in Mangaldan, Pangasinan; Lal-lo and Tuguegarao, Cagayan Valley; Infanta, Quezon; and Ilo-Ilo City, stunning is done through the use of captive bolt pistol. But, in Virac, Catanduanes and Abuyog, Leyte, stunning is still done in traditional way in which an axe and knife are used. Authorities said the use of axe and knife are not recommended in the proper conduct of slaughtering the carabao.
2. These slaughterhouses, except in Lal-lo, Cagayan, do not hang the carabao's meat before cutting it into pieces as they do not have a line rail.
3. Most of the slaughterhouses skin the carabaos and cut meat parts on the floor, a practice that is not recommended in correct slaughtering procedures.
4. All of these slaughterhouses have different age limit in slaughtering the carabao. These limits are the “seven-eleven policy”

which allows that only male carabaos at least seven age years old should be slaughtered and at least 11 years for female; nine-eleven policy; age seven and above; while others allow the slaughter of carabaos which are as young as two or three years old or “having no age limit policy” at all.

5. Some of the slaughterhouses slaughter carabaos twice-a-day while others once daily. The time of slaughtering varies which are as early as 2:00 a.m. and from 3:00 to 7:00 in the morning. Others do it at 12:00 and still others do it at 7:00 in the evening.

6. The slaughterhouses had varying number of animals slaughtered daily as detailed below.

Place	No. of carabao slaughtered daily
Ilo-ilo City slaughterhouse	26-30
Mangaldan slaughterhouse	25
Tuguegarao City slaughterhouse	10
Infanta, Quezon slaughterhouse	4
Abuyog, slaughterhouse	2
Catanduanes slaughterhouse	2
Lal-lo slaughterhouse	1 or 2

7. Meat dealers pay a slaughter fee in various amounts depending on the weight of the carabaos, and

8. The number of slaughtered carabao increases when there are special occasions such as “fiesta” and other gatherings in the places where these slaughterhouses are situated. However, in Lal-lo, Cagayan, it was noted that the number of carabaos being slaughtered rises when the farmers need money for the education of their children (especially during pre-harvest time).

(Author's note: The facts contained in this article were from the results of interviews of persons involved in the slaughtering of carabaos in their respective places. They include: Veronica P. Hunatas, Slaughter Master III from Mangaldan, Pangasinan; Hilario M. Los Baños, meat inspector and meat supervisor from Lal-lo, Cagayan Valley; Dr. Pastor C. Tumaliuan, City Veterinarian in Tuguegarao City; Remegio C. Japon, meat inspector in Abuyog, Leyte; Gerardo P. Romero, meat inspector from Virac, Catanduanes; and Romero Bartolome, meat inspector from Infanta, Quezon. Added information were from the internet (www.fao.org; journals.uplb.edu.ph; and psa.gov.ph) and in the article “Hindi totoong mababang klase ang carabeef” by Rowena G. Bumanlag published in the PCC Balita Espesyal na Isyu 2012. Philippine Carabao Center, Science City of Munoz, Nueva Ecija).

Carabeef gastronomic delights

A list of must-try carabeef dishes from Luzon to Visayas

Text and Photos by: KHRIZIE EVERT M. PADRE

With more and more Filipinos discovering a whole new world of gastronomic delights using carabeef as their prime ingredient to a dish, the water buffalo meat is now gaining attention in the local markets and in many Filipino restaurants.

The current demand for carabeef is due to recent studies, which showed that buffaloes are better source of quality meat than cattle due to its high palatability, physiochemical, and nutritional characteristics. Carabeef is a hit among health-conscious individuals, experts said, because it contains 40% less cholesterol and 55% less calories while it has 11% more protein and 10% more mineral compared to beef.

If you are on the search for some carabeef dishes to eat, here are some popular Filipino dishes made from carabeef to try and where to find them:



Pigar-Pigar

If you are in Dagupan City, then try Pigar-Pigar, which is very popular in that place that it has its own festival. It was created as part of the annual celebration of Bangus Festival. In Galvan Street, near the public market, small entrepreneurs set up their makeshift tent, tables and chairs at night time to serve the delicious Pigar-Pigar.

Pigar-Pigar is Dagupan City's version of stir-fried beef. It is made of thin slices of carabao's meat and liver (optional) seasoned with salt and pepper, deep fried, mixed with cooked cabbage and served with fried slices of onions.

Pigar-Pigar is a pangalatok (native Pangasinan dialect) word for "turning over" that refers to the process of constant turning over of meat strips while being sautéed in a generous amount of oil.

Voted as one of the top ten yummiest restaurants in Pangasinan by a television network, Great Taste Pigar-Pigar Restaurant is one of the best places to go to for a taste of the celebrated dish.

The restaurant started as a simple eatery along Galvan Street in 2009. Today, the classy interior of the full-pledged restaurant, now located in Gomez Street, and its expanded menu make the place a great location to dine in. In addition to the usual Pigar-Pigar being served in the place, its menu offers complete meals from breakfast to dinner. It is open from 7 a.m. until 12 midnight.

