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Sheep raising:

CALABARZON's promising industry

BAR R&D Digest is the official quarterly publication of the Department of Agriculture-Bureau of Agricultural Research (DA-BAR). A staff bureau of DA, it was established to lead and coordinate the agriculture and fisheries research and development (R&D) in the country. Specifically, BAR is tasked to consolidate, strengthen, and develop the R&D system to improve its effectiveness and efficiency by ensuring customer satisfaction and continuous improvement through work excellence, teamwork and networking, accountability and innovation.

This publication contains articles on the latest technologies, research results, updates, and breakthroughs in agriculture and fisheries R&D based from the studies and researches conducted by the member-institutions of the National Research & Development System for Agriculture and Fisheries (NaRDSAF).

BAR R&D Digest welcomes comments and suggestions from readers.

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what's inside

R&D Notes	4
Sheep raising: CALABARZON's promising industry	6
The management of free-range chicken	9
AI in goat: Improving genetics, increasing profit	12
Reducing GHG emission from cattle production	15
Conserving indigenous livestock generic resources	17
Improving cattle performance through AI	19
Siquijor is famed for its organic beef	21
Systematic soybean feed meals for native swine	24
Ensuring year-round quality feeds for dairy animals	28

Exploring the potentials of the livestock and poultry sector

Dr. Nicomedes P. Eleazar, *CESO IV*

Increased production and income for farmers have always been the ultimate aspiration of the Department of Agriculture (DA). These goals will only be achieved if programs and initiatives are directed toward agricultural sectors in need, and are implemented effectively.

Livestock and poultry are two of the sectors that need attention as issues on food security arise. In the country, the livestock and poultry industry stand as valuable assets because of the vital roles they play as safety nets in addressing malnutrition problems and food security concerns especially in the rural areas. Now more than ever, the growing local demand for food needs to be addressed immediately while boosting the two sectors' export potentials at the same time.

According to the Food and Agriculture Organization, the livestock and poultry sectors account to approximately 40 percent of the global value of agricultural output and support the livelihood of almost 1.3 billion people.

In the Philippines, the Philippine Statistics Authority through their quarterly report

revealed that during the first quarter of 2019, livestock production contributed 17.11 percent to the total agricultural production of the country. The cattle, hog, and dairy industry threw in higher outputs amounting to a total of 75.4 billion pesos. Meanwhile, production of poultry increased by 5.41 percent, contributing a total of 16.74 percent in the total agricultural output of the country. The total gross value of the said sector amounted to 55.4 billion pesos. However, there is a slight decline in the production of livestock, and a decrease in the gross value of poultry production during the said quarter.

As such, concerted efforts on characterization, breeding, conservation, evaluation, and commercialization of the country's livestock and poultry are being undertaken by the Bureau of Agricultural Research (BAR) in collaboration with research-implementing agencies of DA and other key players in the said industries.

BAR, as DA's national research and development (R&D) coordinating arm and funding agency, has always been committed to support programs that are

geared toward addressing food security concerns and providing income-generating livelihood for the Filipinos.

A new breeding technology called artificial insemination (AI) is being tested for cattle and goat. AI is an alternative breeding method that aims to address the lack of quality breeder stock and the high cost of breeding activities that hinder the production process of the industry.

The sheep industry in the country is also being studied for its contribution to food production, rural employment, and share in the overall gross national product. The industry is known for its immense potentials due to the variety of products derived from its meat, wool, and skin.

A science-based or methodological approach in raising free-range chickens including preservation of breeds, proper housing, and feeding management is also being looked into for its great potentials.

Different feeding formula, methods, and practices for efficient cattle production that could mitigate its greenhouse gas (GHG) emission is also

found in this issue. The study determined the volume of cattle GHG emission in relation to the type of breed and feeding practices employed by raisers.

Researches on livestock feed are also prioritized as it plays a crucial element in the overall health and growth of farm animals. Due to high costs of feeds and lack in sustainable year-round supply, a research was conducted specifically to utilize soybean-based feeds and other forage crops for small and large ruminants.

Siquijor's organic beef is also gaining popularity. The native cattle strain found in Siquijor is the taurine type (*Bos taurus*) known to have genes for marbling, making it appealing to the global market. The study hoped to commercialize the production of Siquijor beef as healthy meat and develop native beef grading standard, native beef cuts, and other beef products and by-products to increase its competitiveness in the market.

While various new undertakings are being done, conserving the genetic resources of livestock is still pertinent. It helps in restoring endangered species and addresses the increasing demand for food. The Philippine Carabao Center has ongoing efforts to save the country's indigenous livestock and endangered wildlife using cryopreservation technologies.

This issue of BAR R&D Digest details initiatives implemented to support the livestock and poultry industry of the country, from the point of production to commercialization. ###



Sheep raising:

CALABARZON's promising industry

Leoveliza C. Fontanil

Sheep produces a variety of products that can be used for many purposes. The most widely known product from sheep is wool which can be used in many various types of clothing. It is also used in making carpets, filler for mattresses, and other diverse products.

Lanolin or wool wax is a by-product of wool. Lanolin

is used in cosmetics and pharmaceuticals, and in making tape, printing inks, and motor oils. Almost all beauty aids including lipsticks, mascara, and shampoo contain lanolin.

Sheep cheese is use to make some of the world's most famous cheeses. Rogquefort, feta, and ricotta are made from sheep's milk. It is also

used to make yogurt, butter, and ice cream.

The skin from the sheep is used to create high-quality leather. The sheepskin is commonly used to make the chamois cloth that is cast off for car washing.

The most important product from sheep is its meat. It is an important component



of human's diet. Mutton and lamb are packed with vitamins and proteins for healthy living.

Although Filipinos do not generally eat lambs, the Philippine Statistics Authority (PSA), reported that there is a growing demand for sheep's meat and its by-products.

Sheep production in the Philippines

Raising sheep in the Philippines can be as profitable as raising other livestock in local farms. Sheep contributes to food production, rural employment, and gross national product by converting roughages into meat, wool, and skin.

Data from the Philippine Government Embassy stated that the agricultural trade between Australia and the Philippines every year is set to increase with the purchase of more than 3,000 Dorper sheep by Philippine breeders.

The sheep production in the Philippines reached an average of 1.5 million heads from 2005 to 2017. In 2017, the sheep production in the country amounted to approximately 30 thousand heads.

In fact, several sheep raisers are found locally in the provincial areas of La Trinidad, Benguet, Bacolod, and some parts of Negros Occidental.

The Philippines can be an industry player as the sheep industry builds slowly but surely by way of providing livelihood options leading to

DID YOU KNOW

One of the advantages of sheep farming is that they are docile, quiet, and multiply rapidly.



Wilmer S. Faylon, STIARC

full scale entrepreneurship in the countryside.

R&D efforts on sheep

Recognizing the importance of sheep as part of the livestock sector, the Bureau of Agricultural Research (BAR), in partnership with the Southern Tagalog Integrated Agricultural Research Center (STIARC) of the Department of Agriculture (DA), initiated a research study titled "Performance Testing and Technology Commercialization of Sheep Meat and Fiber Production under CALABARZON Condition."

