MAY 2022

DISCUSSION PAPER SERIES NO. 2022-19

Domestic Benchmarking of the Philippine Livestock, Dairy, and Poultry Industries

Sonny N. Domingo, Maureen Ane D. Rosellon, Pauline Joy M. Lorenzo, and Arvie Joy A. Manejar

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PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES

May 2022

Abstract

Production of livestock, poultry, and dairy are private sector-led industries contributing a third of the agricultural sector's output, despite relative neglect in terms of government support. The dual outbreak of African Swine Fever in 2019 and COVID19 pandemic in 2020 has renewed government attention to these industries, with benchmarking of domestic performance against those of global players being seen as key for designing immediate and long-term interventions.

Production volume and value, inventory, and consumption of swine and poultry decreased in 2019. Dairy maintained its increasing production, but locally-consumed milk is almost entirely imported. The bulk of local production in these industries is largely sourced from backyard operations, despite the cost advantage of commercial-size operations owing to economies of scale. Recovery from the pandemic is an opportunity to transform the industries by a process of consolidation under farmer organizations. These organizations shall serve as the main conduit for capacity augmentation, technology transfer, and delivery of regulatory and other services. This set-up promotes resilience to shocks, competitiveness against foreign-produced meat and milk, and strengthening of local institutions, while sustaining the role of the private sector in the long-term development of the industries.

Keywords: livestock, poultry, dairy, African Swine Fever, agriculture, food security

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Domestic Benchmarking of the Philippine Livestock, Dairy, and Poultry Industries

Sonny N. Domingo, Maureen Ane D. Rosellon, Pauline Joy M. Lorenzo, and Arvie Joy A. Manejar [1]

1. Introduction

1.1. Background of the study

The livestock, dairy, and poultry commodity systems are key drivers in Philippine agriculture, accounting for almost a third of the sector's output (PSA 2019). But compared to other commodities within the sector, this grouping has received limited attention and development assistance from the government with fiscal support averaging at only Php 1.18 billion or 1.6 percent of the total budget of the Department of Agriculture (DA) from 2009 to 2020. The occasional and limited livestock dispersal programs have not been sustained, and the Department of Agriculture, in large part, has not created broad-based, organized, and competitive structures within the industries.

Recent critical biosecurity concerns necessitate a closer look at supporting and reinvigorating the sector. Since its detection in August 2019, the African Swine Fever (ASF) has affected a total of 12 regions, 50 provinces, 541 cities and municipalities, sparing only the western seaboard (FAO, 2021). This resulted in 30 percent loss of swine population in swine commercial farms, and 80 percent loss in backyard forms due to poor biosecurity, zoning, and swill feeding practices (Mende 2021). At least 61,324 farmers were also affected by government-led ASF culling of 479, 584 pigs (DA Comms Group, 2021). Aggravating the situation, the COVID 19 coronavirus pandemic impacted labor mobility, and the production and transport of goods. The pandemic response came with strict travel restrictions within and between administrative regions, further constraining the farmers and traders from selling their goods.

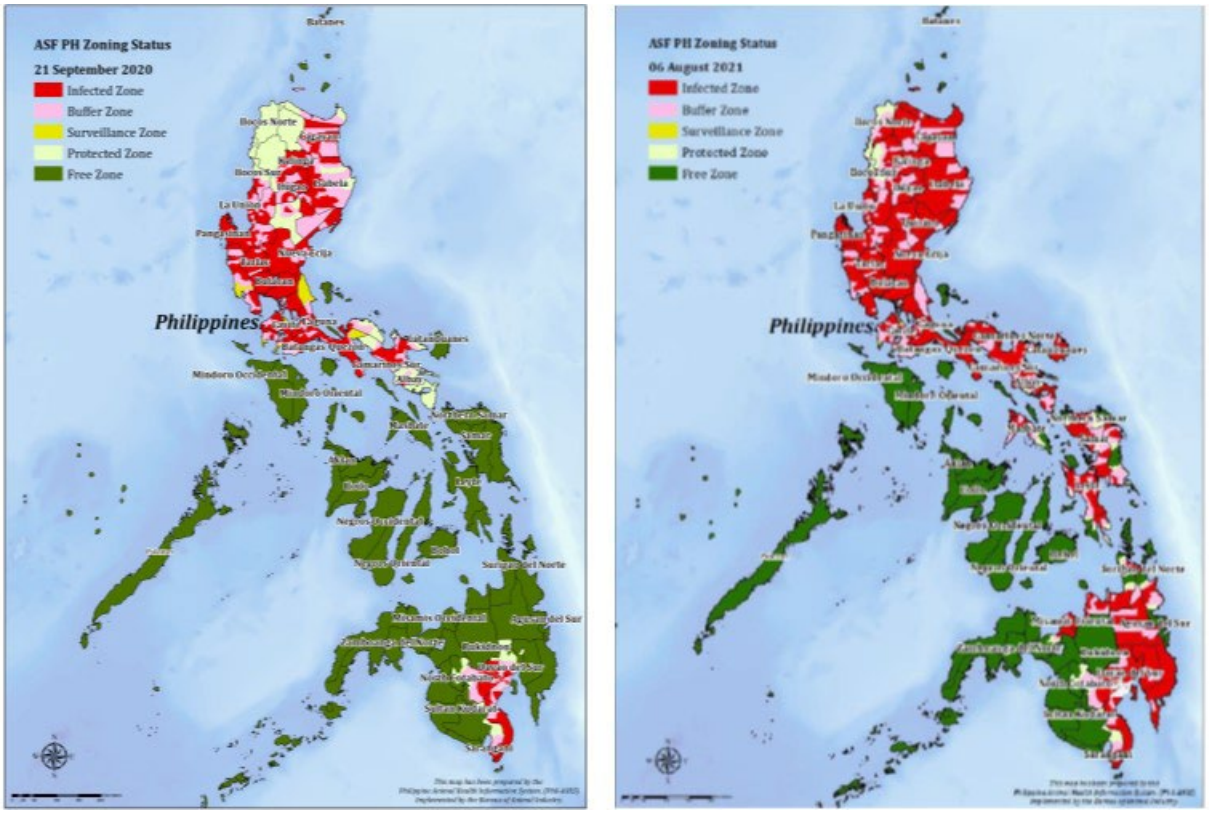
The continuing spread of ASF has resulted in a large supply deficit in the local market. According to the report given by National Economic and Development Authority (NEDA) Chief and Socioeconomic Secretary Karl Kendrick Chua last 15 April 2021 on Senate hearing on pork importation, "the shortage resulted to the spike in retail prices and pushed meat inflation from 2.9 percent in September 2020 to 19.6 percent in the first quarter of 2021" (NEDA, 2021). He further explained that meat inflation was the top contributor to the over-all inflation despite the slower inflation rate of other food items, accounting for 1.4 percentage points. This was considered high because it exceeded the rice contribution to the over-all inflation rate during 2018 at 1 percentage point.

Numerous policies were enacted at the national and subnational levels to limit the further spread of the disease. Local authorities were mandated to strictly follow the National Zoning implementation and movement plan depending on the level of ASF risks (Ocampo, 2019). DA also allocated a fund of around PHP110 million to support pig farms under the national livestock program (Adriano 2021). But based on the Bureau of Animal Industry's (BAI) monitoring map as of August 2021, the ASF virus had already reached as far as the eastern

[1] Senior Research Fellows and Research Specialists, Philippine Institute for Development Studies.
Research support is acknowledged from A/Prof. Bates Bathan, A/Prof. Nohreen Manipol, Ms. Abigail Lat, and Ms. Jennifer Padrid, University of the Philippines Los Banos.

portion of Mindanao. It has also inundated previously protected zones/provinces north of mainland Luzon (Figure 1).

Figure 1. Map of ASF zoning status: A. Sept 2020 B. Aug 2021



Source: Philippine Animal Health Information System-Bureau of Animal Industry

The ASF has heavily affected the country's top swine producing regions, particularly Central Luzon and CALABARZON, which accounted for 50% of the total commercial swine production. The same decline in commercial swine inventory has been observed in Eastern Visayas, Northern Mindanao and Davao Region. Only the regions of Western Visayas, Central Visayas, and Zamboanga Peninsula have reported an increase in hog inventory in 2020. Table 1 shows that the ASF outbreak had led to a total contraction of 27% in the commercial swine inventory in 2020.

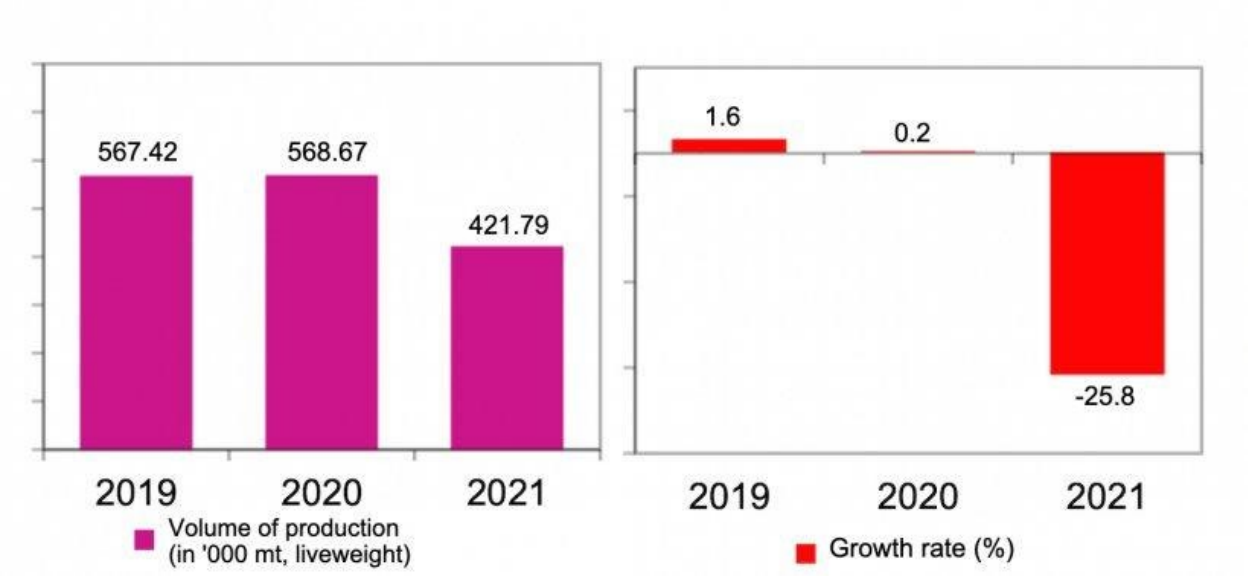
Table 1. Quarterly commercial swine inventory per region (per head), 2020.

Region	No. of heads				Change (Jan vs Oct)	% Change
	01-Jan	01-Apr	01-Jul	01-Oct		
CAR	4,092	4,083	3,665	2,295	-1,797	**-43.91**
I – Ilocos Region	156,956	133,925	119,598	97,781	-59,175	**-37.70**
II – Cagayan Valley	41,961	42,454	41,328	33,977	-7,984	**-19.03**
III – Central Luzon	1,732,234	1,432,244	859,345	738,353	-993,881	**-57.38**
IV-A CALABARZON	1,189,287	1,155,560	1,171,044	1,004,526	-184,761	**-15.54**
IV-B MIMAROPA	129,238	168,298	127,395	126,061	-3,177	**-2.46**
V – Bicol Region	130,758	111,414	94,290	83,910	-46,848	**-35.83**
VI – Western Visayas	143,875	146,623	148,242	147,679	3,804	**2.64**
VII – Central Visayas	262,454	244,012	299,190	299,052	36,598	**13.94**
VIII – Eastern Visayas	15,366	15,087	15,985	12,861	-2,505	**-16.30**
IX – Zamboanga Peninsula	17,316	20,939	21,549	22,463	5,147	**29.72**
X – Northern Mindanao	455,188	499,056	492,038	438,247	-16,941	**-3.72**
XI – Davao Region	182,720	171,328	159,332	143,099	-39,621	**-21.68**
XII – SOCCSKSARGEN	347,374	353,574	368,278	348,031	657	**0.19**
XIII – CARAGA	15,502	13,644	15,003	15,834	332	**2.14**
Philippines	**4,824,321**	**4,512,241**	**3,936,282**	**3,514,169**	**-1,310,152**	**-27.16**

Source: Lifted in full from PSA, 2020. Selected Statistics on Agriculture

The trend in 2020 continued until 2021. The decline in hog production has been reported in 12 regions in the Philippines during the first quarter of 2021, compared with levels in the same quarter of 2020. From January-March 2021, the total pork production was reported at 421.79 thousand metric tons, liveweight (PSA, 2021). This is a sharp decline of 25.8 percent compared to the first quarter of 2020 which reported 568.67 thousand metric tons, liveweight. The same report also showed that the nation's top region for pork producer, Central Luzon, plunged by 76 percent: from 112.58 thousand metric tons, liveweight in the first quarter of 2020 to only 27.19 thousand metric tons, liveweight for the first quarter of 2021. The second largest pork producer, CALARBAZON, also dropped by 50 percent. Among all regions, only MIMAROPA, Western Visayas, Central Visayas, and BARMM reported an increase in pork production for the first quarter of 2021. Moreover, the majority or 36.4 percent of the total pork production in the first quarter of 2021 came from Central Visayas, Northern Mindanao, and Western Visayas.