Fine dining at a reasonable price is what you can find at Great Taste Pigar-Pigar restaurant says its owner, Rommel Cerezo, 37 years old.

"Orders of Pigar-Pigar are good for sharing. For seven to eight persons, the price ranges from Php380 to Php450. Aside from Pigar-Pigar, sizzling specials, chicken, seafood and vegetables dishes have been added in our menu. We also serve all-day breakfast. Since we open up as a restaurant, upper class customers are added to our list of patrons," he said.

For regular days, the restaurant uses 10 kilograms of carabao's meat and up to



Rommel Cerezo, owner of Great Taste Pigar-Pigar

100 kilograms during special occasions such as during the holiday seasons and the celebration of Bangus Festival.

"We usually use the brisket, quarter or rear flank since these are the leaner meats of the water buffalo with less fats. The meat is cleaned first by cutting the fats and the ligaments off the fresh meat then thinly sliced into bite sizes. The cooking is done as ordered for 15 minutes. Constant stirring is needed while cooking deep-fried under moderate heat. Cabbage and onion slices are added before removing the meat from the heat," Cerezo said.

To enhance the taste of the dish, available dips of soy sauce, vinegar, calamansi and chili are served.

The young owner plans to develop more carabeef dishes to add up to his restaurant's expanding list of menu. Currently he maintains three branches of his establishment, which are located at Gomez Street and in Tambac both in Dagupan City and San Carlos City.



Batil Patong

Tuguegarao is a 1st class city and is the capital of the province of Cagayan. The city is a gateway to various tourist spots that can be found at Luzon's tip. One of the highlights of any Tuguegarao's visit is a meal of pancit batil patong.

This locally produced pancit is made of pancit miki Tuguegarao, topped with fried minced carabao meat, bean sprouts and other vegetables, fried egg and chicharon. It comes with an egg soup. This can be poured onto the noodles or consume separately. For additional taste, soy sauce, chopped red onions, calamansi and chili may be added.

"Batil" means beat the egg and "Patong" means place on top.

A number of this popular noodle dish is available in the city's restaurants. However, each one of them has its own version of cooking and ingredients used.

The noodles are cooked in boiling water with soy sauce, seasoned with sugar and spices, mixed with generous amount of carabeef, vegetables and topped with fried egg prepared sunny side-up and chicharon.

One serving of pancit batil patong is good for two people and the price ranges from Php60 to Php70.

"The pancit batil patong is not like other pancit you partake. Its unique taste comes from the flavor that the carabeef adds to the noodles. It has become a staple food of every Tuguegaraoños and Ybanags," said Imogen Claire Callangan, City Information Officer.

She added that Pancit Festival is being held yearly during the week-long celebration of Pav-vurulun Festival in recognition of the pancit batil patong dish. Pav-vurulun is an Ybanag word which means get-together or a sense of belonging.

Cooking and eating contests are part of the festivity, Callangan said.



Carabeef Tapa, Longganisa

Some of the most popular pasalubongs (presents) being bought by tourists in Cagayan Valley, come all the way from Tuguegarao. Among them are the carabeef tapa (dried or cured beef) and the sweet and spicy carabeef longganisa (sausage), Tuguegarao's famous version of tapa and longganisa made from carabao's meat.

Both home-grown products, these classic all-time favorites in Filipino breakfasts are produced with innovations under the brand name Carne Ybanag of Lighthouse Cooperative.

"The idea came about when the coop thought of a product that can stand out among other regional products being sold here in Tuguegarao City. In a table survey that we conducted, we found out that tourists love to buy longganisa," Arthur Tabbu, general manager of Lighthouse, explained.

It was in 2004 that the Cagayano meat brand was born. The Carne Ybanag was named after the first inhabitants of Tuguegarao, the Ybanag people.

"At first, the marketing of our longganisa was successful. But when we introduced our carabeef tapa, consumers began to divert their attention to this product," he said.

One thousand kilograms of carabeef are being processed every month. One kilo of raw meat produces 1.4 kilos of tapa. The meat is sourced from licensed butchers and delivered thrice a week. Their cooperative prefers using choice parts (rump or butt part) of the carcass for leaner meat.

During processing, ligaments are removed from the meat. It is cut into ball shape and frozen for 24 hours for easy

cutting. Slicing is done across the grain of the meat. The meats are then marinated overnight. The marinated meat is packed in 500 grams and retailed at Php125.

The Carabeef Tapa is now recognized as one of the "One Town, One Product" of Tuguegarao City under the Department of Trade and Industry (DTI) listings.

According to Tabbu, the excess meats from processing tapa are used for their longganisa product. The grounded meat is seasoned with the same mixture and put in hog casing. Sixty kilograms of meat are used for processing the longganisa. For every 10 kilograms carabeef, one kilogram of pork is added.

Packed in 500 grams, it contains 12 pieces of longganisa. Chili and pepper are added for its spicy flavor.

The cooperative assures its clients of the quality of its products as its staff and workers involved had trainings on Good Manufacturing Practice (GMP) and Hazard Analysis Critical Control Point (HACCP). They are certified by the DTI and by the Food and Drug Administration (FDA).

