

## R&D Initiatives towards Designing Climate Change Resilient Domesticated Animal Genetics in the Philippines

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### Introduction

Despite technological advancements brought about by thorough understanding of science and profound application of recent innovations, many countries including the Philippines remain vulnerable to the wrath of nature. Dangers and disasters brought about by extreme climate anomalies are among the unfortunate truths that the present and future generations have to face. Discussions about disaster preparedness is no longer about “IF” it happens but rather “WHEN” it happens. Thus, current engagements should be focused on preparing for the looming dreadful effects of climate change.

Natural calamities often cause wide-scale devastation in affected communities and/or localities. The Philippines has several experiences with extreme climatic phenomena that resulted to extensive losses to properties (infrastructures, food crops, livestock, aquatic resources and some economically important natural resources), injuries and casualties to humans. In recent years, the Philippines has also experienced mournful events of severe landslides, earthquakes and storm surges that left massive destructions and enormous injuries and casualties to its people. Typhoons such as Bopha (Pablo) in 2012 that cause extensive damage in Mindanao (southern part), Haiyan (Yolanda) in 2013 that devastated the Visayas (central part) and Ketsana (Ondoy) in 2009 that inundated Metro Manila and surrounding cities and municipalities are among the proofs of the country’s vulnerability to climatic perturbations. These and other natural calamities have claimed thousands of lives and billions worth of properties and natural resources. IOM (2013) as cited by TTPD, DOST-PCAARRD (2016) summarized the occurrences of natural calamities in the Philippines from 1980 to 2013.

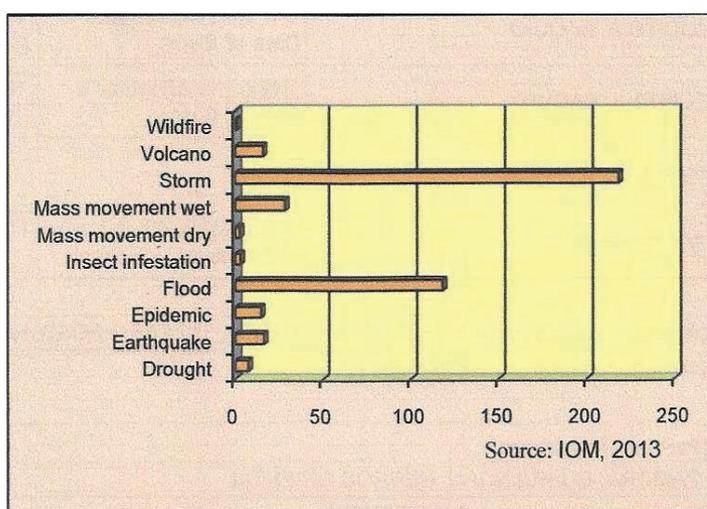


Figure 1. Frequency of natural disaster occurrences in the Philippines, 1980-2013

Figure 1 clearly shows that storms and flooding are the most frequent forms of natural calamities that challenge country. In most likelihood, these natural events also cause the greatest loss in terms of damage to properties and in terms of injuries and casualties. However, the figure also shows some episodes of drought and epidemics (or disease outbreaks) that create negative impacts on humans as well as survival and productivity of livestock and crops.

Implementing disaster impact mitigation actions shortly before, during and soon after the occurrence of calamities is challenging. However, helping communities rebuild from the wreckage and regain their livelihood is even more challenging. This is where R&D in Philippine native animal's development and utilization initiatives is slanted to.

### Characteristics of Philippine Native Animals

The Philippine native animals being products of a long process of natural selection are seen to poses morphological and physiological traits that enhance their fitness to the natural environment. These traits enable them to survive, grow and reproduce with minimal intervention in the production system. Moreover, these inherent traits make them more resilient to extremes of weather. Experiences with super typhoons Haiyan and Bopha have demonstrated the resilience of the Philippine native chickens and pigs to extremes of weather. Farmers in the affected areas have narrated that houses and fences where the native chickens and pigs were kept were toppled and blown away by the strong winds and the animals housed therein were nowhere to be found. But soon after the winds subsided the native pigs and chickens returned to the rearing areas with minimal losses. These are traits of native animals that are important in keeping cost of production at a minimum and thus, allow financially-challenge farmers in the rural areas to profitably participate in the production system.