Figure 2. Volume of hog production and % growth rate, First Quarter 2019-2021

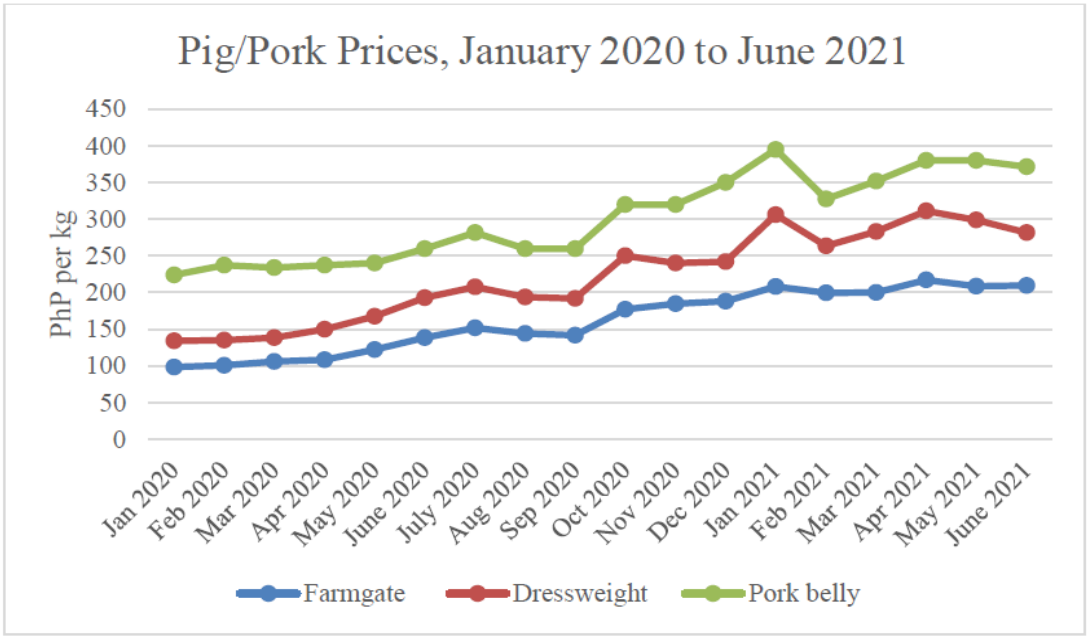


Source: PSA, 2021

Based on PSA data in Figure 2, the total hog production was estimated to be 421.79 thousand metric tons liveweight from January to March 2021, which was 25.8 percent lower compared with the same quarter of 2020 (568.67 metric tons liveweight).

The sudden reduction in local pork production has caused a drastic increase in the prices of pig/pork as depicted in Figure 3. It is also good to note that the choice cuts were priced twice as the farmgate prices. In turn, this has prompted the government to intervene not only to control the spread of ASF but also to stabilize pork prices, one of which is pork importation.

Figure 3. Pig /Pork prices from January 2020 to June 2021

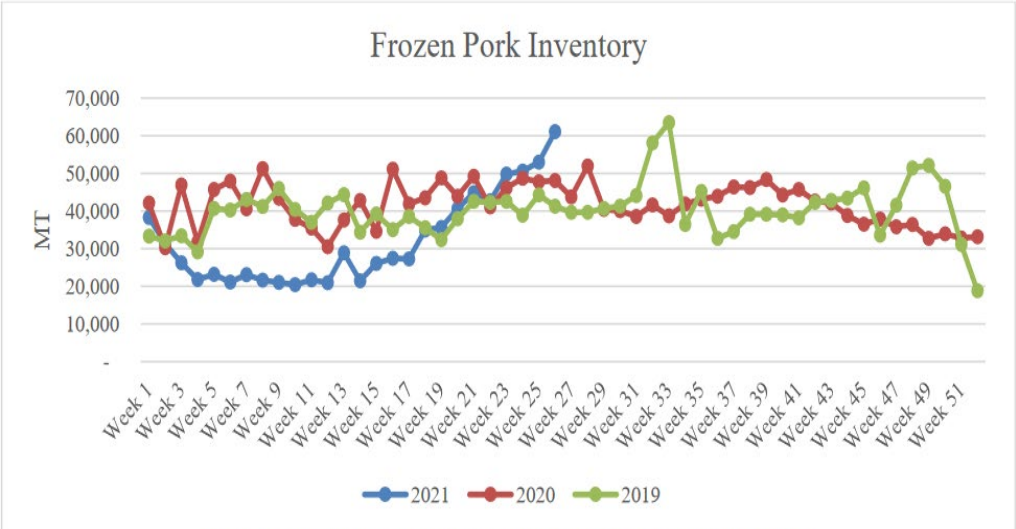


Source: DA-AMAS (Metro Manila wholesale and retail prices); ProPork (farm gate prices)

Source of figure: USDA-FAS, 2021

In answer to the lack of local pork supply, an increasing trend in the inventories of frozen pork in accredited cold storages has been noted from 2019 to 2021 (Figure 4).

Figure 4. Weekly frozen pork inventory from 2019-2021



Source: Department of Agriculture-National Meat Inspection Service

Source of figure: USDA-FAS, 2021

Economic gains from the sectors' growth potential must be tapped, even amid current challenges. Thornton (2010) described the livestock sectors across developing countries as undergoing rapid evolution due to increasing population and economic strength, together with increased purchasing power and demand.

The PIDS, as the government's primary socio-economic policy think tank, was commissioned by the National Economic and Development Authority (NEDA) to benchmark the competitiveness of the Philippine livestock (including dairy) and poultry sector vis-a-vis selected Association of Southeast Asian Nations (ASEAN) countries, based on policy and industry performance, among others. The study covers swine, chicken (broiler and layer), and dairy (carabao and cattle). The outputs of this study may be used to inform legislative action and guide to program interventions to accelerate sector development.

1.2. Objectives

The study generally aims to benchmark the Philippine livestock, poultry, and dairy industries (i.e. hogs, chicken, cattle, and carabao), based on parameters including productivity levels, cost production and structure, among others.

The study covers a comparative analysis broken down into the following:

a. Cost and return structure of Philippine livestock, poultry, and dairy (cattle and carabao) production, by province and by farm type (i.e. commercial and backyard);
b. Determination of comparative advantage in livestock, poultry, and dairy production of Philippine provinces;
c. Livestock/poultry/dairy production management and marketing practices in the Philippines, commercial versus backyard; and
d. Identification and analysis of key enabling policies to strengthen/further develop the Philippine livestock, poultry, and dairy sector.

1.3. Methodology

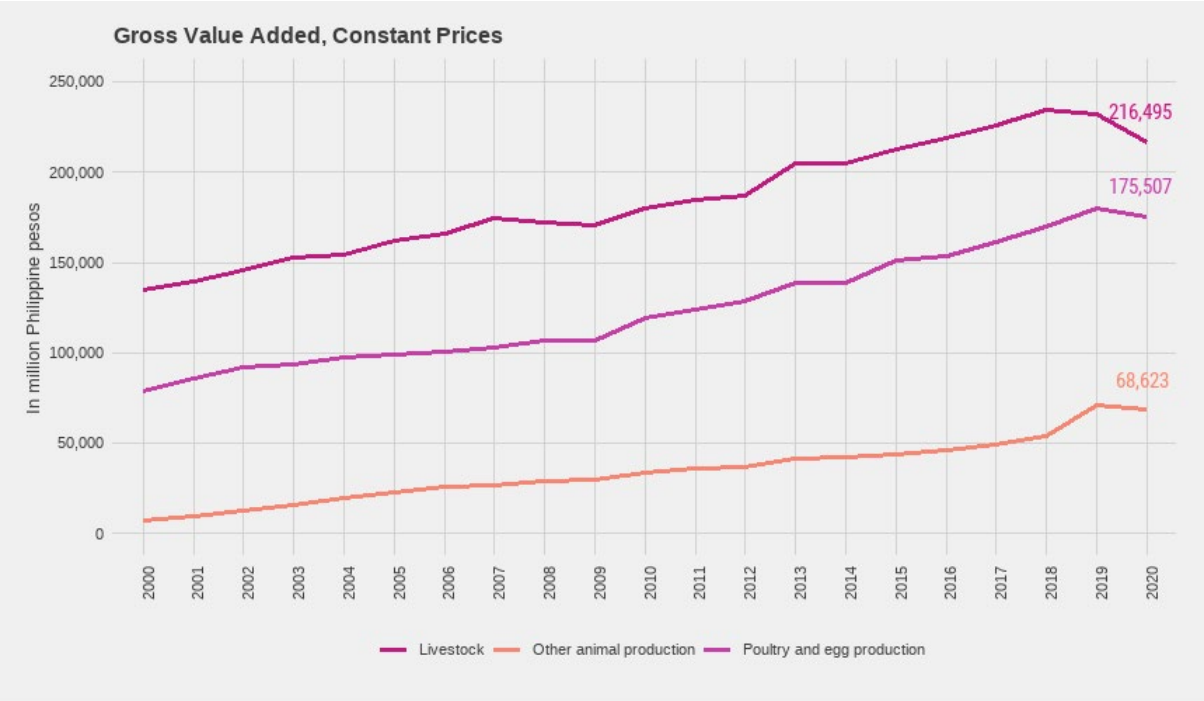
The data collection for this study took on a two-pronged approach. Primary data were gathered through key informant interviews and focus group discussions with key industry players in both commercial and backyard farms. These were led and facilitated by contracted consultants from the University of the Philippines Los Banos (UPLB).

Literature review filled in the secondary qualitative data, detailing the (a) historical performance of the livestock, poultry and dairy industry; (b) farm management practices of local producers; (c) cost of material inputs, land rental, labor, etc.; (d) interventions provided by the government to producers/raisers; and (e) existing policies, and other relevant documents/issuance relevant to livestock, poultry and dairy industries, among others. Relevant secondary data (e.g. prices, volume of production) were also collected across provinces and farms.

2. Industry profiles

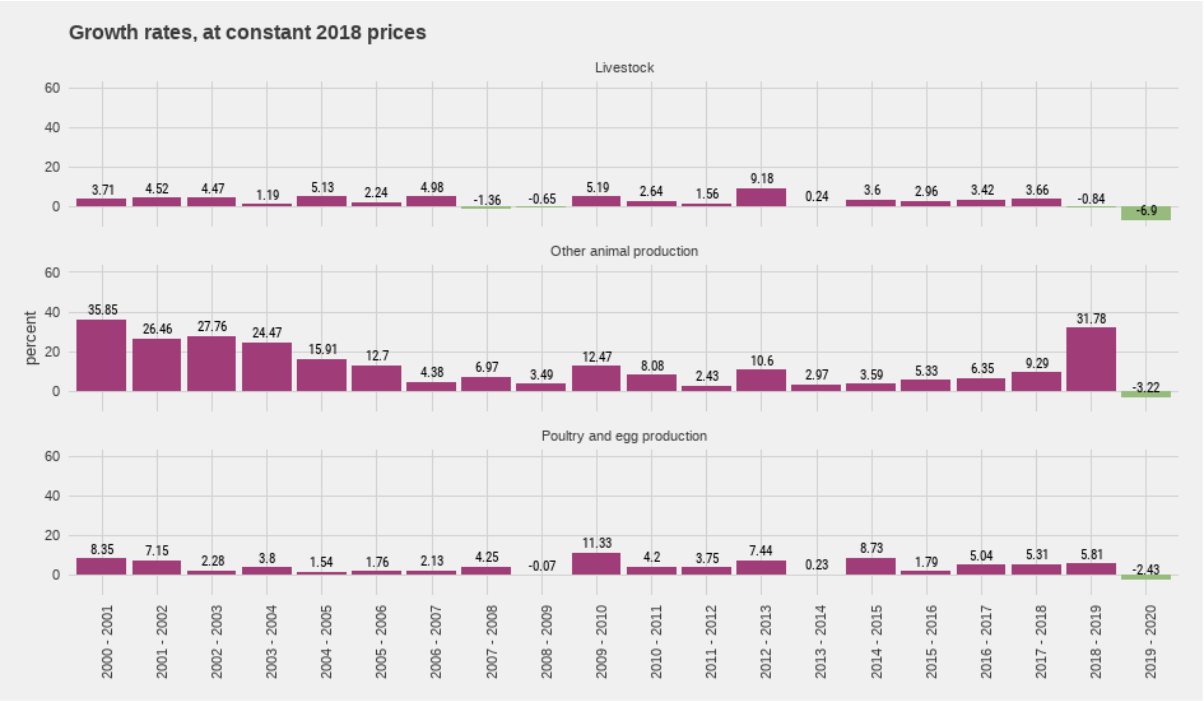
Throughout the years, the livestock and poultry sectors exhibited an increasing trend until 2019 and 2020 where it encountered contractions, the biggest of which were felt by livestock with a drop of -6.9 percent. This was followed by other animal production (e.g. goat, duck) at -3.2 percent, and poultry and egg production at -2.4 percent (Figure 5 & 6).