The coop's tapa and longganisa are sold in the Lighthouse products outlet in Tuguegarao City. They are also being regularly supplied to local grocery stores, bus terminals in Cagayan, Baguio City, Regions 1 and 3 and some restaurants in Manila.

(Continued on next page)

(Continuation from page 27)



Minanok soup

Infanta, Quezon, which is referred to as the great gateway to the Pacific, is one of the farthest parts of the Quezon province. This place offers beach resorts, picturesque riverscape, clean water falls, wooden hills and mountains to those who want worthy getaway especially those from Metro Manila area.

To tourists, a trip to this place is not complete without tasting its popular carabeef specialties such as Minanok, Nilagang Kalabaw and Carabeef steak.

Carabeef foods from recipes passed on from past generations remain popular as ever among locals, visitors and frequent travelers from nearby towns.

For a taste of authentic Quezon cuisine, Kainan ni Diggy is the place to visit.

Tucked beside the city's public market, the small eatery serves local dishes 24 hours a day and is very popular among travelers and the locals.

Established in 2004, its main attraction is its carabeef dishes such as Minanok, Nilagang Kalabaw, Carabeef Steak and Tapsilog (Tapang kalabaw, Sinangag and Itlog)

"Minanok is a soup cooked similarly like the traditional Tinola,



Lucita Andaluz,
owner of
Kainan ni Diggy

only that it uses carabeef instead of chicken meat," said owner Lucita Andaluz.

"The meat is boiled first and seasoned with salt and pepper. While waiting for the meat to be tender, the ginger and garlic are sautéed until golden brown. The boiled meat is then added and sautéed until its color changes. The extract of the carabeef is used as broth. Water is added and the broth should be allowed to boil. After it boils, vegetables are added and allowed to boil again. We usually use mustard greens. One may add salt, pepper or fish sauce for seasoning," she said.

Asked why carabeef is very popular in their hometown, she said that the locals' preference for carabao's meat over cow's meat is because of the relatively "cheaper price".

Another local favorite offered in this eatery is its Nilagang Kalabaw. Carabao's meat is used instead of the traditional beef as its prime ingredient.

According to Lucita, a hefty 40 kilograms of meat is used for their Nilagang Kalabaw and Minanok dishes while another 40 kilograms are for the Tapang Kalabaw and other carabeef specialties.

A single order of carabeef dish ranges from Php60 to Php80.



Beefsteak, Paksiw na Kalabaw

Aside from being well-known for its waves and palm-strewn beachfronts, Catanduanes boasts of some of the best foods in the Bicol region. Virac, the capital of the province, offers a wide range of Bicolano cuisine from sumptuous choices of seafood, exotic dishes and carabeef specialties.

A carabeef-eating province, local favorites include Carabeef Steak, Paksiw na Kalabaw and Sinalpungan (Fried Carabeef Tripe).

A&M JV Snack Parlor located in Eastern Cavinitan, Virac offers some of these delicacies. Owned and managed by Asuncion Jose, her small eatery has been serving carabeef specialties for 35 years now.

"Our best sellers are the Carabeef Steak and Paksiw na Kalabaw. Carabao's meat has been an all-time favorite and specialty



Asuncion Jose, owner of A&M JV Snack Parlor

of Catandunganons. Though carabeef is a bit costly than pork, they still prefer to cook and eat it for health reasons” she said.

A serving of Carabeef steak costs Php40 while Paksiw na Kalabaw is priced at Php35.

According to her, five kilograms of meat is used for cooking Carabeef Steak and an additional four kilograms for the Paksiw na Kalabaw dish.

“Carabeef Steak is cooked the same way the traditional Beefsteak or Bistik Tagalog is prepared. Meat is thinly sliced and marinated with soy sauce, calamansi juice and other seasonings. The meat is stir-fried until the color turns brown. Garlic is then added and sautéed for a few minutes. The marinade will be added and allowed to boil. The fried meat is simmered for 20 minutes or until it is tender. Water is added as needed. Before serving, fried slices of onions are added,” she explained.

Paksiw na Kalabaw on the other hand, is carabao’s meat mixed with vinegar, garlic and a little amount of water. The meat is tendered using a pressure cooker.

Her common patrons are students, employees and travelers.



Pakdol

Tacloban City is a primary tourism destination in the Eastern Visayas region and the main gateway to Leyte and Samar islands. Being a favorite tourist destination for its beaches and nearby diving sites, it is also home to many restaurants serving a variety of cuisines.

Filipino comfort food and local specialties is what “Dahil Sa Iyo” is known for. Owned by husband and wife Mr. Roman and Ms. Anacorita Reyes, “Dahil Sa’Iyo” started in 1976. The couple’s fascination to the late President Ferdinand Marcos and his wife Imelda Marcos who loves to sing the song “Dahil Sa Iyo” led them in naming their restaurant after the song.

One of their best-sellers is Pakdol, which has been its trademark food for 39 years.

Pakdol is a Waray term for buffalo meat stew, an equivalent dish of Bulalo soup, only that it uses carabeef as its main ingredient.