The project aimed to evaluate the potential of sheep in the local growing market in the areas of Cavite, Laguna, Batangas, Rizal, and Quezon. Specifically, it aimed to: 1) develop management technology of raising sheep intended for meat and fiber production; 2) identify different natural dyes appropriate for treating sheep fiber; 3) develop at least two products each from sheep meat and fiber; and 4) be able to introduce the benefits derived from sheep

production that will increase small farmer's income.

Major components of the projects included the establishment of adaptability trial of experimental animals, production and proper management in selected project sites, development of food and non-food products, and identification of forage pasture.

Adaptability trial under local conditions

According to Wilmer S. Faylon, project leader, the activities of the project were conducted in two different sites. One in San Francisco, Quezon and the other in Rosario, Batangas.

The two sites were selected based on the variance in topography, climate, and crops present. Identified forages and grass seeds were used as animal feed. These are centrosema, *ipil-ipil*, Napier, madre de cacao, and Desmodium. Animal house, fence, and planting of forages were established in preparation for sheep production.

Initially, 36 heads of



PHOTO COURTESY OF WILMER S. FAYLON/STIARC

experimental animals, 30 ewes (females), and six rams (male breeders), were distributed to Fornesa, while 39 heads, 30 ewes, and nine rams were given to Reanzares. A total of 72 heads of sheep were distributed for the production phase of the project and for product development, comprised of wool and meat processing.

After pilot testing, there was an increase in the number of heads of the experimental animals in the cooperators' areas. From the initial 36 heads of breeder animals in Rosario Batangas, 29 offsprings were produced 12 of which are rams and 17 are ewes. On the other hand, in San Francisco, Quezon, 18 offsprings were produced. From the breeder stocks in

Batangas, 100 percent of all the ewes gave birth while Quezon has 73 percent birth rate only. Stocks from Batangas were able to produce 106 lambs with 0.3% low mortality.

Compared to raising other animals, Faylon enumerated several advantages of sheep farming. "Other livestock were unruly, ate the bark of the trees, and did not multiply enough. Sheep are docile, quiet, and multiply rapidly."

Processing technologies for mutton and wool

STIARC has already developed different products from sheep meat and wool fiber. The processed meat was restructured (mutton steak) that weighs 250g per pack. Sheets made from wool

were used to create different products such as lampshade, fan, handmade lighting fixtures, and a prototype insulator for egg incubator and chick brooder.

The sheep products were introduced during the 14th Agriculture and Fisheries Technology Forum and Product Exhibition at SM Megamall; and the 2018 First Livestock Technology Expo in Tagbilaran City, Bohol. ###

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The management of free-range chicken

Ephraim John J. Gestupa and Dr. Ma. Asuncion G. Beltran

Chicken raising has come a long way from when it was merely considered a backyard farming practice. As our population increased, so is the demand for poultry and with it, the rise of chicken raising by the hundreds. Chickens are not just raised for their meat because even the eggs that they lay and their brooding stock proved to be lucrative business ventures themselves.

In March 2019, the Bureau of Agricultural Research (BAR)

organized a highly-attended in-house seminar on free-range chicken management for meat and egg production. The resource speaker, Dr. Ma. Asuncion Beltran began her discussion with a quote, “*Bago pumasok sa negosyo, dapat may alam base sa agham.*”

As the seminar discussion unfolded it became clearer as to why raising chicken, if one wants it to be profitable, requires one to grasp the science behind it. She compared chickens to humans.

People go through different life stages and they require a specific way of management and care for each life stage. Raising free-range chickens by the hundreds is no longer something that requires minimal to zero attention.

Meanwhile, a BAR-funded research project titled, “Integrated RDE on the Commercial Production of Free-range Chicken for Women in Tarlac” was completed recently. The project looked into the science of free-range



PHOTO COURTESY OF DR. MA. ASUNCION G. BELTRAN/TAU

PHOTO COURTESY OF DR. MA. ASUNCION G. BELTRAN/TAU



“ Ang free range chicken ay kumakahig sa labas ng bahay, nakakakuha ng natural na pagkain, naiinitan at nakakapag-ehersisyo sa labas ng bahay.
Dr. Ma. Asuncion G. Beltran, TAU ”

chicken: from the most ideal housing layout, to how the flock is fed, to how poultry farmers can get the best yield whether it is in terms of chicken meat, eggs laid, or eggs hatched.

The project was led by Dr. Beltran who is a professor at the Tarlac Agricultural University (TAU), the implementing agency.

Housing

According to Dr. Beltran, one of the initial investments that poultry farmers should consider when venturing into free-range chicken management is constructing a house and securing a perimeter to which the chickens can roam around. Building a house for the chicken provides them with protection from other predators, shade, shelter under extreme weather conditions, safe and quiet spaces for hens to lay their eggs, and extra space to set up enclosed, temperature-controlled cages for newly hatched chicks.

When constructing houses for free-range chicken, one must consider the orientation of the structure. Dr. Beltran advises that both ends of the house, especially when built in an area where there is no shade, must face eastward and westward so that the sun's motion can circulate the air inside the house in a uniform manner. These corners should be 10 feet wide (maximum width).

She also encouraged growers to plant trees and plants, such as aratiles, banana, *ipil-ipil*, and *kakawate* around the perimeter which gives shade

and acts as a natural cooling system for the chickens as well as a source for alternative feeds.

Inside the house, Dr. Beltran advised poultry farmers to elevate the flooring by a minimum of one meter from the ground and to add perches at about two feet high. These train the chicken layers to be accustomed to climbing to a higher and safer platform for them to lay their eggs in nests instead of on the ground. Setting up a perimeter fence at about six feet high is also useful to keep the flock from straying too far away.

Classifications

Dr. Beltran divided free-range chickens under three classifications: pastured broilers, layers, and breeders.

Broilers are chickens raised mainly for their meat hence their diets are not restricted. Layers and breeders, on the other hand, must have a controlled diet in order to avoid the development of too much muscle and fat which can limit the female chicken's capacity to lay good quality eggs and produce offspring.

According to Dr. Beltran, improved free-range chicken differs from native chicken in terms of the breeds being raised.

Free-range chicken makes use of heritage breeds like Australorps (dominant black), Sussex (dominant white), Rhode Island Red (dominant red), Plymouth Rocks (dominant barred), and Dominant Blue (gray feathers) breeds.

“Ang mga breeds na ito, ay ini-import ang mga parent stock pero pino-produce na natin dito ang mga sisiw nila.” These breeds are ideal for meat and egg production with an average yield of 260 eggs per hen per year and an average weight of 1.5 kilograms per chicken.

Poultry farmers who have no incubator machine may opt to raise native chicken that will incubate and hatch the eggs naturally. The way to do this is by collecting the eggs laid by the native chicken and replacing them with the eggs of improved free range chicken breeds.