Figure 5. Gross value addition at constant 2018 prices



Source: PSA, 2021

Figure 6. Growth rates at constant 2018 prices



Source: PSA, 2021

2.1. Swine Industry

2.1.1. Overview of the industry

The Philippine Swine Industry is a PHP 200-billion industry (USD 5 billion) and is considered as the largest among the livestock subsectors and second contributor to Philippine agriculture, next to rice. In 2019, the country ranked 7th among the top pork producing countries in the world, with 1.71 million metric tons. China was the top producing country, with 54.76 million metric tons in the same year, registering a 1.3 percent increase compared to 2018. The United States, Brazil and Russia ranked second, third and 4th respectively. Vietnam, on the other hand, ranked 5th with 2.90 million metric tons, registering a 3.3 percent increase year on year in production since 2014 (NationMaster 2021). In 2015, the number of registered hog farms was 437, which employed 11,699 workers, 11,620 of which were paid.

The species of swine commonly used in the country were the following: Landrace, Large White/Yorkshire Duroc, Pietrain, Hampshire, Berkshire, and synthetic or Hybrids (Agbisit, & Bantoc, 2004). Maintaining and developing genetic competence of hogs is important in improving quantity and quality of produce, production efficiency, and even aesthetic value of the animals. There are varying modern breeding technologies being practiced in swine farms abroad, especially in the US, not to mention other research, like nuclear cloning, which are continuously being done. Examples of this would be Artificial Insemination (AI), Multiple Ovulation and Embryo Transfer (MOET) technology, Sexing Semen and In Vitro Fertilization. These modern means of animal reproduction have been substituting conventional natural breeding for several years. Moreover, these breeding technologies were cited to increase the reproductive rate of females and the quality of progeny (Bondoc et al. 2013).

Farm Practices

To produce productive pigs, they should be grown in a temperature-neutral environment where they prevent using feed energy to regulate their temperature (Ikani, et al.,, n.d.). In fact, there are existing guidelines from Agricultural Machinery Testing and Evaluation Center or AMTEC in constructing roof, flooring, and appropriate pen size (AMTEC 2001).

Swine production systems can be classified into three: sow-herd, growing-finishing enterprise, and boar-for-hire enterprise.

Sow-herd enterprises are those farms that take care of sows to produce piglets or sell live hogs. This type of enterprise can be further categorized into three: farrow-feeder, farrow to finish, and farrow to breeder operations. Farrow to feeder operation starts with a gestating gilt or sow to produce pigs or weanlings which will then be marketed to other hog raisers or to growing and finishing operators (Agbisit, & Bantoc, 2004). A farrow to finish enterprise operates from keeping a sow-herd and produces finishers. This type of operation feeds the offspring until they reach a specified market weight of 90 kg to 100 kg. The entire production period takes 10 to 11 months, with four months for breeding and gestation, plus six to seven months to raise the litter to market weight (Ikani, et al. n.d.). Lastly, farrow to breeder operation gets going with a sow-herd and will then produce breeder stocks, purposely raising junior boars and replacement gilts which will either be used for their own operation as well or be sold to other breeder farms (Ikani, et al. n.d.).

Growing-finishing enterprises begin with piglets, either weaners or growers, which will be fed and fattened until they reach slaughter weight of 95 kg, on the average. This type of

operation requires relatively high capital requirement, but the rate of capital turnover is faster than the sow-herd enterprises (Agbisit, & Bantoc, 2004). Operating on a growing-finishing system usually starts with 10-15 kg weaners and would take four to five months to rear until marketable size.

Lastly, the swine production that focused on raising and training young boars until sexual maturity or breeder age is known as boar-for-hire enterprise. Hogs bred from these operations were usually used as farm gilts or sows for a set fee depending on the hogs' quality and ability to produce superior progeny (Agbisit, & Bantoc, 2004).

Feeding rations vary across different stages of growth to ensure productive animals. A simplified ration should always contain sufficient carbohydrates, protein, vitamins, and minerals to provide necessary nutrients for the animals. Some of the c
ommon ingredients of hog feed would be corn and corn by-products, cassava, soya, coconut oil, molasses, discards from slaughterhouses, etc. In terms of feeding practices, dry feeding is usually done in commercial operations to save on labor and feeding equipment costs, while backyard raisers practice wet feeding. Most of the time, the feed ration given to the animals is controlled, but drinking water is always provided.

The swine industry is predominantly backyard farmers, as defined in Table 2. About 90 percent of producers in the country are not commercial in size (Manipol et al. 2014).

Table 2. Definition of swine farms in the Philippines

Scale	Number of sow	Characteristics and players
Backyard farms	Any farm/household raising any of the following conditions a. 1-20 head of adult and zero young; b. 1-40 head of young animals; or c. 1-9 head of adult and 1-21 head of young animals	Operations done in the vicinity of residences and properties
Commercial farm	Satisfies at least one of the following conditions: a. At least 21 head of adult and zero young b. At least 41 head of young animals; and/or c. At least 10 head of adult and 22 head of young animals	Employing modernized methods of farming

Source: PSA, 2018

Figure 7 maps the value chain consisting of identification of the main actors of the chain as well as their corresponding activities that are essential in transforming agricultural inputs to outputs for consumers. The activities involved in swine production include input provision, production, processing distribution and consumption.

For the input provision, procurement of quality stocks is essential. Commercial swine farms may have their own breeder farms or may source their stocks from other breeder farms and importers of breeds. Most of the commercial swine farms use hybrids. Feed millers are also essential as they provide feeds for the hogs. The certified feed mills in the country that conform to international standards include CJ Philippines, Agrispecialist Inc, Philippine

Foremost Milling Corp, Limcoma Multipurpose Cooperative, Santeh Feeds Corp, Pilmico Foods Corp, Sorosoro Ibaba Development Cooperative and Sunjin Philippines Corp. Commercial farms may have their own feed mills to minimize cost of production and to gain control of the quality of feeds. Veterinary services are also essential, particularly in executing artificial insemination, as well as crafting vaccination programs and herd health management in commercial swine farms. Provision of appropriate machines, equipment and housing facilities are also crucial in commercial swine production. Rearing the animals from birth to marketable age would require labor (farm workers).

Apart from commercial farms growing their own stocks, they can also opt to choose contract grower arrangement. In this scenario, the commercial farms would provide inputs of production and ensure the contract grower's market for its hogs and offer a competitive payment scheme. Furthermore, cooperatives with large asset size may also have the financial capacity to engage in commercial swine production.

Ready-to-market hogs may be sold to agents, wholesalers or integrators for slaughtering which will be distributed to retailers and distributors. Meat can also be sold to manufacturers/processors for further processing. Consumers consist of institutional buyers (hotels, restaurants, supermarkets, schools, and hospitals) and household consumers.

The support services that may be provided by the government, private sectors and NGOs can help develop the swine industry in the Philippines, such as research and development, technology, finance, cold chain, logistics, technical/business advisory services, packaging, and other marketing services. On the other hand, the enabling environment consists of the key institutional policies influencing the chain dynamics and actor behavior. These include product quality and safety standards, certification, regulatory policies, export and import regulations, and trade agreements.

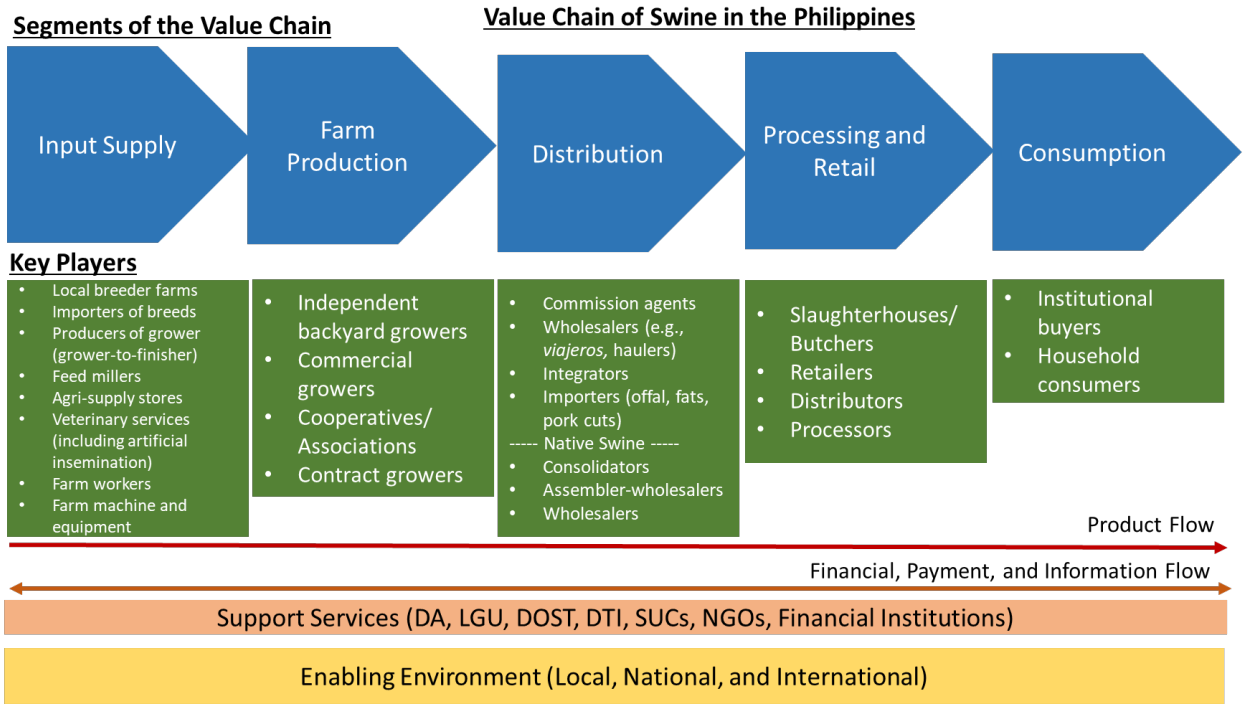
In terms of market share in 2014 (i.e., percentage of the volume of production or total inventory of each player to the total volume of production or inventory in the Philippines), the four major producers of pork in the Philippines were San Miguel Foods, Inc. (2.90%), Universal Robina Corporation (1.42%), Foremost Farms (1.10%), and Cavite Pig City (0.58%) (Gordoncillo et al. 2019). This relatively low market share suggests that the swine industry has many independent swine farms, which are mostly backyard, supplying the pork requirements of the domestic market.

San Miguel Foods (SMF), Universal Robina Corporation (URC), Sorosoro Ibaba Development Cooperative (SIDC), and LIMCOMA Multiple Purpose Cooperative are examples of key players with vertically integrated operations. For example, the SMF operates hog farms and serves as retailers of meat products under Purefoods and Monterey brands (Miraflor 2021). URC, on the other hand, is engaged in producing and distributing animal feeds and health products aside from hog and poultry production (Universal Robina Corporation 2019).