Moreover, the Philippine native animals also have developed unique texture and flavor in its meat that are paid premium prices by consumers. For example meat of Philippine native chickens is priced 85% (on the average) higher in local markets than its commercial broiler counterpart. Native pig "lechon" (roasted pig, [Fig. 2]) is commonly priced 50% higher than that of lechon made from commercial hybrid pig. These characteristics of native animals, compensate for its relatively slow growth rate and small body size and provide opportunities for native animal raisers to earn more from the production activity. Native animals particularly layer ducks produce eggs that are preferred for processing into "balut" (boiled embryonated egg, [Fig.3])- one of the Philippines' ethnic delicacies.



Figure 2. Native pig lechon



Figure 3. Balut from duck egg.

These are among the characteristics of Philippine native animals that highlight their importance to the rural economy of the country aside from the other socio-cultural services they provide to Filipino communities.

### **The Industry Strategic Program for Native Animals**

The negative impacts of climate change are currently being felt and are expected to persist in the coming years. Thus, the overarching goal of the Philippine native animals R&D program is to develop a sustainable and a more climate-resilient subsector that complements with the established livestock industries of the country.

Planning and implementation of the Philippine native animals R&D program is accomplished thru the Industry Strategic Program (ISP) for domesticated native animals. Implementation of the ISPs on livestock and poultry that include native animals is being led by the Livestock Research Division of the DOST-PCAARRD. These ISPs serve as the R&D counterpart of the Philippine Native Animals Development (PNAD) program, which is being led by the Department of Agriculture's Bureau of Animal Industry (DA-BAI).

The Philippine native animals ISPs consider the capabilities and capacities of native animal producers, availability of production inputs and services, consumer demands and preferences, prices and market trends and climate variations in the production sites. Moreover, the native animals ISPs also consider capability building (both manpower and facilities) of R&D institutions and to a certain extent of farmers engage in native animal production. Enabling and regulatory policies pertaining to native animal production and marketing are also among the issues being studied thru the native animals ISPs.

ISPs on Philippine native animals are currently focused on Philippine native pigs, chickens and ducks. Although limited R&D activities on native cattle and goats are pursued by some R&D institutions. Guided by the PNAD's framework of native animal conservation thru profitable utilization, R&D directions are geared towards purification of native animals and establishment of breeding true-to-type populations of the different genetic groups of native pigs, chickens and layer mallard ducks, while being mindful of maintaining genetic diversity. This strategy is implemented to achieve uniformity, predictability of production performance and consistent quality of native animal products. The unpredictability of production performance and wide variability in the quality of products from native animals are among the reasons why these animal genetic resources are not profitably utilized in building enterprises by farmers. For a very long time these native animal genetic resources are seen as part of the rural farm landscape in the country but its utilization is limited to home consumption and occasional source of additional income. However, perception and utilization of native animals by the Filipino farmers have

significantly changed after breeding true-to-type populations of native chickens, pigs and ducks were developed. Today many Filipino farmers are already using native animals in establishing enterprises and in building rural assets.

#### ISP on Philippine Native Chickens

Previously conducted R&D have identified several genetic groups of Philippine native chickens found in different geographic locations of the country. These are the “Paraoakan” in the island province of Palawan, the “Banaba” in the Southern Tagalog region, the “Camarines” in the Bicol Region, the “Darag” in the Panay island, the “Boholano” in the island province of Bohol and “Zampen” in the Zamboanga Peninsula. Breeding and selection in their natural environment have been conducted on these chickens to establish breeding true-to-type populations. Today, breeding populations of these chickens are already established in government R&D stations. On limited scale, farmers are already using these chickens for production purposes. Recent molecular studies on these groups of chickens suggested genetic distances wide enough for them to be considered genetically unique from each other.



Figure 4. Flock of Darag chickens used for meat production.

Current R&D directions for Philippine native chickens are focused on wide-scale utilization of these genetic resources for meat production and for livelihood in rural areas. R&D towards improving further the traits that enhance their fitness to the natural environment, productivity and qualities that are preferred by consumers are also being pursued. Profitable utilization of these improved Philippine native chickens are envisioned to promote conservation of these genetic resources.