Egg Production

Layers begin to produce eggs at five months. Breeders on the other hand are a mix of male and female chickens assigned to mate and produce offspring of a specific free-range chicken breed. Layers can be a hybrid of two breeds but breeders are usually made to mate with their own breed because the chicks coming from them are sold for profit. When raising breeders, Dr. Beltran advised controlling the ratio one male for every 10 females.

Poultry farmers can also further maximize the number of eggs a chicken can produce by exposing it to a lighting program. Once a chicken starts to lay its eggs, artificial light can be added to the chicken house to simulate daylight, extending it from being 12 hours long to 16 hours.

When utilizing this program, poultry farmers must be careful in separating the layers from the chickens

turn to page 31



AI in goat:

Improving genetics, increasing profit

Rita T. dela Cruz

PHOTO COURTESY OF MAG-AGRI TAYO

Goat raising is a practical livestock-based enterprise that requires minimal investment but guarantees a good return in a short period of time. However, the lack of quality breeder stock and the high cost of breeding activities are some of the constraints that cause the low rate of local goat production in the country.

The price of goat is mainly determined by its genetic size and weight. When it reaches its marketable age, usually at eight months, a native goat, weighing 16 kilos can be sold at Php 1,600 while an upgraded goat or a goat of good breed, weighing 30 kilos is double the price.

To improve the genes of goats,

a farmer needs guaranteed goat breeders. Unfortunately, bucks cost a lot more and are difficult to find. But with artificial insemination (AI), the same benefit is within reach of farmer-entrepreneurs.

AI is one of the best technologies being used today as an alternative to natural breeding. It is used to fast track the dissemination of genetic materials from quality breeders to improve the blood composition of farm animals.

Although AI is more widely-used for cattle and swine, its use for goat breeding is yet to be fully explored. Many goat raisers are still hesitant in adopting AI in goat due to: 1) unavailability of processed semen, 2) lack of trained

inseminators, and 3) absence of a viable industry to support the commercialization of the technology.

To address these constraints, the Cagayan Valley Small Ruminants Research Center (CVSRRRC) of the Isabela State University implemented the project “Commercialization and Institutionalization of Artificial Insemination for Goats Delivery System in Cagayan Valley.”

Funded by the Bureau of Agricultural Research (BAR), the project is headed by Dr. Jonathan Nayga of CVSRRRC with the hope of upgrading local stocks that will make the technology accessible to target clients. Specifically, the project aimed to increase the



At present, more than 240 backyard raisers in 21 municipalities of Cagayan Valley have already benefitted from this project in terms of improved stocks without even purchasing a breeder buck.

Dr. Jonathan Nayga, CVSRRC

PHOTO COURTESY OF MAG-AGRI TAYO



PHOTO COURTESY OF ISU-CVSRRRC

production of processed goat semen intended for AI and to train more technicians who will facilitate the delivery of insemination services to intended clients.

After the project was initiated in 2012, it is now producing benefits not only to direct beneficiaries but to the goat industry as a whole. After the development of AI protocols, the project was able to sustain the upgrading of stocks for the production of quality slaughter goats in the Cagayan Valley region through technology commercialization and institutionalization activities.

Increasing availability of frozen semen

Through the AI technology, frozen semen from a buck is thawed and then inserted or deposited into the cervix of a doe in heat. If the necessary equipment is available, the use of frozen semen is much less expensive than paying a breeding fee.

For this project, the ISU-AI Goat Semen Processing Laboratory was tapped for semen processing. Part of the project activities was the purchase of breeder bucks of pure breed to increase the production of processed frozen semen.

As part of the commercialization initiative, the laboratory at ISU is selling frozen semen of Boer, Anglo-Nubian, and Toggenburg breeds to private raisers and commercial farms. Much of these genetic materials have already reached parts of Northern Luzon and even Central Visayas.

Training inseminators

Capacity-building activities for AI service providers are important components of the project. These come in the forms of trainings and implementation of a technology orientation program. Participants were provided with start-up kits for insemination. Sixty-seven AI service providers in Cagayan Valley underwent the training on AI and conducted 1,211 inseminations.

Today, the technicians are continuously providing insemination services to qualified does. Provision of AI services has become an additional source of income for them. It also provides the means to sustain the upgrading of stocks for the production of quality slaughter

turn to page 27

Reducing GHG emission from cattle production

Rena S. Hermoso

Efficient livestock production systems can significantly reduce GHG emissions and enhance sinks while increasing productivity.

Food and Agriculture Organization of the United Nations

The global temperature is rising. While natural disasters such as volcanic eruption and biogeochemical cycles such as carbon cycle, nitrogen cycle, and methane cycle cause the greenhouse Earth, human activities are attributed as the main culprit.

The Paris Agreement adopted by 195 nations in December 2015 established a 1.5 degree Celsius threshold. Limiting the warming of the planet to this decreases the risks of irreversible drastic changes. According to the Intergovernmental Panel on Climate Change, “human activities are estimated to have caused approximately 1.0 degree Celsius of global warming above pre-industrial levels, with a likely range of 0.8 to 1.2 degrees Celsius. Global

warming is likely to reach 1.5 degrees Celsius between 2030 and 2052 if it continues to increase at the current rate.”

Carbon dioxide accounts for the biggest share in the greenhouse gas (GHG) emission followed by methane and nitrous oxide. Direct emissions from livestock account for five percent of the total emissions from human activities. These consist of methane and nitrous oxide from rumen digestion and manure management.

The Food and Agriculture Organization of the United Nations reported that “efficient livestock production systems can significantly reduce GHG emissions and enhance sinks while increasing productivity.” While various local research

and development (R&D) initiatives are exploring adaptation measures for crops, a fair few is looking through measures to mitigate GHG emission.

Dr. Tomas M. Austral, Jr. of the Caraga State University, together with his team, explored the different feeding formula, methods, and practices for efficient cattle production that could mitigate its GHG emission. With funding support from Bureau of Agricultural Research, the project team determined the volume of cattle GHG emission in relation to the type of breed and feeding practices.

“The feed formula used in the study was based on the common livestock practices in the Philippines,” said Dr.

Austral.

Four types of treatments were tested in the study: 1) commercial feeding practices, 2) good agricultural practices, 3) conventional farming, and 4) organic agricultural practices. The treatments used grasses (i.e. Napier grass, legumes, corn fodder, and Flamenja) and mixed concentrates (ground yellow corn, copra meal, molasses, and salt).

Twenty-four cattle (8 native, 8 crossbreeds, and 8 Brahman) were treated for three months. Each treatment has six cattle with two cattle (one male and one female) per replicate. Further, the volume of GHG emission from the cattle manure was measured after 60 days.

To replicate the production of methane and carbon dioxide gas from cattle manure, the

study adapted a customize gas digester. The carbon dioxide and methane gas from decomposed manure were analyzed through gas chromatography.

The study found that methane gas from decomposed manure has higher accumulated percent composition than carbon dioxide gas regardless of the feeding practices. While on the average volume of GHG, good agricultural practices got the highest emission.

The results of the project will be presented in international and national symposia to further reach cattle raisers, professionals, academe, government line agencies and other stakeholders. The project team also provided the generated information to the Climate Change Commission, local government units, and other related organization as part of the missing data on the

contribution of GHG emission from livestock.