Some cooperatives in the country also exhibit commercial-like operations. SIDC operations include feed milling, contract growing, and veterinary products. LIMCOMA provides feed quality and testing control through its feed milling quality control laboratory, diagnostic laboratory through its multipurpose laboratory, artificial insemination services, and a credit line of 30 days for feeds. It also serves as an input supplier to its hog raiser members as

well as other hog growers, and a meat processor which sources hog supply from its members (Baconguis 2007).

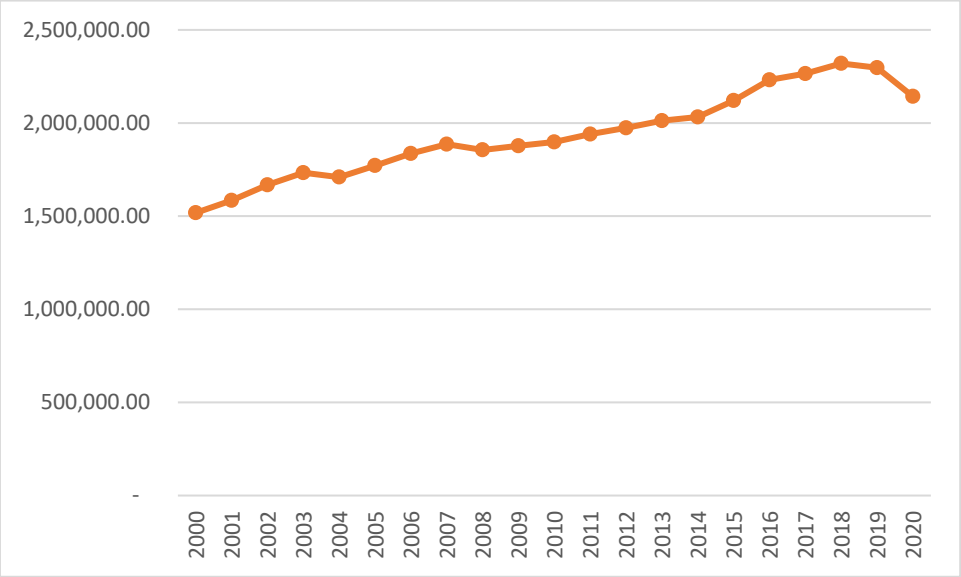
Figure 7. Philippine swine value chain



Source: Key informant interviews, industry specialists (2021)

2.1.2. Production, inventory, and trends

Figure 8. Volume production, tons, 2000-2020

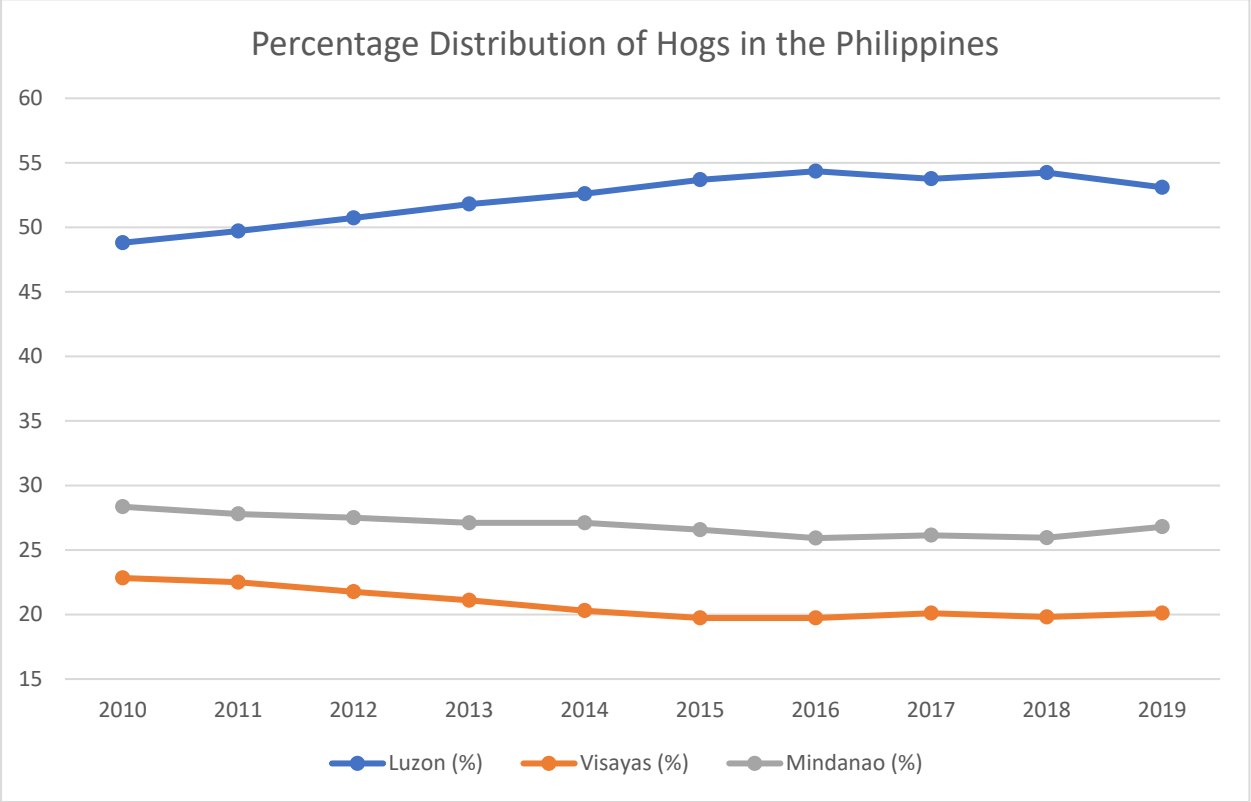


Source: PSA

Figure 8 shows an increasing trend in volume produced from 2000 until 2018 before it dropped in 2019 and 2020. The volume of pork produced in the Philippines in January 2021 was approximately 1.4 million metric tons, while the total domestic consumption of pork reached 1.5 metric tons (Statistica Research Department, 2021).

Figure 9 shows that Luzon dominated swine production from 2010-2019, contributing an average of 52.2 percent of the total hog production in the country for the 10-year period. Meanwhile, Visayas contributed an average of 20.8 percent, followed by Mindanao with 26.9 percent. The percentage of hog production in Luzon declined from 2018 to 2019, with 54.2 percent and 53.1 percent contribution, respectively. On the other hand, the percentage contribution of swine production in Visayas and Mindanao increased from 2018 to 2019, with Visayas contributing 19.8 percent to 20.1 percent in 2018 and 2019, respectively. While Mindanao contributed 25.9 percent and 26.8 percent, respectively.

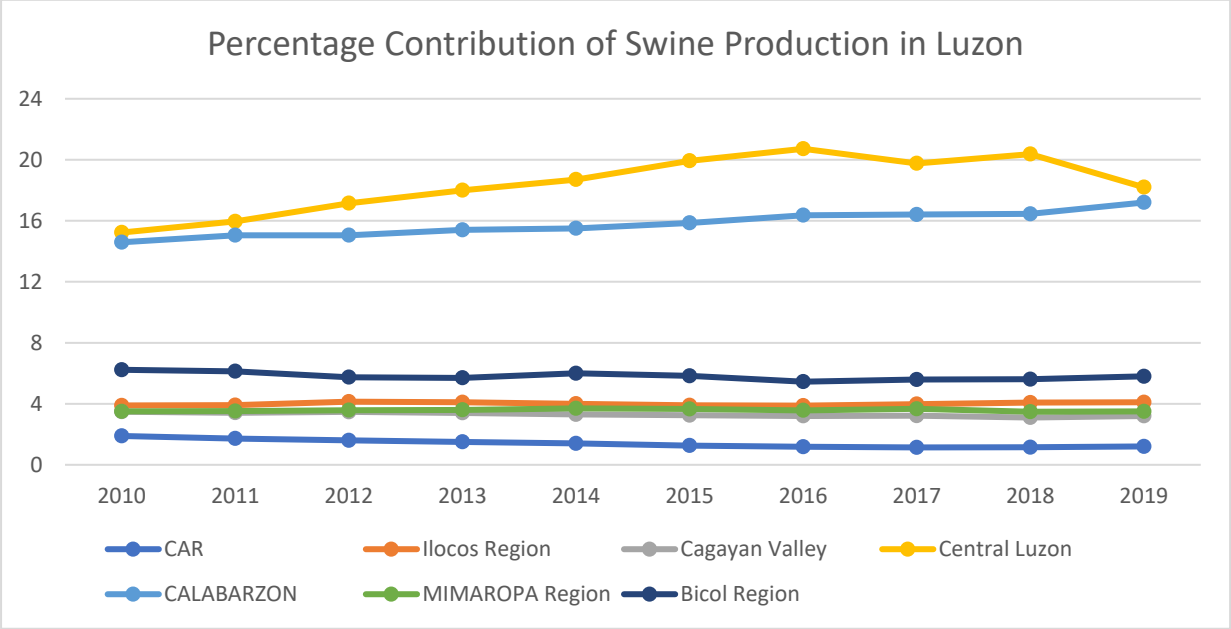
Figure 9. Percentage distribution of hogs in the Philippines 2010-19



Source: PSA, 2010-2019

From 2010-2019, the top producing regions in Luzon for swine were Central Luzon, CALABARZON and Bicol region, with an average production of 18.4 percent, 15.8 percent and 5.8 percent, respectively, as presented in Figure 10.

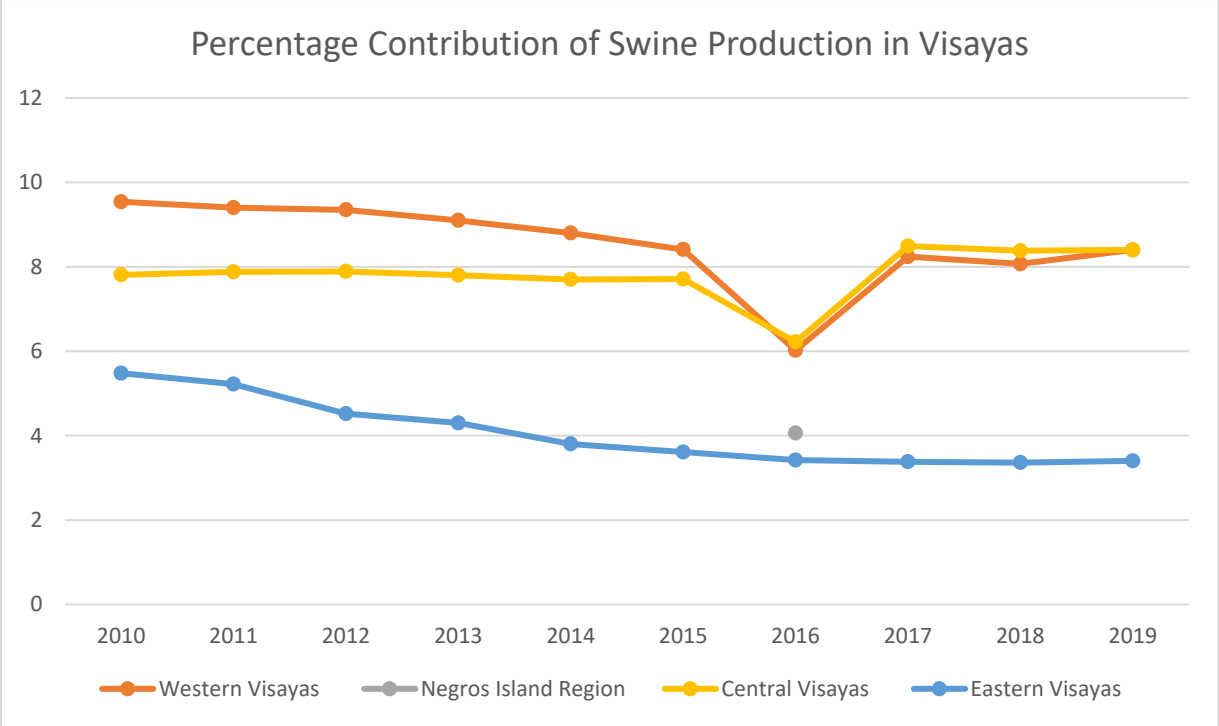
Figure 10. Swine production in Luzon 2010-19



Source: PSA, 2010-2020

Figure 11 describes the top three regions in Visayas with the highest swine production contribution: Western Visayas had an average of 8.5 percent production, followed by Central Visayas with 7.8 percent and Eastern Visayas with 4.1 percent.