#### ISP on Philippine Native Pigs

In the Philippines, the primary use of native pig meat is “lechon” processing. “Lechon” is one of the most popular ethnic delicacies of the country, which is often served in many occasions and gatherings (i.e fiestas, weddings, birthdays, family reunions). With the apparent improvement of the Filipino’s purchasing power, demand for “lechon” is consistently increasing hence, demand for native pigs. Therefore, R&D directions for native pigs development is centered on establishing breeding populations with predictable production performance and consistent production quality to encourage farmers to produce the raw materials that the “lechon” processors require. Although native pig meat is also used to process other ethnic delicacies such as the “Etag” (fermented partially dried native pork slices) in the Cordilleras. Native pigs are also used by some ethnic groups for cultural ceremonies (as offering to the Gods). Hence specific quality requirements for these purposes are also considered in the breeding and selection process.

Significant R&D investments in Philippine native pigs development started only in 2014. The R&D program covers Philippine native pigs found in the Cordillera region, in Cagayan Valley region, in Quezon province, in the island province of Marinduque and in the province of Eastern Samar. The native pigs in these areas show wide variations in their phenotypic characteristics however, analysis to ascertain genetic uniqueness of these groups of pigs is yet to be completed.

Among the specific traits that are targeted for improvement are litter size and growth rate. In general, Philippine native pigs produce only 3-5 piglets per litter. However, a few sows studied by the project were found to produce litter size of more than 10 piglets (Fig. 5). This observation suggest the potential to increase the litter size thru selection and proper management. Selection for growth rate is also conducted to meet the “lechon” processors’ requirement of 25 to 30kg (liveweight) at 4-5 months of age.



Figure 5. Marinduke native sow with more than 10 piglets.

Current R&D on native pigs also includes topics on assisted reproduction in support of improving breeding efficiency, range production management, health care particularly on managing zoonotic diseases, marketing and distribution, which is aimed at improving marketing efficiency and ensuring income for farmers, and on enabling and regulatory policy support.

#### ISP on Philippine Native Ducks

R&D initiatives on Philippine native ducks are focused on the development of the Philippine native layer mallard called the Pateros duck. Implementation of the duck R&D in 2012 was the R&D sector’s response to the call for help by the local duck industry. Duck egg production in the Philippines, which dates way back pre-Hispanic times is aimed at producing raw materials for “balut” production. However, due to the lack of deliberate efforts for development, the industry experienced significant decline that put it at the verge collapse. Many duck egg producers stopped production due to losses caused by low productivity and high feed costs. Due to the absence of organized breeding, inbreeding is considered among the major causes of low productivity. Thus initial R&D activities were focused on breeding and selection to establish duck breeding populations with predictable egg production performance and consistent egg quality.

The R&D that was implemented in 2012 in partnership with the National Swine and Poultry R&D Center of the Bureau of Animal Industry yielded a breeding true-to-type duck population with registered trade name “Itik Pinas” (Fig. 6) The “Itik Pinas” has three variants namely “IP-Itim,” “IP-Khaki” and the “IP-Kayumanggi,” which is considered the commercial layer duck. These improved native ducks show an average of 70% egg production with about 80% of the eggs produced weighing >65 grams- the minimum weight requirement for “balut” production.

Current R&D on ducks is focused on nutrition and feeding as well as promotion for the wide-scale adoption of the “Itik Pinas” by duck egg producers. Issues on processing and product value-adding as well as on expanding the markets for “balut” and other duck products will be considered in succeeding R&D activities.



IP Itim

IP Khaki

IP Kayumanggi

### ISP on Dairy

Dairy is considered as among the most important livestock industries of many countries. However, because of the complexity of milk production, establishment of dairy farms remain challenging to many countries in the humid tropics including the Philippines. Compared to other local livestock industries the dairy industry in the Philippines is small. Thru the leadership of the Philippine Carabao Center (PCC), comprehensive R&D on dairy buffalo is being implemented. Issues on breeding and genetic improvement, animal health, feeding and nutrition, assisted reproduction, milk handling and processing and policy studies are being covered by the R&D activities of the PCC.

Directions on dairy R&D are towards application of molecular methods in breeding and selection for genetic improvement, comprehensive forage production, nutrition and feeding, biotechnology on assisted reproduction, molecular methods of disease diagnosis and health care, processing and value-adding of milk and milk products and promotion of dairy production to farmers. These R&D initiatives are aimed at ensuring sustainable milk production despite the threats of climate change.

R&D activities on dairy cattle and goat are still very limited. But development of a more comprehensive dairy R&D agenda that would cover buffaloes, cattle and goats is currently given a serious thought.

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