After the success of this project, Dr. Austral sought to “continue to replicate the project to other livestock animals like dairy buffalo, small ruminants (goat, sheep), and swine which were still the gap of the research study.” He would also like to discuss with the officials on the future plans of the project through roadmap development.

Adapting to the risks and threats of climate change requires the cooperation and contribution of all sectors. Otherwise, drastic consequences cannot be undone. ###

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Conserving indigenous livestock genetic resources

Rena S. Hermoso

As our ancestors learned to till the lands and rear the animals, nomadic lifestyle ceased to exist. The population burgeoned, industrialization kicked in, and urbanization developed at its pedestal. With this, humans learned to harness and exhaust our natural resources to feed the rapidly growing population.

Evolution occurred because mass extinction took place. Development comes at a price. The future generations might not enjoy the resources available now. Human activities and climate change are threatening the genetic resources of the Earth's flora and fauna.

The bias towards standardized breeds for livestock has posed a serious threat to their indigenous counterpart. Its

forecasted impact will not only affect the livestock sector but also disturb the quality of life.

Various government agencies are on the move toward preserving and conserving our animal genetic resources. The Philippine Carabao Center (PCC), by virtue of Administrative Order No. 9 series of 2008, is the lead agency in Livestock Biotechnology in the Department of Agriculture. PCC has a cryobank facility established in 2012.

Cryobanking capitalizes on cryopreservation technologies such as conventional slow freezing, vitrification or quick freezing to preserve sperm cells, egg cells and embryos at cryogenic temperature in liquid nitrogen cryotanks. PCC has ongoing efforts to

save the indigenous livestock and hopefully for endangered wildlife's posterity through in vitro conservation research.

Native animals are said to possess climate resiliency, disease resistance traits, and genetic variety that allowed them to persist in the local environment. Collecting semen from native animals remains to be a major constraint because they are not trained for ejaculated semen collection.

According to Dr. Lerma Cajuigan-Ocampo of PCC, "I have difficult time getting sperm from native animals." She said that the only way to get sperm from native animals is after they're butchered. As a veterinarian, Dr. Cajuigan-Ocampo hypothesized that she might still be able to salvage live sperm from butchered

animals. With funding support from the Bureau of Agricultural Research (BAR), she explored possible procedures to extract viable epididymal sperm (ES) from post mortem testicles of goat.

Through the study, her team was able find that viable ES can be recovered from post mortem testicles within 30 minutes to two hours upon death at room temperature. Beyond three hours, storing the testicles in iced water condition (17-22 degrees Celsius) or chilled condition (4-7 degrees Celsius) could be used to keep the integrity of the post mortem testicles. They also found that post mortem ES remain physiologically functional as demonstrated by their ability to fertilize matured oocytes through in vitro fertilization technique.

Further, ES can be preserved at cryogenic temperature in ultralow freezer or in styropor box through vapor cooling prior to liquid nitrogen plunge. According to Dr. Cajuigan-Ocampo, 90 percent of the goat population in the Philippines is in backyard farms. Thus, it is equally important to contain wide spectra of genetically diverse species such as the indigenous livestock in the cryobank core collections apart from those breeds selected with superior genetics.

Dr. Cajuigan-Ocampo shared that she was surprised by the promising results of their study. This paved the way to explore more about assisted reproductive technologies. Driven by the desire to develop technologies that



could reach outside the laboratory where the rich genetic resources of livestock dwell, Dr. Cajuigan-Ocampo is currently implementing another BAR-funded project. This aimed to determine fertility in vivo of processed/frozen ES through artificial insemination in two distinct season; optimize cryopreservation procedure outside the laboratory by setting up ambulant clinic on sites; and isolate ES from other livestock species and determine quality and fertilizing potential in vitro.

Conservation of the indigenous livestock genetic resources could not only help in restoring endangered species but it could also provide possible solutions in addressing the increasing demand on food and agriculture. ###

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Improving cattle performance through AI

Leoveliza C. Fontanil



Cattle are important sources of food and livelihood. As draft animals, cattle are also important in farming activities. Given its potential as an industry, the beef cattle industry in the Philippines is still one of the least developed commodities as manifested by its population decline which is attributed to high slaughter rate.

With the number of cows raised and the cost of bull, research interventions are being considered to improve the genetic composition of Philippine beef cattle. One technology is through artificial insemination (AI), a process of collecting sperm cells from a male animal and manually depositing them into the reproductive tract of a female. AI is seen as an alternative option over natural mating.

At present, the Isabela State University (ISU), through the Cagayan Valley Small Ruminant Research Center (CVSRRC), has been promoting AI as an option to improve

the genetic composition of goat. CVSRRC is equipped with Computer Aided Sperm Analyzer (CASA) for more concise evaluation of sperm cells. It has established its own semen processing laboratory for goat.

With the presence of this facility, ISU is gearing towards the expansion of the services it provides, one of which is the AI for cattle. This will be executed on commercial-level to fast track the production of improved animal for beef production in Cagayan Valley areas.

A team of researchers, led by Dr. William C. Medrano of the Department of Animal Science, College of Agriculture of ISU, set out to promote the utilization of AI by increasing the number of farmers who are adopting the technology. Guided by ISU's aim to upgrade local stocks that will make the technology accessible to target clients, a project titled, "Promotion of Artificial Insemination as Breeding Tool for Cattle Production in Region

2" was funded by the Bureau of Agricultural Research.

Initiated in 2018, the project aimed to: 1) conduct socio-economic studies for the sustainability of cattle production using AI technology; 2) capacitate farmers on the management of cattle production using AI technology; and 3) increase the number of farmers engaged in AI technology.

The project intended to increase safety of the animals produced, increase production efficiency, and provide better genetics of cattle. AI will also reduce the risk of transmitting disease. The entire procedure is also more hygienic than natural mating.

Socio-economic results

The ISU project started with identifying the project sites, and project beneficiaries and cooperators. Among the cooperators tapped were the Malaya Dairy Cooperatives, San Agustin Dairy Cooperatives, Cagayan Valley Federation of Dairy Cooperatives, and

Quirino Dairy Cooperatives.

ISU conferred with the provincial veterinarian for the baseline data of cattle population in the said provinces.

The study determined the benefits as well as highlighted the importance and insights of the present value of cattle production as a complementary enterprise among smallscale raisers in the region. On the other hand, the supply chain analysis conducted determined the flow of the products in the market, and identified the major key players in marketing of products.

Adoption and capacitation of farmers

ISU established an information drive to all local government units (LGUs). An orientation directed to introducing AI as a breeding tool among raisers and technicians in the selected project sites in the provinces of Isabela, Cagayan, Nueva Viscaya, and Quirino was

conducted.

The activity served as a venue for information dissemination, and discussion of the advantages and benefits of AI; prerequisites for adoption and basic management of the cattle required before and after AI is conducted.

The rapid promotion of AI technology was attained by ISU through the conduct of training, production of information and communication materials, and availability and supply of frozen semen from purebred bulls.