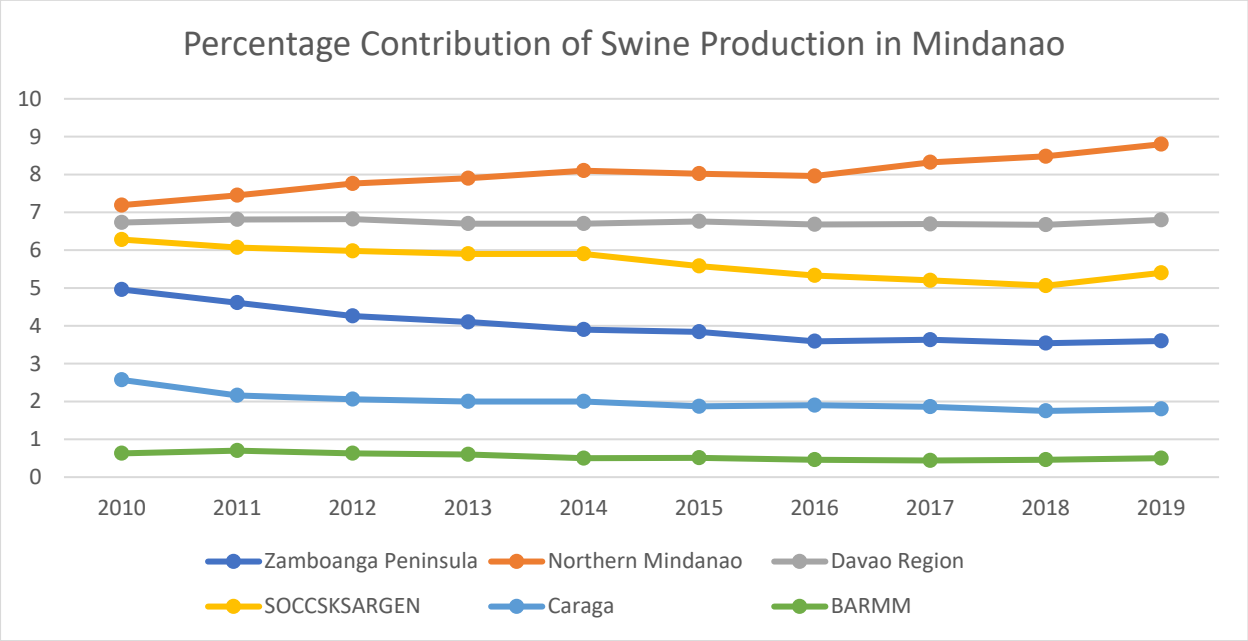
Figure 11. Swine production in Visayas 2010-2019



Source: PSA, 2010-2020

In the case of Mindanao, the top three producing Regions from 2010-2019 were Northern Mindanao with an average production of 8.0 percent, followed by Davao Region with 6.74 percent, and SOCCKSARGEN with 5.67 percent (Figure 12).

Figure 12. Swine production in Mindanao 2010-19

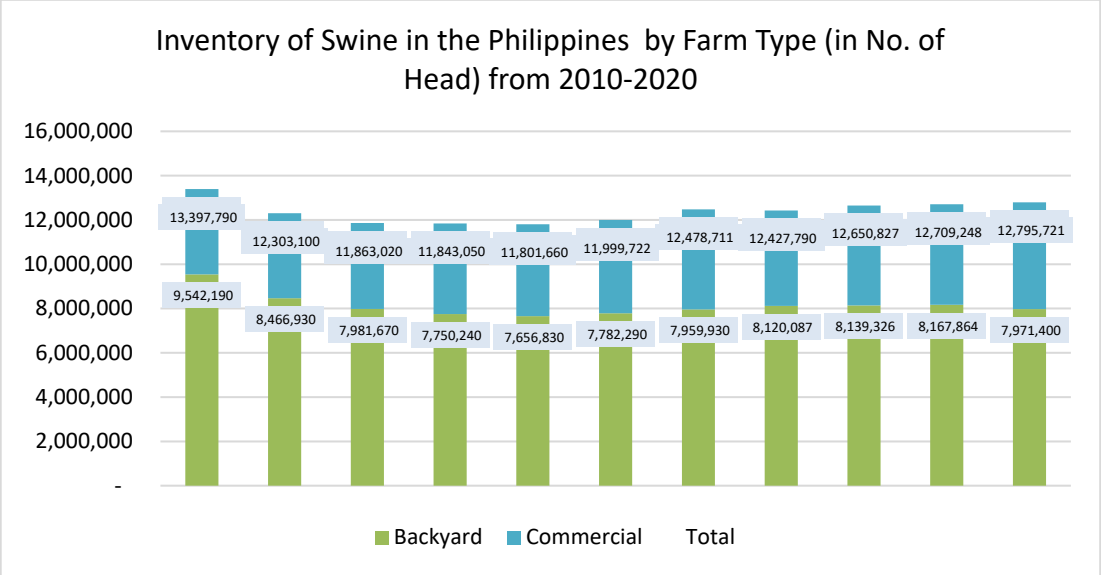


Source: PSA, 2010-2020

Figure 13 presents the inventory of swine in the Philippines by farm type. Backyard production dominates the swine inventory in the country, accounting for 64.3 percent of the total production in 2020, while commercial farms comprised 37.7 percent of the total production in the country in the same year. On average, the backyard swine production comprised 65.7 percent while commercial swine production comprised 34.3 percent of the total swine production in the Philippines from 2010-2020.

Furthermore, there was a 2.41 percent decline in backyard swine production from 2019-2020 (196,464 head). In contrast, there was an increase of 6.2 percent in commercial swine production from 2019-2020 (282,937 head). Overall, there was a 0.7 percent decrease in the total swine inventory in the country from 2019-2020.

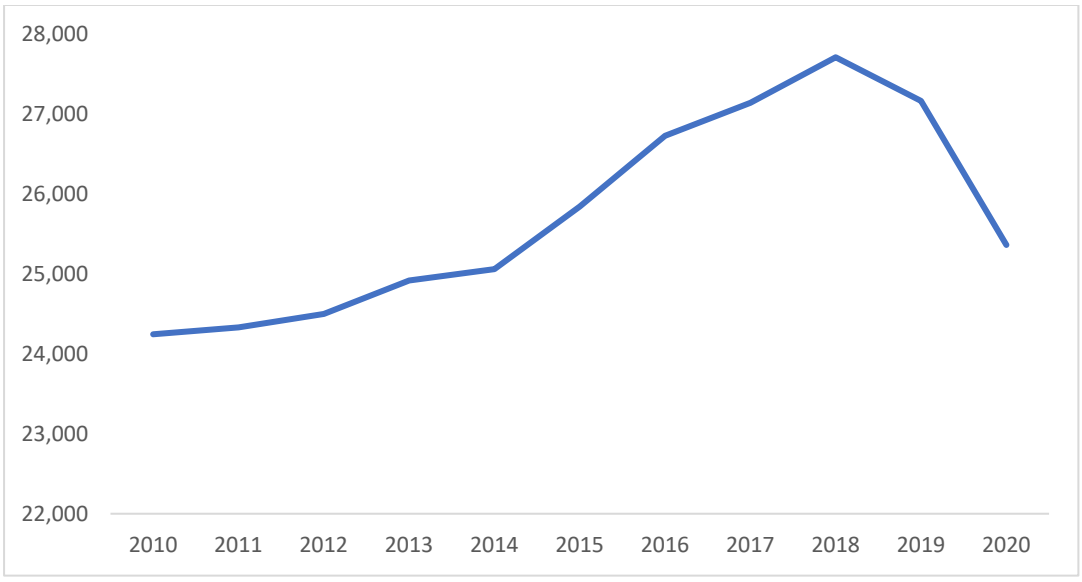
Figure 13. Inventory of swine by farm type from 2010-2020



Source: PSA, 2010-2020

The number of hogs slaughtered in the Philippines showed an increasing trend from 2010 to 2018, with the latter recording 27,712,985 head as shown in Figure 14. However, from 2018-2019, there was a 2.0 percent decrease in the number of hogs slaughtered. Moreover, a 6.6 percent decline in the number of hogs slaughtered was recorded between 2019 and 2020. The number of hogs slaughtered for these years decreased from 27,167,256 to 25,363,010 head, respectively.

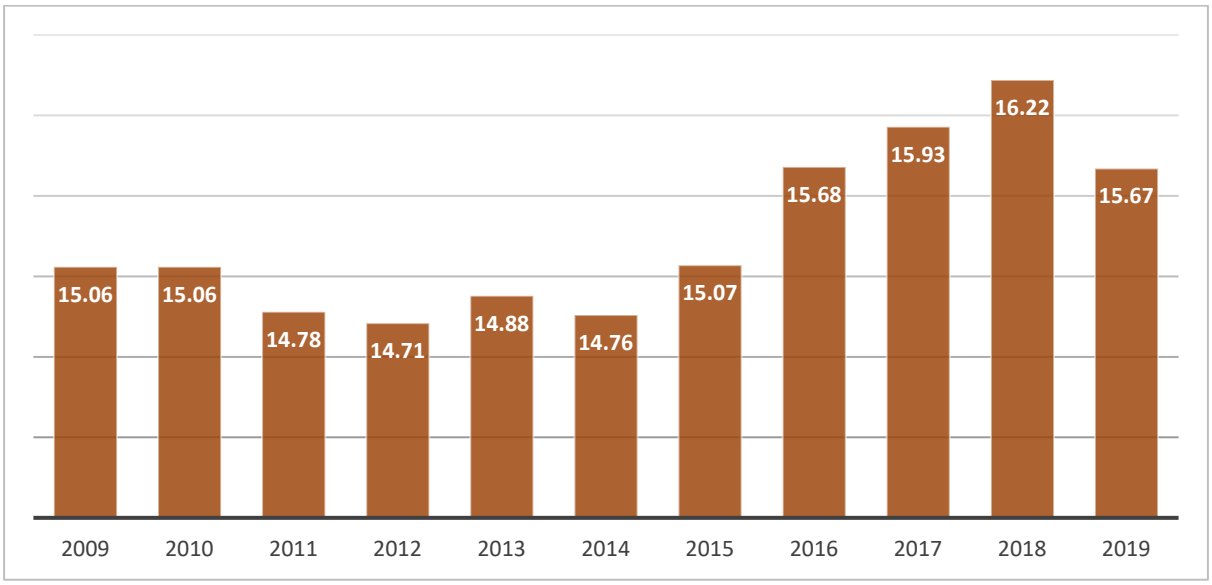
Figure 14. Number of slaughtered in the Philippines from 2010-2020 ('000 Head)



Source: PSA, 2010-2020

2.1.3. Consumption trends

Figure 15. Pork annual per capita consumption 2009-2019 (kg/year)

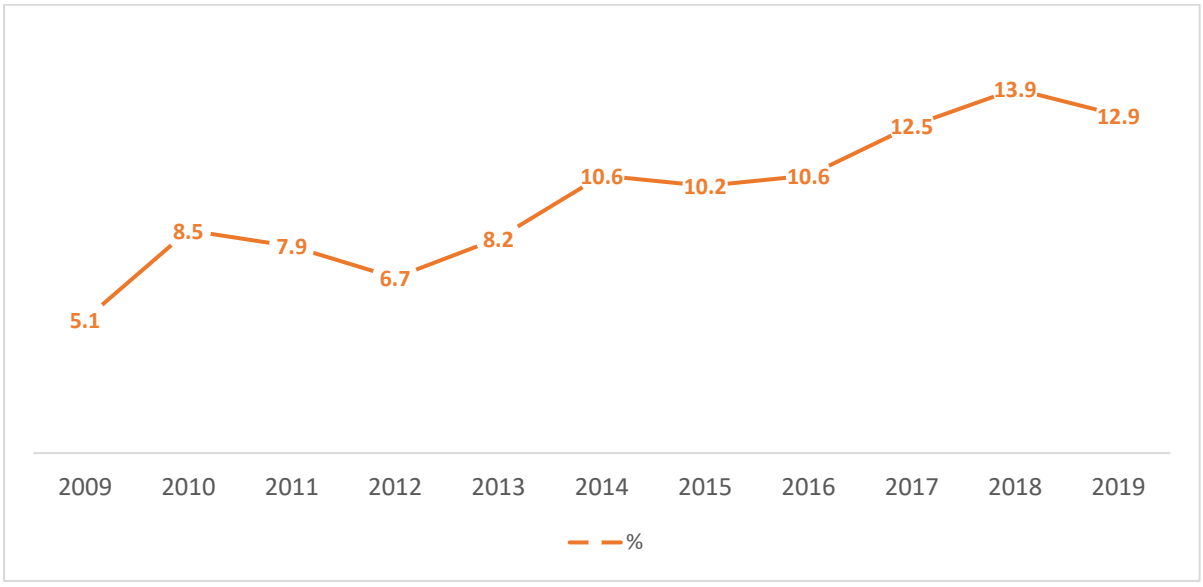


Source: PSA Open Stat, 2009-2019

Figure 15 describes the annual per capita consumption from 2009-2019. There has been an increasing trend since 2014 but it dropped in 2019. On average, the annual per capita consumption of carcass and offal was 14.93 and 3.78 kg, which increased by 0.64 and 2.59 percent, respectively for the period 2000-2019.