Pakdol soup is comprised of carabao’s shank with bone marrow still inside the bone and vegetables. It is a perfect dish during rainy days and the cold season or during the “ber” months.

Like any other Filipino dish, techniques are discovered to develop a unique and delicious taste. To tender the meat, it is simmered for four hours under low fire using charcoal.

For 2-3 persons, a serving of Pakdol costs Php250.

Located along the highway of Real St. and corner P.Burgos St., the restaurant is open 24 hours.

It has taken a long while for the carabeef meat industry to be noticed. Today, carabeef dishes stand out among other cuisines and certainly this new world of carabeef gastronomy has opened up a whole new generation of meat lovers. 🐃



The **WATER BUFFALO** and some of its famous breeds across the globe

did you know?

Compiled by: **CHRISALYN L. MARCELO**

Hello our dear readers! By now, you must have read or heard a lot about how the Philippine Carabao Center is promoting the utility of carabaos or water buffaloes. But have you ever wondered where they come from or what types or common breeds of water buffaloes are being raised for economic purposes? We have put together some key facts for your reading pleasure.

Origin and classification of buffalo

In the book of Aleko Alexiev, titled “The Water Buffaloes”, the zoological classification of buffalo, according to various authors, belongs to the class *Mammalia*, sub-class *Ungulata*, to the order of *Artiodactyla*, sub-order of *Ruminantia*, family of *Bovidae*, sub-family of *Bovinae* and the tribe *Bovini*.

The tribe *Bovini*, Alexiev said, includes three groups: *Bovina* (cattle), *Bubalina* (the Asian buffalo) and *Syncerina* (the African buffalo). The Asian and the African Buffaloes, he further said, have been given different genus names which are *Bubalus* and *Syncerus*, respectively.

The African buffalo (*Syncerina* group) includes only one species---the *Syncerus caffer*. This specie has three sub-species, namely: *Syncerus caffer caffer* (Cape Buffalo), *Syncerus caffer* (Congo Buffalo) and *Syncerus aequinoctialis*, he said.

The Asian buffalo (*Bubalus*), he further explained, is comprised of three buffalo species. These are the Anoa (*Bubalus depressicornis*) from the Island of *Celebes*; the Tamarao (*Bubalus mindorensis*), from the Island of Mindoro in the Philippines; and Arni (*Bubalus arnee*) or the Indian

wild buffalo.

Of the four species of African and Asian buffaloes, Alexiev said, only the Indian wild buffalo Arni has been domesticated and received the species name *bubalis*. The three other types, he said, have not been domesticated.

According to him, the domesticated buffalo that are presently raised in the world under the name water buffalo is classified as *Bubalus bubalis*.

Moreover, he said, this buffalo species has widely spread in Asia and was introduced in parts of Europe, the Near East and Egypt, the Caucasian region of the former USSR and later in South America no matter how many years it has been domesticated in India or China. He also said that through the ages, the domestication of this animal went on various degrees of intensity and is still on-going.

Today, the population of this animal around the globe is 168 million. More than 95 percent of these buffaloes are found in Asia, more than two percent in Africa which are almost entirely in Egypt; 1.96 percent in South America, .02 percent in Australia, and .30 percent in Europe (Roque, 2010).

Two major types of buffalo

According to Alexiev, there are two major types of water buffalo in the world. These are the riverine and the swamp types.

The riverine type, is mainly for dairying and for meat. This type is bigger in size compared to the swamp type and yields more volume of milk.

The swamp type, on the other hand, is the buffalo that is mainly used for draft power and to some extent, for meat and milk production. It produces less milk but is excellent as a work animal as it is patient and very tractable.

In the Philippines, the most common riverine types include Murrah Buffalo, Bulgarian Buffalo, Brazilian Murrah Buffalo and Italian Mediterranean Buffalo breed which were imported by the government as early as 1500 and onward and in recent years by the Philippine Carabao Center (PCC). The swamp type (the native carabao), on the other hand, has been with the Filipino farmers since time immemorial or from the time it was brought in by the early migrants.

Comparisons between the two types (Swamp and Riverine)

According to the book “Appreciating the Carabao” by local author Anselmo Roque based on different references, the comparisons between the two major types of buffaloes are the following:

- 1 The river buffalo has 50 chromosomes while the swamp buffalo has 48. But, they interbreed;
- 2 The river buffalo usually has curled horns while the swamp buffalo has horns that extend outwards and then curl backwards. The horns of swamp buffalo form a semi-circle shape in the forehead plane;
- 3 The river type is mainly used in dairying while the swamp type is for draft power. Though, they can be used in both aspects;
- 4 The river type is known to have higher milk yield, which is about two to four times higher per lactation, compared to the swamp type;

Famous breeds of water buffalo

The water buffalo has many famous breeds across the globe as various countries continuously improve its breed. Primarily, its popular breeds belonged to the riverine type.

Here are some of them:

Murrah



Male



Female

The Murrah buffaloes have curled horns and produce big volume of milk. The term “murrah” means “curled”. It originated in India. Several other countries, like Bulgaria and the Philippines, have imported these animals.