ISU provided two hands-on demo training on AI. Topics on care and management, feeds and feeding of cattle were piloted at San Ramon Aglipay, Quirino; and Dalibubon, Jones, Isabela, which were participated in by more than 300 cattle raisers and interested farmers.

Upgrading AI facilities

The facilities established for

goat semen processing at ISU were tapped for the project. Breeder bulls (Brahman and Sahiwal), a predominantly first filial generation of cattle, was purchased as source of semen.

Additional laboratory supplies were purchased to cater to cattle semen processing. The project purchased artificial vagina for cattle, additional reagents for bull semen processing, AI gun for large ruminant, and other laboratory materials to ensure and secure frozen bull semen that were used for the insemination of selected cows.

To date, 214 heads of breeder cow were synchronized and inseminated. Out of the 214 breeder cows inseminated, there were 104 heads of cow diagnosed pregnant or equivalent to 49 percent.

Collaboration with the other government agencies

The project implemented is in close coordination with the Bureau of Animal Industry (BAI) and the Philippine Carabao Center (PCC). Trained AI technicians from BAI under the “Unified Artificial Insemination Program” and from PCC were tapped to administer the AI at the farmers’ fields.

The project paved way for more technology transfer and commercialization. ###

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Siquijor

is famed for its organic beef

Rita T. dela Cruz

Siquijor, a tiny island province known for its mysterious and bewitching tourist attractions, is likely to be famed for yet another of its best and finest product—its beef.

This is not something to be surprised about since agriculture is a predominant sector in Siquijor and cattle raising, a significant agricultural activity.

Nestled between the Visayas and Mindano group of islands, Siquijor ranks second among the highest cattle producing provinces in the country, next to Ilocos Norte.

The native cattle strain in Siquijor is the taurine type (*Bos taurus*) known to have genes for marbling making it competitive with the rest of the best beef cattle in the world. Marbling is the white flecks and streaks of fat within the lean sections of meat. The degree of marbling is the primary determination of quality grade in beef. Marbling has a beneficial effect on the juiciness and flavor of beef as it

keeps beef moist and succulent.

Bos taurus is a grass-fed type of cattle. Hence, the meat is lean and tender and has moderately full flavor. This native cattle strain is suitable for Siquijor's weather condition because it can tolerate the heat and it needs little water requirement. It can also easily adapt to the environment. This is also the reason why this breed is preferred by majority of the farmers in Siquijor. This native breed is also known to produce quality milk.

Because *Bos taurus* is a grass-fed cattle, Siquijor's locally-produced beef is considered a healthy beef. With the promising potential of the native strain, it is important to enrich the cattle production and meat processing industry to help the breeders raise their income, and provide an opportunity for Siquijor to export its quality meat globally.

R&D project on Siquijor beef

In Siquijor, the cattle industry is hounded mainly by two aspects: production and marketing. Major constraint in

production is affected by the dry season in Siquijor resulting to limited water supply, limited food supply, and excessive heat that can affect cattle raising. The natural climatic condition and sloping topography of Siquijor greatly affect the feeding practice of farmers especially during the dry season. In terms of marketing, one major challenge is the unfair pricing of traders due to lack of price standard.

Dr. Agapita Salces of the Institute of Animal Science, University of the Philippines Los Baños (UPLB), conducted a study that will not only address these challenges in production and marketing but more importantly, will commercialize the production of Siquijor beef as healthy meat.

The UPLB-led project, "Commercialization of Philippine Native Cattle for Optimum Production of Siquijor Beef" is being funded by the Bureau of Agricultural Research through its National Technology Commercialization Program. Specifically, the

BEEF FLOSS



BEEF TAPA



CORNERED BEEF



BEEF PATTIES



PHOTOS COURTESY OF DR. AGAPITA SALCES/UPLB

DID YOU KNOW

Siquijor ranks second among the highest cattle producing provinces in the country, next to Ilocos Norte.



Dr. Agapita Salces, University of the Philippines Los Baños

project will develop native beef grading standard, native beef cuts, and beef products and by-products.

In collaboration with the Department of Agriculture - Regional Field Office 7 and the Province of Siquijor - Provincial Veterinary Office, the project is employing various science-based interventions including data collection of animal performance, development of software for smallhold native cattle production, planting of forage trees and legumes, and meat processing and product development.

Profitability of cattle raising

Results of the socio-demographic analysis conducted by the group of Dr. Salces showed that an average cattle farmer in Siquijor has three cattle per farm being raised in a land he owns through inheritance. The rate of technology adoption of cattle raisers in Siquijor is high due to the various support provided by the provincial government.

In the profitability analysis of the project, results showed that the investment cost for setting up a cattle enterprise will cost Php 22, 555. 51. This

is comprised of cattle house, feeding, breeding stock (two young cattle one male and one female), farm tools (drum, containers, pail, and scythe). However, if the cost of land will be included the total investment cost is Php 101,703.65.

The three-cattle operation in Siquijor is considered successful in increasing the income of the farmer. In terms of net income, results showed that a farmer could expect at least Php 1,000 increase monthly when he choose to engage in the cow-calf operation in Siquijor.

General assessment of the results showed that good cultural management practices employed by the raisers could not be translated into profit until problems in marketing is resolved. This is attributed to the lack of price standard in Siquijor.

Product development and marketing

One of the interventions of the project was meat processing and product development through the conduct of training. One of the beneficiaries of the project was the Catulayan Community Multi-Purpose Cooperative

wherein members were taught how to process and add value to their beef products. In 2017, 33 members of the Cooperative underwent the training in Siquijor. Dr. Maria Cynthia Oliveros, project study leader, demonstrated how to process beef tapa, corned beef, burger patties, and beef floss.

Meat processing was introduced to the members to increase their income and to promote the quality of native Siquijor beef. They were also taught how to look at fresh meat including the physical and chemical properties of meat to ensure its quality, tenderness of the meat during processing and storage, and even the correct meat cut. Another aspect of the training was teaching them about meat spoilage and proper handling to maintain food safety and avoid food poisoning.

Aside from meat processing, 11 members of the Cooperative also underwent slaughter and beef fabrication training. They were exposed to existing beef grading standards and beef cuts. Leading the training were Dr. Oliveros and Dr. Salces.

The various meat products were exhibited during the 14th Agriculture and Fisheries Technology Forum and Product Exhibition held on 30 August-2 September 2018 at SM Megamall, Mandaluyong. ###

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Systematic soybean feed meals for native swine

Ephraim John J. Gestupa

Swine production in the Philippines is usually implied to commercial level production. When

thinking about where their pork dishes were sourced from, consumers would typically visualize fair skinned,

pink pigs being fed with golden brown powder-like substances as seen on television.

But if one were to compare a commercial pig with that of a Philippine native, the difference is as stark as black and white. Philippine native pigs have black skin and have tusks sticking out of their long snouts. Just like any native livestock breed, whether it's chicken, goat, or pig, those considered as such survive and thrive under the climate of the region of which they are native to ranging outdoors and feeding off of plants in the surrounding area. Place a commercially-grown pig in the same environment and they are sure to not survive.