2.1.4. Trade trends

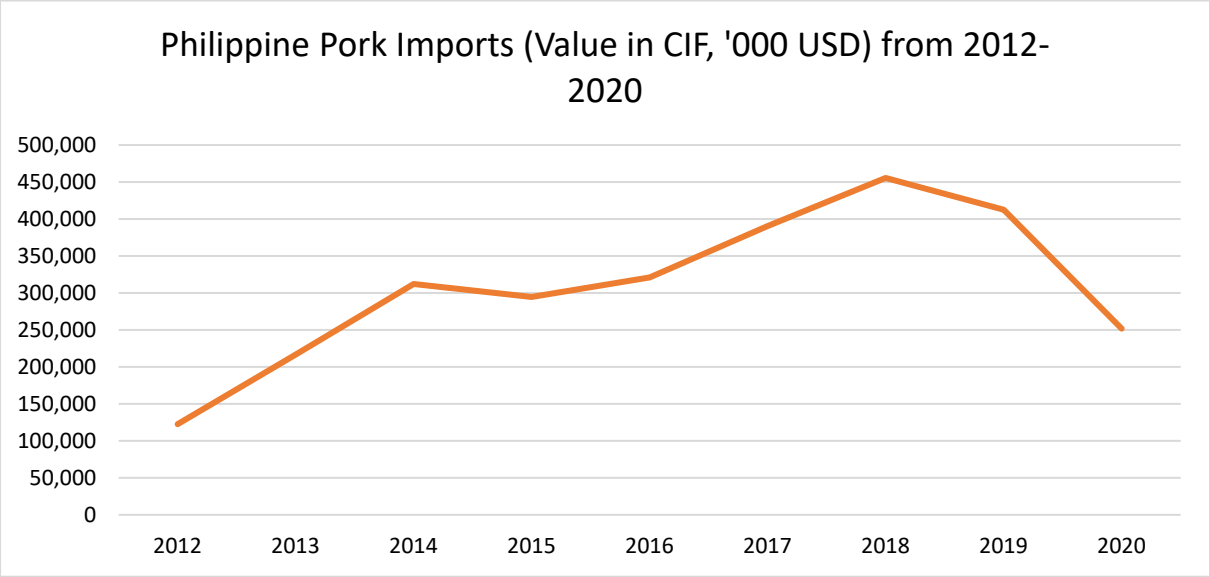
Figure 16. Import dependency ratio of pork



Source: PSA, 2009-2019

The value of Philippine pork imports showed an increasing trend from 2012-2018. In 2018, the CIF value was USD 455,496,000 (Figure 17). The value decreased in 2019 and 2020, with USD 413,589,000 and USD 251,699,000, respectively.

Figure 17. Philippine pork imports (Value in CIF, USD) from 2012-2020

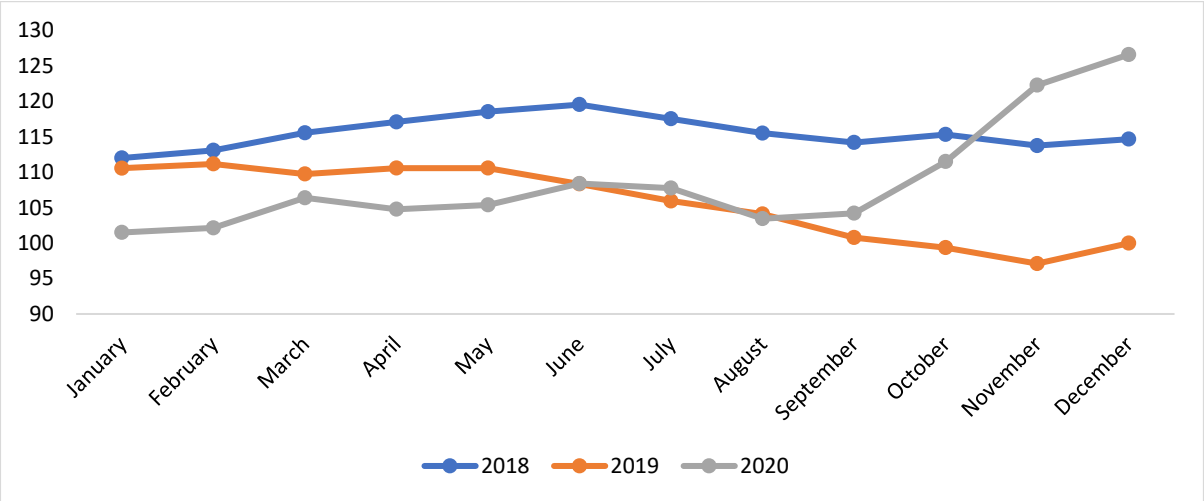


Sources: PSA, 2012-2020

2.1.5. Other relevant data

The farmgate price of pork continues to increase throughout the years. Figure 18 shows that values in 2018 and 2019 follow a similar trend except that the farmgate prices are lower in the latter year. Year 2020 showed a reversal of trends starting as early as March 2020 and even exceeding 2018 prices in November and December. In fact, the farmgate prices in December 2020 almost reached PHP 130/kg liveweight compared to PHP 115/kg liveweight in the same month in 2018.

Figure 18. Monthly average farmgate prices of hogs upgraded for slaughter (per kg liveweight), 2018-2020



Sources: PSA, 2018-2020

Table 3 shows the regional differences in farmgate prices due to varying prices of feeds and other farm inputs. Uniquely, it can also be observed that commercial farms tend to have higher farmgate prices compared to the backyard farms. It is also good to note that farmgate prices tend to be lower in Visayas and Mindanao regions, compared to the Luzon prices where the top producing regions, Central Luzon and CALABARZON are situated.

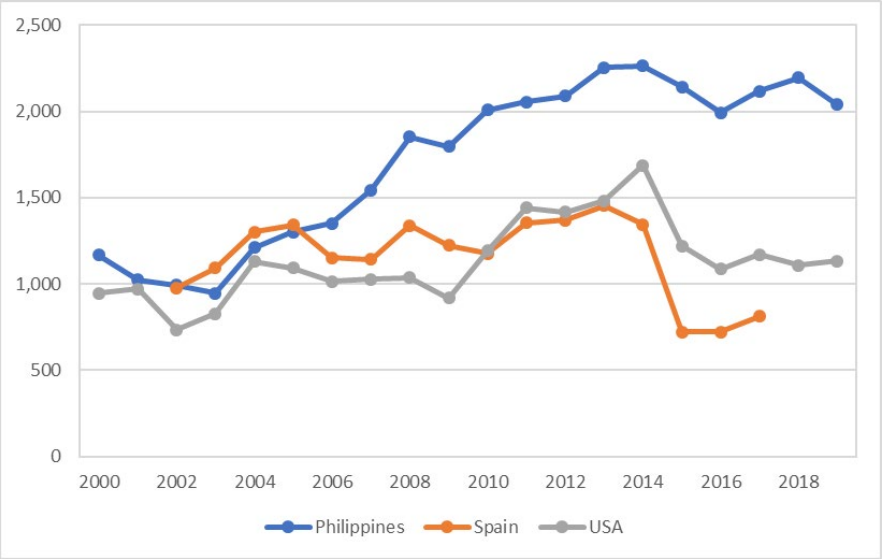
Table 3. Regional farmgate prices (peso per kg) of hog upgraded for slaughter for backyard and commercial farms 2016-2020

REGION	2016		2017		2018		2019		2020	
	Comm	Backyard	Comm	Backyard	Comm	Backyard	Comm	Backyard	Comm	Backyard
CAR	103.28	104.30	116.16	112.19	124.04	122.95	120.22	117.52	131.89	125.71
ILOCOS	106.60	103.42	120.82	116.83	125.26	122.79	118.32	115.95	133.76	129.88
CAGAYAN VALLEY	100.37	97.26	120.10	114.32	126.76	122.39	114.99	114.13	118.70	117.10
CENTRAL LUZON	107.54	100.91	123.54	116.84	127.55	121.64	110.05	109.99	149.07	137.54
CALABARZON	107.01	100.58	125.48	116.60	127.75	118.91	111.31	105.25	142.40	122.86
MIMAROPA	103.06	96.58	109.90	107.71	106.86	110.50	94.10	97.85	106.87	105.40
BICOL	105.96	94.64	122.36	106.96	132.42	116.78	110.97	101.36	113.86	105.13
W. VISAYAS	94.08	84.02	110.43	109.77	118.15	122.97	105.73	100.49	106.05	103.55
C. VISAYAS	100.15	98.21	113.92	105.12	123.77	118.93	113.27	116.44	110.97	110.03
E. VISAYAS	103.51	105.39	113.51	108.50	124.06	118.85	120.19	113.88	120.86	113.68
ZAMBOANGA PENINSULA	98.40	91.61	105.40	95.02	115.38	107.61	107.06	98.97	105.15	94.08
N. MINDANAO	96.76	93.14	107.36	101.23	112.05	108.40	114.70	103.44	108.97	97.26
DAVAO	97.86	91.24	113.01	100.06	116.62	106.75	104.09	99.88	109.09	106.91
SOCCSKSARGEN	90.99	84.69	108.30	97.66	115.70	105.37	101.98	92.85	108.23	95.22
CARAGA)	99.97	95.41	108.01	99.56	119.63	107.85	114.60	106.97	112.40	103.18
ARMM	..	80.54	..	92.43	..	101.57	..	106.40	..	113.34

Source: PSA OpenStat 2016-2020 Note: [..] Data not available

Figure 19 plots the liveweight prices of the country vis-a-vis the top hog producers in the world. The country's price started its increasing trend in early 2000s, and the gap between the prices from the top hog producers continued to widen.

Figure 19. Producer prices, pig (liveweight), USD per ton



Sources: FAO 2021

2.2. Chicken (broiler and layer) industry

2.2.1. Overview of the industry

Chicken industry is divided into two categories: broiler which is reared for meat production and layer which is for egg production. There is also another classification of native/improved type which can be raised for both meat and some eggs. This study focuses more on the broiler and layer categories.

Production scale can be identified as backyard/smallholder and commercial farms with large differences in terms of number of birds raised, technology level, and feeds procurement (Table 4). Backyard farms are owner-operated and they outsource their supply of feeds compared to commercial farms which produce their own. Chicken are housed in small units or allowed to freely range. Not all growers are registered with the local governments. Meanwhile, commercial farms usually comply with all documentary requirements and are up-to-date with technology. Producers in this scale venture into two other types of value chain – one with an integrator and one with non-integrator or independent grower.

The broiler industry, in particular, is estimated to be composed of 80 percent commercial farms and 20 percent backyard farms (USDA-FAS 2020). Major chicken commercial farms are mostly located in CALABARZON and Central Luzon in the Luzon Island with major growing areas in Bulacan, Nueva Ecija, Pampanga, Tarlac, Batangas, and Rizal (Gonzales et al 2012; USDA-FAS 2020). For Visayas, these are located in Iloilo, Cebu, and Leyte while for Mindanao, production zones were in Cagayan De Oro, and Bukidnon (growing area for layer in Northern Mindanao). Some of the major commercial and integrated players in the industry include San Miguel Food and Beverage, Inc., Bounty Fresh Group, Foster Foods, Inc., and Vitarich Corporation.