Traits and characteristics

- Wide deep frame and heavy body
- Short and tightly curled horns
- Straight strong short limbs with black hooves
- Long tail with white switch
- Black body, though a few have brown or fawn grey color
- The male has thicker neck while the female has fine clean-cut head and neck
- Average body weight is 550 kg for males and 450 kg for females
- Udder is well developed with squarely-placed teats, and
- Milk yield per 270-305 days lactation in good herds is 1,500-1,800 liters with 7% fat content

Nili Ravi



Male



Female

The Nili Ravi is a high milk producer. It resembles the Murrah, except for the white markings in its head. This breed was described as having two breeds before: the Nili breed which can be found in Sutlej Valley and Ravi which is in Sandal Bar, both located in the central areas of Punjab, Pakistan.

Traits and characteristics

- Massive black body
- Short and tightly curled horns as the Murrah
- Long and convex head with white markings
- Wall-eyed
- Noticeable double chin
- White hooves and switch of the tail
- Average body weight is 600 kg for males and 450 kg for females
- Udder is well developed with squarely-placed long teats and very prominent milk veins, and
- Milk yield per 250-300 days lactation is 1,800-2,000 liters with 7% fat content

Jafarabadi



Male

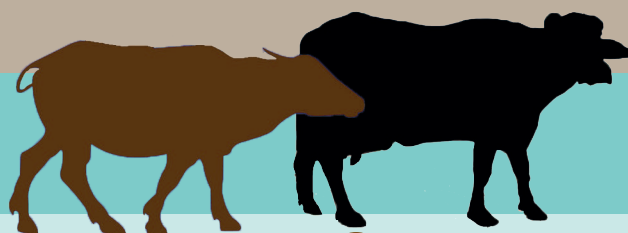


Female

Jafarabadi is one of the high milk yielding buffaloes in India. It has been named after the city of Jafarabad in the Indian State of Gujarat.

Traits and characteristics

- Massive black body
 - Amber-black color with a white tuft tail
 - Long and tender neck
 - Wide and deep chest
 - Heavy and wide horns that are declining and falling down on both sides of the neck and curled backwards and upwards
 - Udder is well developed with well-shaped long teats
 - The live weight for this buffalo cow is about 500-550 kg. But, there are also cows that reach 700-800kg in weight, and
 - Milk yield per 300 days lactation is 1,850kg with 8.5%
- (Continued on next page)*



5 The river type has longer pregnancy and lactation period and is heavier compared to the swamp type;

6 The river type matures sooner and reach breeding age faster compared to the other type;

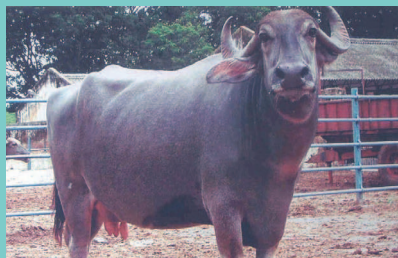
7 The river type is usually dark or jet black in color while the swamp type is light grey; and

8 The river type has 22 different kinds of breeds while the swamp type has five with different varieties.

Surti



Male



Female

Surti is described mainly as purebred. It was named after the city of Surat from the Indian State of Gujarat.

Traits and characteristics:

- Medium size body
- Silver-gray to rusty brown hair color
- Lighter limbs
- Black or red brown hide
- The breed is characterized by two white chevrons on the chest
- Horns are flat, of medium length, sickled-shaped and pointed downwards and upwards
- Elegant, long and dry head
- Deep but narrow chest
- Legs are medium, big and strong
- The tail is extremely long and flexible
- Udder is well-developed but much smaller compared to the other Indian breeds
- Teats are medium sized and squarely placed
- Average weight is about 500 kg for males and 410kg for females, and
- Milk yield per 305 days lactation period is 1,364kg

Kundi



Male



Female

This breed originates from Murrah. It got its name from the shape of its horn, which is described as looking like a “fish hook” whose name in the Sindhi language is “Kundi”.

Traits and characteristics

- Generally black in color but there are some light brown individuals
- Horns are thick at the bottom, bent backwards and pointed upwards with a moderate curve at the end
- Head is comparatively small and the forehead is slightly prominent
- Hind quarters are massive
- Udder is well-developed with prominent milk veins and teats that are squarely placed
- Tail is long with a black tuft
- Lighter and smaller compared to Nili-Ravi and Murrah
- The mature buffalo cows have a live weight of 320-450 kg, and
- Milk production ranges from 1,361 and 1957 kg in different periods

Bulgarian



Male




Female

Bulgarian buffalo was developed by crossing the Mediterranean buffalo which was indigenous in Bulgaria with the Indian Murrah buffaloes in the early 1960s. Continuous backcrossing of its offsprings to Indian Murrah and selection were done for several generations until they bred true to type. Most of the current dairy buffalo stocks in the Philippines are of this type.

Aside from these breeds, the other breeds of the riverine type are the Mehsana, Bhadawari, Nagpuri, Toda, Egyptian, Mediterranean, Caucasian, and Bufalypso.