In urban areas across the country, a niche market is responsible for the continuous demand for native swine. Because the diet of native pig is completely natural, health-conscious consumers are opting to buy native. Having been raised as free-range livestock, the meat of native pig also exhibit a flavor that is superior to commercially-produced pigs.

With the industry in place and the demand for the commodity sustained, studies have been conducted on the formulation of native pig feeds sourced from natural ingredients.

According to the Food and Agriculture Organization of the United Nations, the nutritional needs of pigs can be divided into six categories: water, carbohydrates, fats, proteins, vitamins, and minerals. Native pig's carbohydrate intake can be from eating rice bran, wheat bran, or corn while their protein intake comes from eating legumes such as *ipil-ipil* and soybeans.

To further supplement the diet of native pigs, farmers usually add market-rejected fruits and vegetables as well as kitchen leftovers after being cooked to remove traces of harmful bacteria.

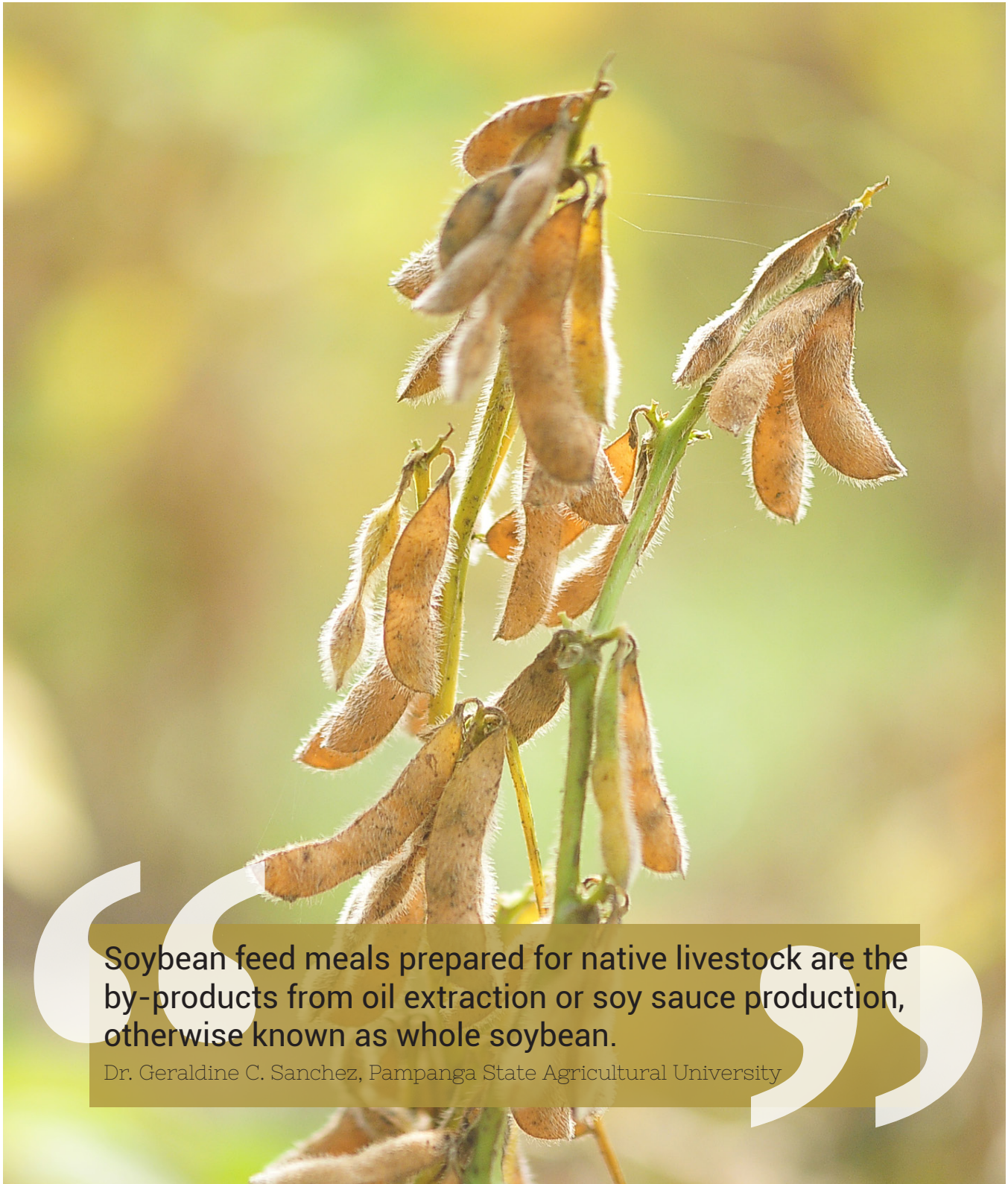
The increasing demand for native pig products poses a challenge to farmer raisers to turn their backyard farming practice into becoming more systematic and profitable, while at the same time, still utilizing the natural approach to growing livestock.

It is for this reason that the

Pampanga State Agricultural University (PSAU) set out on a study on soybean feed meals and its effects on the growth performance of native pig. Related studies have verified the benefits of soybean feed meals for commercial pigs but very little research has been done to see if soybean has the same effects on native livestock.

“Since native pigs are commonly seen feeding on crops in the surroundings and are thought to be thriving well, native pig raisers have put little attention to their





Soybean feed meals prepared for native livestock are the by-products from oil extraction or soy sauce production, otherwise known as whole soybean.

Dr. Geraldine C. Sanchez, Pampanga State Agricultural University

nutritional requirements. Because of this practice, the pig's growth potential is not fully achieved," said Dr. Geraldine C. Sanchez, project leader of the BAR-funded

research titled, "Utilization of Soybean (*Glycine max L.*) to Enhance Growth, Health and Estrus Among Native Pigs in Pampanga." The first two objectives of

the study investigated the effect of soybean feed meal formulations on a pig's physiological health.

Soybean is not usually fed raw

to pigs because it influences average daily gain negatively, and increases feed conversion. Soybean feed meals prepared for native livestock are the by-products from oil extraction or soy sauce production, otherwise known as whole soybean. Whether or not whole soybean is fermented is one of the variables studied by Dr. Sanchez and her team. Initial results have successfully proven that fermented soybean leads to positive effects on native pig's gastrointestinal and respiratory systems.

Study three and four of Dr. Sanchez's research project looked into the effect of soybean feed formulations to the reproductive performance of female native pigs. Soybean contains compounds called phytoestrogens. Phytoestrogens have a similar make-up of human estrogens, the compound released in a woman's body that regulates her menstrual cycle.

Foreign studies conducted with rodents have shown that high dietary intakes of soy isoflavones (phytoestrogens in soybean) resulted in the increase of uterine and ovarian weight as well as higher levels of follicle stimulating hormones. Even Dr. Sanchez herself has conducted similar tests on rodents at the Nutraceutical Research Laboratory, a BAR-funded research facility in PSAU.