Table 4. Farm characteristics for poultry

Scale	Number of birds	Characteristics and players
Backyard/ Small-hold	Less than 500 layers or 1,000 broiler chicken; or less than 100 layers and 100 broilers if raised in combination	Owner-operated; buys feeds; small house or free-range; may be registered with the LGU
Commercial farm	At least 500 layers or 1,000 broiler chicken, or, at least 100 layers and 100 broilers if raised in combination	With farm records & business papers; practices modern technology Non-integrator – Buys day-old-chicks and feeds, with some feed mixing Integrator/Large farm – Imports grandparent and parent stocks; with breeder farm, feed mill; sell feeds and breeder stocks

Source: Lifted in full from PSA (2020); Gonzales et al (2012)

Farm practices

The broiler and layer industries require good quality chicks, proper housing, brooding area, light, ventilation, adequate feeds, and disease prevention and control to ensure productivity and profitability. Criteria for selection of stocks include performance, adaptability and availability of stocks, and reliability of suppliers (The Broiler Production Committee 2006). Performance is determined by the genetic make-up of the breeder strain based on their production traits, growth rate and feed efficiency.[2]

Housing in most local poultry farms are of the conventional type which is made from wood, (including bamboo slats, net, for backyard farms), and galvanized iron (GI) sheets for roofing (also aluminum and poly-vinyl carbonate or PVC for commercial farms), while difference may be found in the ventilation system used, e.g. tunnel vent particularly for commercial farms (The Broiler Production Committee 2006). Caging is important especially for layers as hens and eggs are kept in a clean environment, eggs can easily be collected, and production can be easily recorded and monitored.

Brooding (artificial heating) and lighting are important for growth and reproduction of chickens. There are prescribed levels of temperature and provision of light depending on the age of chicken. Disease prevention and control is also an important practice and is done through vaccination programs. Broilers and layers are given vaccines such as the ones against New Castle Disease, Infectious Bursal Disease, and Infectious Bronchitis, among others. Vitamins and other medications are also given as necessary for chicken health. Good sanitation is also important to observe in poultry farms to prevent infections.

In terms of feeding, broilers require more feeds than layers as they grow faster and are required to attain a marketable weight. Broilers are normally fed with commercial poultry feeds that are high in protein to induce fast growth; while for layers, feeds are high in vitamins and minerals

[2] The three main strains for commercial broiler production in the Philippines are Cobb, Ross, and Indian River. Cobb is considered the best performing, while the other two are better in terms of availability. For commercial layer, breeds mostly include Dekalb, Hy-line, Lohmann, Shaver. For backyard, common breeds for broiler are Rhode Island, Barred Plymouth Rock, among others; for layer, Rhode Island, Barred Plymouth Rock, Leg horns, Sussex. (Source: Key informant interviews, 2021).

that would enhance egg quality and production. Backyard farmers use commercial feeds but would also mix alternative or non-traditional feedstuffs, e.g. azolla, malunggay, camote leaves, scrap cabbage/kangkong.

Value chain

The value chain structures for broiler and layer are similar as illustrated in Figure 20 and 21. The chain starts from farm inputs being supplied/used for farm production, followed by distribution of produce, processing and retail, and consumption, with each segment involving several key players.

Input provision to the industry include the sources of breeders (local farm or imported), producers of day-old chicks, feed millers and agri-supply stores. Agricultural feed companies have marketers or sales agents being sent to the commercial farms to offer commercial feeds based on their needs. Some of these companies are also owned by the large integrators in the country.

For backyard farmers, agri-supply stores are the primary source for commercial feeds. Backyard growers also mix alternative or non-traditional feedstuffs in their feeds, e.g. corn, azolla, malunggay, camote leaves, scrap cabbage/kangkong, which are available within the vicinity of the farm.

On the farm production side, independent commercial growers are those that buy day old chicks and ready to lay pullets/day old pullets as well as feeds and other inputs with their own money. They do not engage in contracts as they might lose freedom in raising the chickens the way they want to and might not meet the requirements of integrators.

Independent backyard broiler growers sell to dealers and wholesalers, and the dealers and wholesalers sell to slaughterhouses or retailers, and finally, chicken meat is sold to institutional buyers and household consumers. Meanwhile, backyard growers of native chicken can sell through agents or to *viajeros*, assembler-wholesalers, and wholesaler-retailers, or directly to institutional buyers, such as restaurants, and household consumers.

Independent backyard growers engaged in layer operations sell chicken eggs (table egg) to assembler-wholesalers and wholesalers, which then sell to wholesaler-retailers, retailers, and processors before the chicken eggs and processed egg products reach the institutional buyers and household consumers. Some backyard growers, particularly those engaged in native chicken production, sell chicken eggs directly to consumers.

Contract growers are commercial broiler growers who are engaged in raising of day-old chicks for chicken meat. They are contracted by integrators who set the standards and requirements for raising chicken. Pre-arranged prices for the harvest are included in the contract. There are also backyard contract growers that sell to integrators.

On the distribution segment, one of the key players are integrators. They engage in the integration of production, marketing, and feed manufacturing and marketing (e.g. San Miguel Food and Beverage, Inc., Bounty-Fresh Group, Vitarich Corporation). One of their key activities is the provision of inputs, which allows them to modify feed formulation, vaccination programs and medications, among others, that are necessary to optimize production. Integrators own feed mills to sustain their operations and ensure feed quality. They also have the option to either absorb the produce from their contract growers and carry the company's brand which

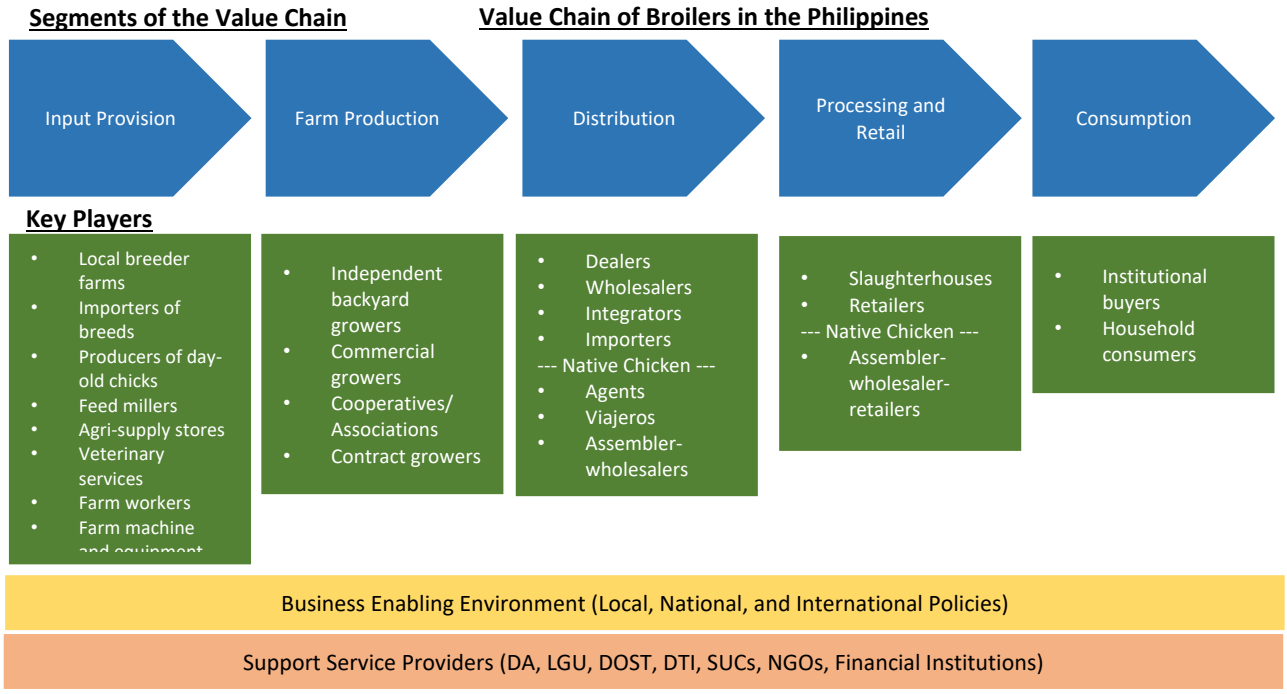
will be sold in supermarkets, restaurants, etc., or let the *viajeros* buy the produce from the contract growers which will be sold, unbranded, in the wet markets or to the institutional buyers.

Viajeros or traders are those who buy live chicken from contract growers and chicken eggs from either contract growers or independent growers and sell them to the wet markets. In an integrated system, *viajeros* are "third party" players that integrators contact during harvest time. *Viajeros* are one option for transporting and marketing produce (chicken and chicken egg). Meanwhile, some commercial farmers also contact them to pick up the produce (live chicken) from the contract growers and bring to dressing plants for further processing. Some commercial farmers also let the *viajeros* buy the produce from contract growers to be sold unbranded.

On the consumption side, there are institutional and household buyers. Institutional buyers are those who buy chicken meat or chicken egg for further processing such as restaurants and bakeries.

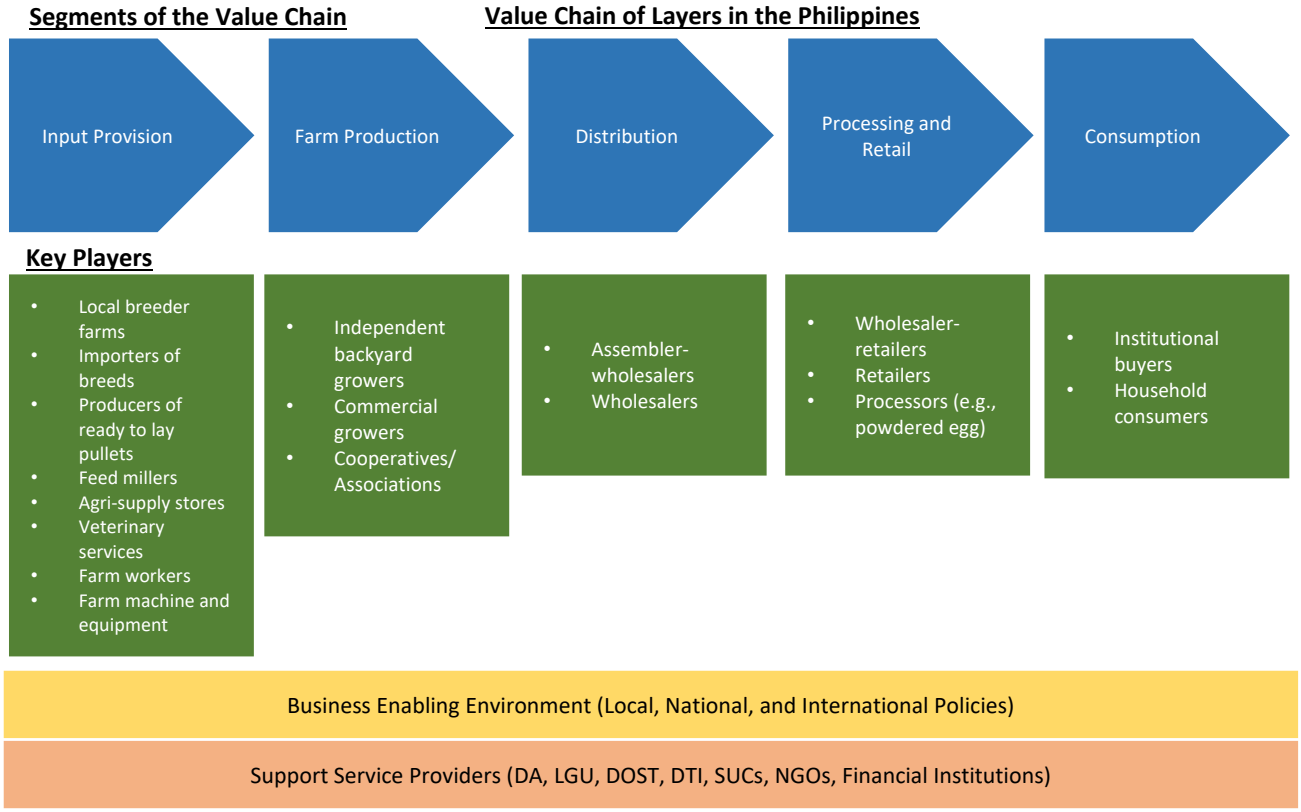
Enabling business and policy environment, and support services are important for any industry. In the chicken industry, local, national and international policies have implications on industry growth and development, and how issues and gaps can be addressed. Policies include product quality and safety standards, certification, regulatory policies, exportation and importation procedures, and trade agreements. Meanwhile, support services have direct impact on production, processing, marketing and other activities of industry players. They may be provided by the government and the private sector. Examples are support or assistance in terms of research and development, technology, finance, logistics, business advisory, product design and packaging and other marketing services.