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How the carabao is honored in different PH festivities

Compiled by: MA. CECILIA C. IRANG

The carabao plays an important role in rural farming communities making it earn a respected place in the heart of Filipinos. As such, the grateful Filipinos honor the carabao in many various ways, among them by giving tributes to this animal in the form of festivals. Thus, “carabao festivals” are held in many parts of the country in different times of the year but most particularly in the month of May.

Traditionally, they are the much awaited events in towns or cities where they are held.

These festivals showcase how the farmers, particularly, cherish and bestow great importance to this animal. Through these festivals, they proclaim that the glory of this animal will never fade even in the succeeding generations.

The carabao festivals are sure come-ons for seekers of delights and meaningful honoring.

The title of the festivals, date, location and descriptions have been compiled for ready reference. Here they are:

January
(every third Saturday)

**Pasungay Festival,
San Joaquin, Iloilo**

The bullfighting is left between the two bulls, or more specifically the “kalabaw” or the water buffalo. It is the highlight of the weeklong celebration that gives homage to the Sto. Niño or the Child Jesus.

May
(First week)

**Karbo Festival,
Vigan, Ilocos Sur**

It is one of the highlights of the week-long “Viva Vigan Festival of Arts” held on the first week of May, which features carabao painting pageantry and an exposition of the abundance of seed of life showcased in “boklan” (seeds) artworks, a mosaic-type masterpiece that uses different kinds of seeds as its medium. “Karbo” came from the word “karabao” (carabao).

5-7 May

**Pastillas Festival,
San Miguel, Bulacan**

The festival is a tribute to one of the town’s famous sweets – pastillas de leche (carabao milk candies). The town was formerly known as San Miguel de Mayumo, so called because it was renowned for the sweets made there. Among the events in the festival are demonstrations on pastillas cooking and the craft of making pabalat, the lacey pastillas wrappers made of rice paper. The art of making the pabalat or pastillas wrappers has transformed in recent years from being a local, folk tradition into a popular art.

15 May

**San Isidro de Labrador Festival,
Angono, Rizal**

This festival is celebrated in honor of the feast day of San Isidro de Labrador. Its highlight is a colorful and joyous procession of carabao with their respective owners riding on them and carabao-pulled carts loaded with myriads of farm products and adorned with flowers and bunting that made them colorful.

28 September

**Nuang Festival,
San Agustin, Isabela**

An array of dark and stocky crossbred carabaos owned by smallholder-farmers is paraded on the streets before the locals and guests who cheered for their own favorites. The festival is celebrated during the founding anniversary of San Agustin, Isabela.

March

(Last Saturday)

**Kariton Festival,
Licab, Nueva Ecija**

Kariton, which means rig-cart drawn by carabao, it plays a significant part in the history of Licab. Don Dalmacio Esguerra, the town’s founding father, used kariton when he left San Nicolas, Ilocos Norte until he finally settled and found this town in Licab. In fitting recognition of the significance of this very important farm equipment, the LGU of Licab adopted “Kariton Festival” as the town’s official festival. The event features a parade of colorfully-dressed kariton floats, Search of Outstanding Licabenos, Agri-aqua trade fair and beauty pageant.

3 May

**Carabao-Carroza Festival,
Pavia, Iloilo**

It is the oldest-of-its-kind festival in the heritage-rich province. The event is a showcase of the Pavianhon’s ingenuity, teamwork, and pleasant nature as they participate in varied activities during this celebration.

14 May

**Kneeling Carabao Festival,
Pulilan, Bulacan**

This particular festival in Pulilan, Bulacan is a “show of religiosity” of the townfolk which they apparently passed on to their carabaos as the animals, with the signal of their caretaker, genuflect right in front of the church.

16 June

**Katigbawan Festival,
Catigbian, Bohol**

This festival, in the town of Catigbian Bohol, is celebrated to honor the carabao itself because of its vast contributions in farm works helping the farmers in particular and the town in general.

29 September

**Karabaw (Carabao) Festival,
Gandara, Samar**

This festival is celebrated to pay tribute to the animal that helps in the livelihood and in honor of the town’s patron saint, Michael the Archangel. Carabaos are the faithful partners of farmers not only in Gandara but in the whole country. They help plow the fields, give milk and provide transportation. The festival is marked by a colorful street dancing which depicts the rural life of Samar. The dancers are dressed in colorful costumes that act as carabaos, farmers, townspeople and many more.

1-9 April

**Kesong Puti Festival,
Sta. Cruz, Laguna**

Cheese has been part of the Filipino palate particularly during celebrations. The festival lasts for nine days. Different activities are lined up such as trade fair, food festival, cultural shows, street dancing, painting contest, and beauty pageant.

May

(Second week)

**Gatas ng Kalabaw Festival,
Nueva Ecija**

The festival aims to actively promote carabao’s milk as an essential health food that helps arrest malnutrition among pre-school children.

15 May

**Pahiyas Festival,
Lucban, Quezon**

This festival is a century-old and prestigious gaiety held annually in Lucban that never fails to enthrall its audience with its amazing showcase of home-grown creativity immortalized from the Lucbanin’s motto: “Yanong rikit, baling ganda” which means “most beautiful”.