Dr. Sanchez and her colleagues are now analyzing initial data of the changes in a native pig's reproductive cycle under various soybean feed formulations. The research

tested the hypotheses of Dr. Sanchez that if fed with soybean, female native pigs will have prolonged estrus or "heat period" therefore increasing gilt's potential for pregnancy.

During one of the bureau's monitoring activities in Region 3, Jacob Sanchez who is a member of the project team expressed the need for studying the pig's reproductive performance because Philippine native breeds have irregular estrus. Developing an enhanced and all-natural soybean feed meal can potentially be useful in improving the reproductive performance of native pig.

This component of the study can be attributed as research efforts towards genetic conservation of native animals. According to Dr. Sanchez, raisers of native pigs crossbreed their stock with commercial breeds in order to produce bigger livestock. While this is more profitable, it puts at risk the genetic diversity of native pigs which can potentially lead to extinction. But studies like that of Dr. Sanchez aimed to conserve biodiversity while at the same time, address the needs of farmers who want to augment their income through native pig raising. ###

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AI in goat...from page 14

goats in the region.

With this development, increase in goat population can be attained through AI provided that the goat raisers' management also includes following protocols and standards on proper feeding and health management.

Supporting commercialization

The stored frozen semen is sold to raisers and technicians outside the region who are conducting AI. Each semen straw is sold at Php 300.

With this commercialization project, different business portfolios have been developed. These portfolios serve as guides for animal technicians in making this service provision into a livelihood. Different services offered range from provision of insemination services to large or small ruminants, to administration of biologics, and even semen processing.

At present, more than 240 backyard raisers in 21 municipalities of Cagayan Valley have already benefitted from this project in terms of improved stocks without even purchasing a breeder buck. ###

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Ensuring year-round quality feeds **for dairy animals**

Patrick Raymund A. Lesaca

Livestock is an important subsector of agriculture. The Philippine Statistical Authority reported that livestock production posts a 1.25 percent increment, contributing 17.11 percent to the total agricultural production. Higher outputs were recorded for cattle, hog, and dairy.

In spite of the gains reported, challenges continue to hound the livestock sector. One constraint is the availability of quality forages for dairy cattle and buffalo. Forages are plant materials, consisting mainly of plant leaves and stems, eaten by grazing livestock.

In the province of Isabela in the Cagayan Valley, cattle raising and dairy farming are two of the top sources of livelihood among raisers and entrepreneurs. One perennial concern of the farmers, considering that the valley produces an abundance of rice and corn, is the insufficiency of processed quality feeds for dairy animals especially during dry season to boost meat and milk production.

Green corn, rice straw, corn stover (leaves, stalks, and

corn cobs left in a field after harvest) are some of the abundant feed resources that the province can optimize as forage.

It was observed that during dry spell, the supply or availability of forages are low, which could be detrimental to a sound production of meat and dairy products, while feeds are high in supply during the wet season.

To address feed quality and scarcity, it is recommended that quality feeds are made available all-year-round because large ruminants like cows and buffaloes depend on them for milk and meat production.

One intervention is through forage production and silage. Silage is chopped feed like corn, sorghum, Napier, and other forage crops fermented with moisture content (60-70 percent) that are fed to ruminants. If properly prepared, silage can provide a year-round consistent feed supply for the livestock sector.

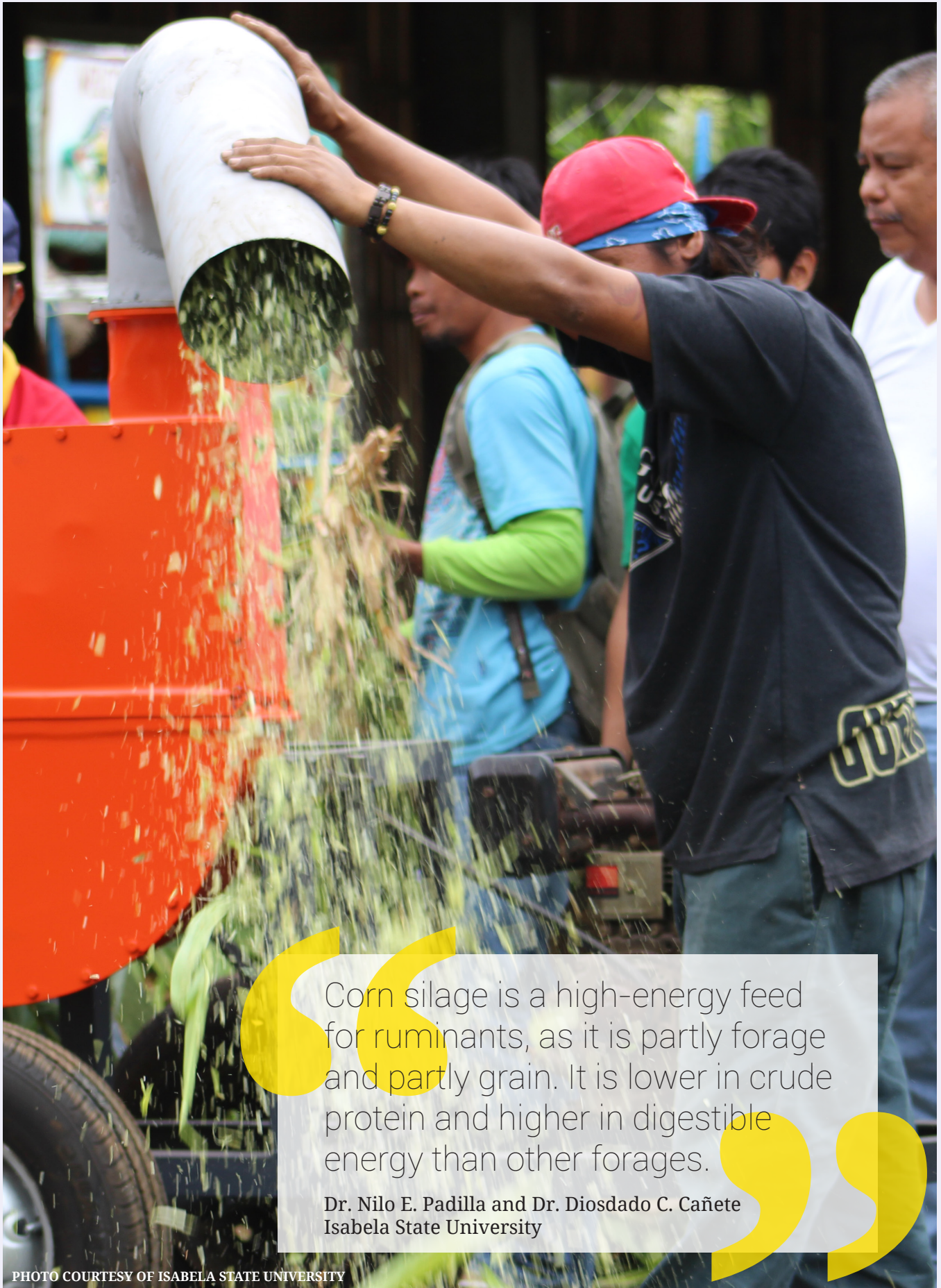
Farmers need to be proficient in managing and developing their forages. Having an

alternative and continuing supply of feeds will be advantageous especially during lean months. It will reduce cost to produce feeds while improving the production of meat and volume of milk.