24-25 June

**Queseo Festival,
Compostela, Cebu**

This pays homage to the beast of burden in Compostela, Cebu which is the carabao. There are street dancing, parades and agri-trade fairs that showcase the humble carabao, which has provided help to farmers and where the queso or keseo (native cheese) comes from. This festival involves making of the ‘biggest queso’ and eight (8) basic steps of queso making.

During Black Saturday

**Turogpo Festival,
Carigara, Leyte**

The term “turogpo” emanates from the root word “togpo”, a waray word which means matchmaking. It is a Camansi’s version of a bull fight made popular in another country. It is a contest of strength between two carabaos, a test of endurance for both through locking of their horns and pushing one another until the losing the animal starts to run away from its opponent.

Native carabaos... (Continuation from page 16)

caused by chemical reactivity or time are preserved by cooling to sub-zero temperatures.

In the PCC, cryopreservation was done through subjecting germplasms or biological samples (which includes semen, oocytes, embryos, blood and somatic cells of livestock species) to -196 degrees celsius for the boiling point of liquid nitrogen.

According to Ms. Lilian P. Villamor, head of the cryobanking facility, cryobanking was already started in 2012 in PCC when Dr. Libertado C. Cruz was still the PCC executive director.

"Now, the facility, which was located inside the Livestock Innovations and Biotechnology (LIB) complex of PCC National Headquarters and Gene Pool in Science City of Muñoz in Nueva Ecija, was considered as the national cryobank in the country," she said.

"In the present, the facility banks germplasms of cattle, goats and carabao," she said. She added that there were initial efforts to bank other germplasms of other livestock species that includes native species of pigs, chicken and ducks, but, arrangement with various entities are still in process.

Villamor mentioned that the main reason of cryobanking is to address the following concerns: climate change preparedness, sustainability of genetic

materials and saving the genes of wild, threatened livestock species.

"Cryobanking can support the establishment of PCC's in-situ gene pool of buffaloes. It is also a way where we can back-up germplasms of our animals with good genetic merit for future use," Villamor said.

She further explained that:

"Being prepared in the changing climate means, whatever happens to our live animals, whether it dies or something, we can be sure that we can still have the genes of these animals in the future".

"Another is that, we can sustain supply of genetic materials through cryobanking and that this effort can help us to preserve the indigenous species of livestock, especially the wild threatened animals like the tamaraw".

"Cryobanking can be a tool to preserve the genetic diversity of animals so that we can preserve the ecological balance," she further said.

Villamor mentioned that the collection of germplasms, specifically for the native carabaos, has just started. Though, she added that, in close coordination with Dr. Ester Flores, PCC National GIP coordinator, they are planning to bank many germplasms of native animals too for future use.

"We just bank germplasms of animals with high genetic merit here in the cryobank facility," she further said. 🐃

Native carabao figures...

(Continuation from page 23)



Keseo is described as a soft, unaged, homemade white cheese made from whole carabao's milk, salt, and rennet.

popular breakfast fare eaten with the freshly baked local bread called "pan de sal".

Operated by the Gandara Keseo Producers Association (GKPA), the processing center, situated in Barangay Natimonan has at least 45 members.

Municipal Agriculture Officer (MAO) Adelfa U. Gabejan said that the center is expected to further develop and upgrade the keso industry in the area in terms of processing, packaging, promotion and marketing of the product.

Nilo Armamento, 49, a member of GKPA, has been engaged in dairying for five years now. He is not selling his harvested milk but instead his family processes it into keso.

He has five carabaos, three female natives, one crossbred and one bull. He collects two liters from his lactating carabao. His wife, Joven, processes it into keso, which is 63 mm in diameter.

"We are earning at least P300 every day from the sales of 50 keso that we produce. We have already regular buyers for our product," Joven said.

"Keso" is also a much-liked delicacy in the Poblacion of Compostela in Cebu. The Compostela Market Vendors Multi-Purpose Cooperative serves as the market outlet for dairy products from the PCC at USF.

One of the suppliers of queso and carabao's milk to the town is Nenito Perales, 72, who has been into carabao raising and dairying for 50 years. He is collecting 1.5 liters from each of his native carabaos.

Tamaraw ... (Continuation from page 17)

PCC acting Executive Director Arnel N. del Barrio, in an interview, said that the tamaraw population has been steadily increasing by an average of 10% from 2001 to 2008.

Furthermore, WWF, together with the DENR, TCP, Far Eastern University (FEU), Hubbs Seaworld Research Institute (HSWRI) and Mindoro's Indigenous Tau Buid tribes folk collaborated to launch the Tamaraw Times Two (Tams-2) project, a campaign that intends to double the number of the tamaraw by 2020.

Also, Tams-2 aims to revitalize Mindoro's deforested mountain habitat with the hope that it would result to healthy peaks and forests. Healthy peaks and forests are essential in the conservation and breeding of the tamaraw, it said.

In 2002, Proclamation No. 273 declared the month of October as "Special Month for the Conservation and Protection of the Tamaraw in Mindoro."

Occidental and Oriental Mindoro celebrate the month by conducting activities that increase the awareness of the people about the importance of the tamaraw. Motorcades, quiz-bees, poster-making contests, Biodiversity Day Camp and fun run are just some of the activities the provinces hold.

Come 2020, authorities said that with all the conservation efforts of the different organizations and agencies in the country, significant developments, including the doubling of the population of this rare animal, are expected to happen. 🐃

Milk candy

In San Antonio, Lalo Cagayan, one of the delicacies produced and sold in the market is the milk candy made from the native carabao's milk.

According to Jinnifer C. Puerco, chairman of the San Antonio Dairy Carabao Raisers Association, the PCC at Cagayan State University encouraged them to try their luck in dairying.

"Some PCC staff visited and encouraged us to form an association and then helped us organized and make it operational. They provided us trainings on social preparation, basic leadership, forage production, dairy, and proper milking," he said.

Their association was established in November 2013 with 27 active members.

Since starting raising carabaos in 2005, Jinnifer now owns eight native carabaos.

"The native carabao's milk used for the production of milk candies in our town, is coming only here in San Antonio," he added.

Romeo Conseha, 62, milk collector and delivery man since 2002, said he buys the milk at Php13.50 per bottle of gin (333ml) from 23 farmers and sells them, to the town's market. Other entrepreneurs in the market also produce milk candies out of it.

The association gets a share of 50 centavos per bottle from the milk collected and accumulates an average earning of Php2,000 quarterly. Its current capital is more than Php30,000.

Bienbenido Conseha, 55, is one of the members of the association who provides milk to Romeo. He is collecting 2 liters from his two lactating carabaos which is equivalent to nine bottles of gin. His milking activities start at five in the morning. He is currently raising eight native carabaos, five of which are females, two are calves and one is a bull.

"I can't imagine living my life without my carabao. My life almost revolves in raising carabaos," he said.

According to Conrado Dupaya, barangay captain, there are more than 200 native carabaos in their place. He averred that "life in their place becomes 'lighter' because of these animals".

Certainly, as attested through the testimonies of the farmers and entrepreneurs, the native or Philippine carabaos have beneficial roles among rural farming communities. It is because their products are sought-after in their own niche markets. 🐃

PCC improving... (Continuation from page 19)



Robert Garbino and his family of Barangay Dalid, Calinog, Iloilo.

Continuous backcrossing

Crossbreeding is another way to improve its breed in areas that are of dairy source. The desired end-result is the production of crossbreds, from the crossing of purebred Murrah bulls and female Philippine Carabaos, with 50% exotic blood and 50% Philippine Carabao blood.

Increasing the riverine blood in the crossbred buffalo population is intended for higher milk production. This is done by repeated backcrossing to different riverine bulls up to fourth generation. Continuous backcrossing will result to a 93.75% riverine blood with higher milk production.

"We are developing our own Philippine Dairy thru backcrossing because we only have few purebreds imported from other countries which serve as our genetic resource. These are what we use in the selection for genetic improvement. They will reproduce thru continuous backcrossing of the native and riverine breed. If it reaches 93% that is almost pure and we can call it our own Philippine dairy buffalo breed," Dr. Flores explained.

An example of this successful continuous backcrossing activity are the crossbred dairy buffaloes owned by Robert Garbino of Barangay Dalid on Calinog Iloilo. Garbino is a member of the Calinog-Lambunao-Bingawan Carabao Raisers Association (CLB-

CARA) and a farmer-partner of PCC at Western Visayas State University.

One of the crossbreds, named "Julia" with ID number 6WVC080163, has a 75% riverine blood having been a product of a successful artificial insemination by Mr. Anjo Palmes, a PCC trained village-based AI technician. The animal gave birth to a female calf with 87% riverine blood in 2014 out of AI process and was named "Krissy".

"Julia" was recorded to have an average of 5.7 liters of milk production per day at 181 days of lactation and calvings in February 2012, February 2013 and February 19, 2014 with 12 months of calving interval. "Krissy", on the other hand, recorded an average of eight liters of milk per day for 45 days and has just calved last January 21.

"We are very grateful that we have these crossbreds because of the income they are providing us. I was a construction worker before and only earned P350 for working the whole day, but now that I have my crossbreds, I earn thousands of pesos from milk sales in just a half day of work," Garbino proudly stated.

The two crossbreds were awarded as "Best Senior Crossbred Dairy Cow" and "Best Junior Crossbred Dairy Cow", respectively, during the PCC 22nd founding anniversary last March 27.

These crossbreds are certainly proof enough that given the necessary attention and care, they can be on a par with the imported dairy breed. 🐃

For centuries, the Philippine Carabao has been the ideal ally of farmers in their farm works. This animal, due to its unquestioned draft power abilities and its being tractable and friendly, became the farmers' handy partner in their toils that without it they feel becoming less of an effective and efficient farmer.

Thus, while the upgrading of the native carabaos take place, thru the introduction of the blood of the riverine-type by way of crossbreeding and back crossing, the cause of conserving and utilizing the breed of the native carabao is not forgotten.

(Photo by: Khrizie Evert Marcelo-Padre)