The Isabela State University (ISU) conducted a project, "Adoption and Commercialization of Green Corn, Green Corn-based Silage, Haylage and UMMB Production for Dairy Cattle in Cagayan Valley" funded by the Bureau of Agricultural Research (BAR). Led by Dr. Nilo E. Padilla and Dr. Diosdado C. Cañete of ISU, the project was conducted in collaboration with the Department of Agriculture-Regional Field Office (DA-RFO) 2, and in consultation with the National Dairy Authority and the Philippine Carabao Center.

The project tapped the Malaya Development Cooperative (MDC), Inc. of Mallig, Isabela; and the San Agustin Dairy Cooperative (SADACO) of San Agustin, Isabela, as beneficiaries.

The project hoped to improve dairy production and ultimately increase the income



Corn silage is a high-energy feed for ruminants, as it is partly forage and partly grain. It is lower in crude protein and higher in digestible energy than other forages.

Dr. Nilo E. Padilla and Dr. Diosdado C. Cañete
Isabela State University

PHOTO COURTESY OF ISABELA STATE UNIVERSITY

of dairy farmers through the use of green corn silage, haylage, and Urea Molasses Mineral Block (UMMB) supplementation using locally-available feed resources. According to Dr. Padilla, green corn production for silage was found profitable as an alternative to corn production for grain. Further, nutrient-enriched rice straw (haylage) and the use of UMBB have been proven effective to improve the nutrition of dairy animals, resulting in improved meat and milk production.

Corn silage is a high-energy feed for ruminants, as it is partly forage and partly grain. It is lower in crude protein and higher in digestible energy than other forages. Corn is relatively easy to ensile. Ensiled forage or silage is good up to three years without deteriorating. Silage is very palatable to livestock and can be fed at any time. It is also considered the most convenient way to conserve forage crops.

According to the proponents, the project has been piloted in the Malaya and San Agustin Dairy Coops, where farmers were taught how to make corn silage. They were also advised to plant corn and harvest between 70 to 85 days. Harvested corn are chopped and packed in 30-40 kgs capacity sacks with polyethylene bag, sealed, and stored. The silage is ready for feeding after three weeks in storage. Aside from on-site and experiential learnings on silage making, haylage, and UMBB; and silage and haylage feeding demonstrations, training on the use of UMBB as feed supplement was conducted.

As a result of the intervention, the MDC and SADACO have fully adopted corn silage as feeds in their dairy animals. It was reported that, MDC's average milking capacity increased from 8-10 liters per head per day compared to the 3 liters milk per head per day before the intervention.

Body weight and physical appearance of the herd have also improved. Both cooperatives are now producing their own corn for silage production and have been using UMBB as feed supplement.

Through the project, a year-round availability of nutrient-rich feedstuff for dairy, increased milk production, higher household income, improved nutrition of farm families, and less dependence on imported milk and milk products are now within the sector's reach. ###

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The management...from page 11

who are younger than four months old to avoid premature reproductive development.

Layers need to have an isolated and quiet spot to lay their eggs. Chickens are also very sensitive to sound. Dr. Beltran emphasized the importance of designating a darker corner in the house for chickens to lay their eggs without getting disturbed. Layers need to have a protein-rich diet so Dr. Beltran suggested that legumes such as *madre de agua*, azolla, duck weeds, and *malunggay* be added to the chicken's diet at about 15 percent.

Brooding

Before the eggs are hatched, poultry farmers should set up a cage for brooding the chicks. Brooders must be fully covered to avoid drafts. Hung two feet above the cage is a heating lamp that keeps the cage warm 24/7 at 38-39 degrees Celsius. The brooder cage must have a flooring of 2 inches of rice hulls or newspaper sheets to insulate the heat.

Poultry farmers must also regularly check the behavior of the chicks, they must be evenly distributed around the source of heat, thus maintaining a good temperature inside the brooders. The temperature is gradually decreased days following the hatching of the chicks until the wing feathers are totally developed. The growers could be completely let out to range freely, 45 days after hatching.

In growing free-range chicken, poultry farmers should be familiar with the growth stages of the stock and pay

attention to the uniformity of each chicken's weight in every life stage. When monitoring the weight of free-range chicken, poultry farmers must do this practice once a week in the same spot within the perimeter, eventually picking almost the same birds to monitor the uniformity of the flock's weight. Results should be uniform across all weighed birds only deviating at 10 percent more or less than the target weights every week.

When buying day-old chicks to serve as initial stock, Dr. Beltran advised to be cautious in double checking the sex before purchasing the chicks. Based on her experience and the accounts from other poultry farmers, many have been scammed to buy day-old chicks sold over the internet only to find out that the stock purchased were all male.

During the seminar, Dr. Beltran discussed the various techniques in finding out the sex of day-old chicks based on their wing feather structure, or through cloacal sex identification.

Health Management

Dr. Beltran reminded the attendees to also vaccinate their flock regularly, to observe proper biosecurity measures, as well as to retain at least 50 percent of the chicken's diet to commercial feeds if they are being replaced with green feeds.

Alternative feed sources include snails, monggo or soybean seeds, darak, corn, black soldier fly larvae, banana plant parts, kitchen leftovers, duckweeds, and azolla. It is important when

feeding free-range chicken to always elevate the container or dispenser of the feeds to chicken breast level so as to keep the chickens from spilling the feeds or having it mixed with soil or other matters.

Chicken growth can also be enhanced through fermented plant/fruit juice. Dr. Beltran recommended the use of Oriental Herbal Nutrient concoction made from garlic, ginger, onion, hot pepper extracts, muscovado sugar, mixed together with gin/beer (after 12 hours) and fermented in jars for seven days. Two table spoons of the OHN concoction is mixed in a liter of water given thrice a week. Her findings indicated a 200 grams increase in the usual weight.

Dr. Beltran defined free-range chicken management as raising chickens the way they would grow naturally. "*Ang free-range chicken ay kumakahig sa labas ng bahay, nakakakuha ng natural na pagkain, naiinitan at nakakpag-ehersisyo sa labas ng bahay.*"

With this approach, poultry farmers can guarantee that their chickens are raised naturally and are not introduced to artificially administered growth hormones. Investing on free-range chicken not only promises good income for farmers but healthier options for the consumers as well. ###

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Sheep wool is a versatile and durable textile fiber. It is the most commonly used and widely available fiber material for clothing and other forms of textile.

The Southern Tagalog Integrated Agricultural Research Center (STIARC) has conducted a research to test the adaptability of sheep in Quezon and Batangas. The project also explored value-adding technologies for wool fiber. Lantern, lampshade, folding fan, and wool sheet were among the products developed by STIARC. (Photos: Rdelacruz/BAR)



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