Figure 20. Value chain for broiler industry



Source: Key informant interviews, industry specialists (2021)

Figure 21. Value chain for layer industry

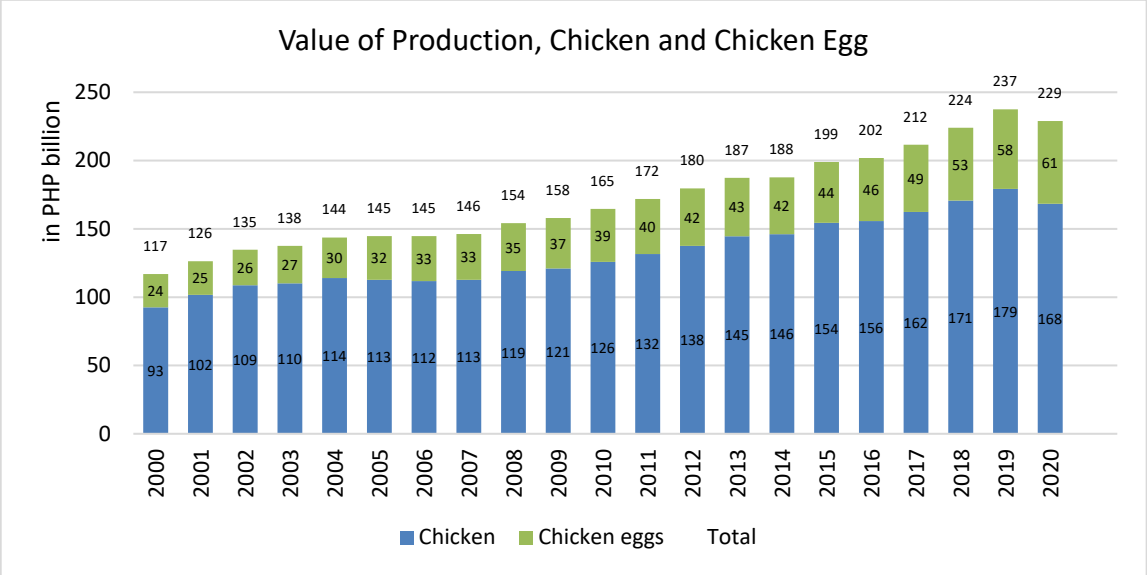


Source: Key informant interviews, industry specialists (2021)

2.2.2. Production, inventory, and trends

Value of production of chicken has been increasing in the last decade except for a drop in 2019 to 2020 by 6.1 percent (Figure 22). The ASF may have been presumed to increase the demand for chicken, but the restrictions in mobility and limitations in business operating capacity due to the COVID-19 pandemic may have weakened the demand for chicken especially from institutional buyers such as restaurants, food chains, and hotels. Meanwhile, value of chicken egg production increased by 3.9 percent from 2019 to 2020, and generally has been increasing from 2010-2020.

Figure 22. Chicken and Chicken egg value of production (billion pesos)



Note: Values in constant 2018 prices

Source: PSA

Regional data from 2010 to 2020 from PSA indicate that chicken production is highest in the regions Central Luzon (35.4% of total production in the country), CALABARZON (19.0%), Northern Mindanao (9.0%), Central (6%) and Western Visayas (5.9%) [Table 5]. Chicken egg production is concentrated in the same regions: CALABARZON (29.9%), Central Luzon (20.1%), Central Visayas (9.5%), Northern Mindanao (9.1%), Western Visayas (6.9%).

The top producing provinces, which are from the abovementioned regions, include Bulacan, Pampanga, and Nueva Ecija for chicken production; and Batangas, Pampanga, and Cebu for chicken egg production.

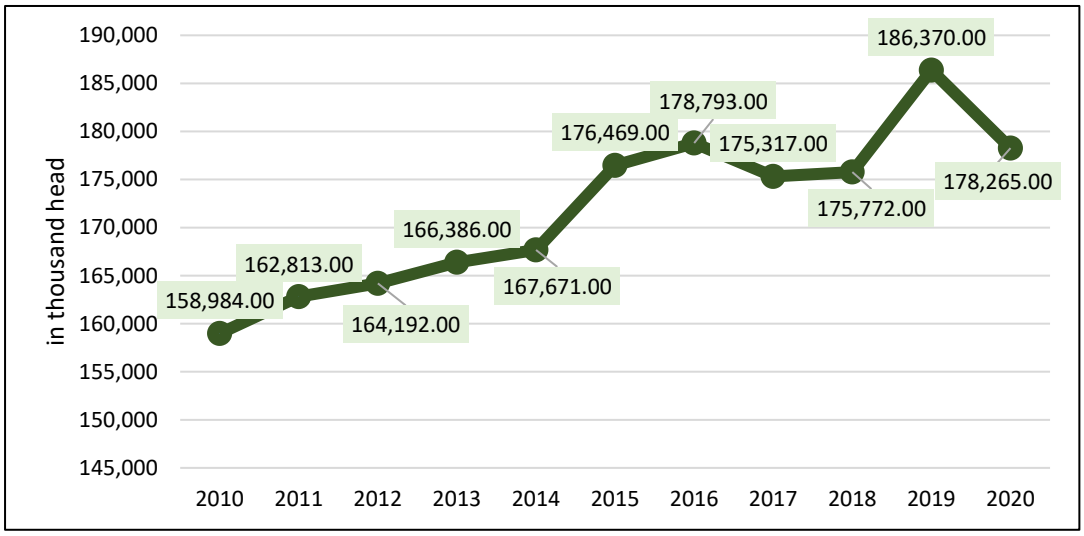
Table 5. Top poultry producers, region and province, 2010-2020 (sum in metric ton)

Chicken	Volume in mt (2010-2020)	Share, Total Production in PH (%)	Chicken Egg	Volume in mt (2010-2020)	Share, Total Production in PH (%)
Region, top 5			*Region, top 5*		
REGION III (CENTRAL LUZON)	6,377,328.08	35.4	REGION IV-A (CALABARZON)	1,547,352.68	29.9
REGION IV-A (CALABARZON)	3,434,131.96	19.0	REGION III (CENTRAL LUZON)	1,040,787.46	20.1
REGION X (NORTHERN MINDANAO)	1,616,820.89	9.0	REGION VII (CENTRAL VISAYAS)	490,622.08	9.5
REGION VII (CENTRAL VISAYAS)	1,075,377.41	6.0	REGION X (NORTHERN MINDANAO)	469,419.62	9.1
REGION VI (WESTERN VISAYAS)	1,069,268.94	5.9	REGION VI (WESTERN VISAYAS)	356,267.39	6.9
Province, top 10			*Province, top 10*		
Bulacan	1,641,874.60	9.1	Batangas	1,078,048.49	20.8
Pampanga	1,630,052.01	9.0	Pampanga	468,363.64	9.0
Nueva Ecija	1,223,452.50	6.8	Cebu	403,737.59	7.8
Batangas	1,016,465.70	5.6	Bukidnon	327,683.87	6.3
Rizal	960,990.86	5.33	Bulacan	320,825.23	6.2
Tarlac	954,972.11	5.30	Rizal	292,027.33	5.6
Misamis Oriental	823,716.11	4.6	Davao City, Davao del Sur	195,549.88	3.8
Cebu	636,936.29	3.53	Negros Occidental	137,192.91	2.7
Bataan	632,493.09	3.51	Tarlac	135,826.94	2.6
Pangasinan	621,664.17	3.4	Iloilo	123,887.81	2.4

Source: PSA

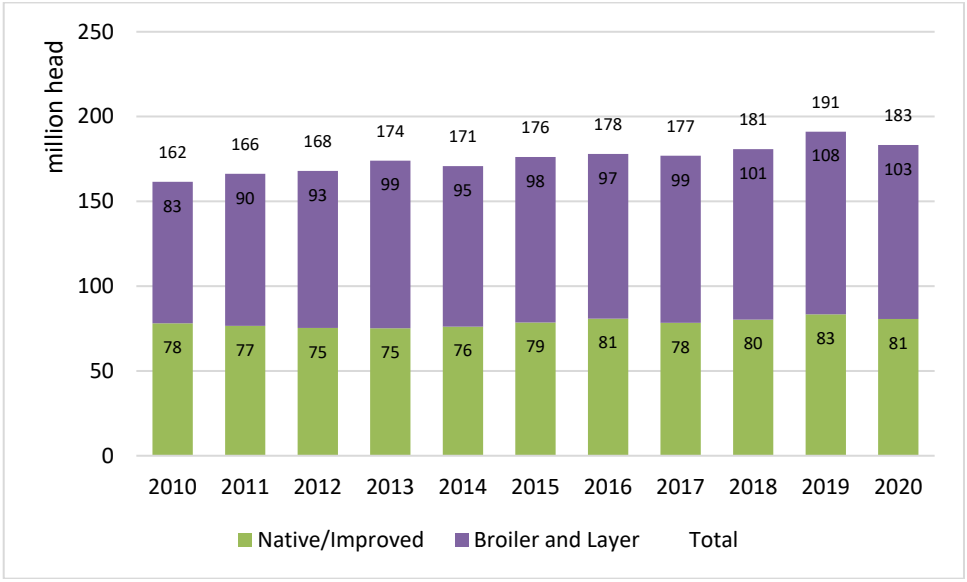
Similar to the trend in production, chicken production's inventory is generally increasing from 2010 to 2019 but declined from 186 million head in 2019 to 178 million in 2020 (4.3%) [Figure 23]. Looking closely at the inventory types, the number of broiler and native/improved chicken head declined in the same year, except for layer where the increasing trend continued. Among the three types of chicken, native/improved chicken has the most share in total inventory in the last ten years at about 46 percent, followed by broiler at 35 percent, and layer at 19 percent (Figure 24).

Figure 23. Chicken inventory (number of head), 2010-2020



Source: PSA

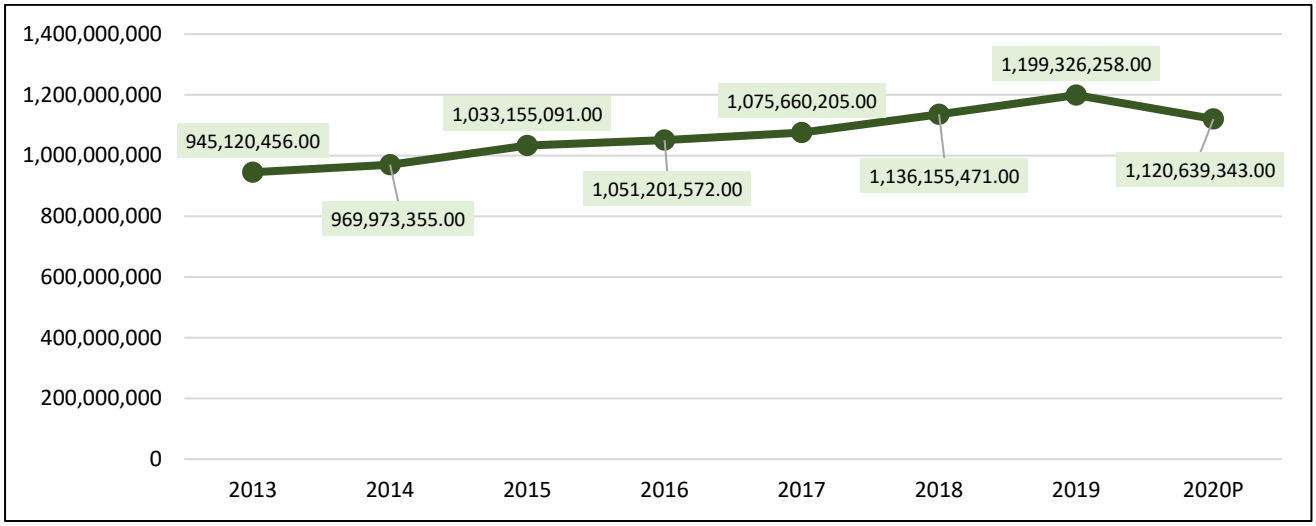
Figure 24. Poultry inventory by type of poultry (number of head), 2010-2020



Source: PSA

Volume of birds dressed has plateaued at one billion mark since 2013 even when it slightly dipped by 2020 (Figure 25). The extent of the broiler industry is very large compared to other sectors, around three times the size of the swine industry, and it suffered the least decline during the pandemic.

Figure 25. Number of birds dressed, 2013-2020

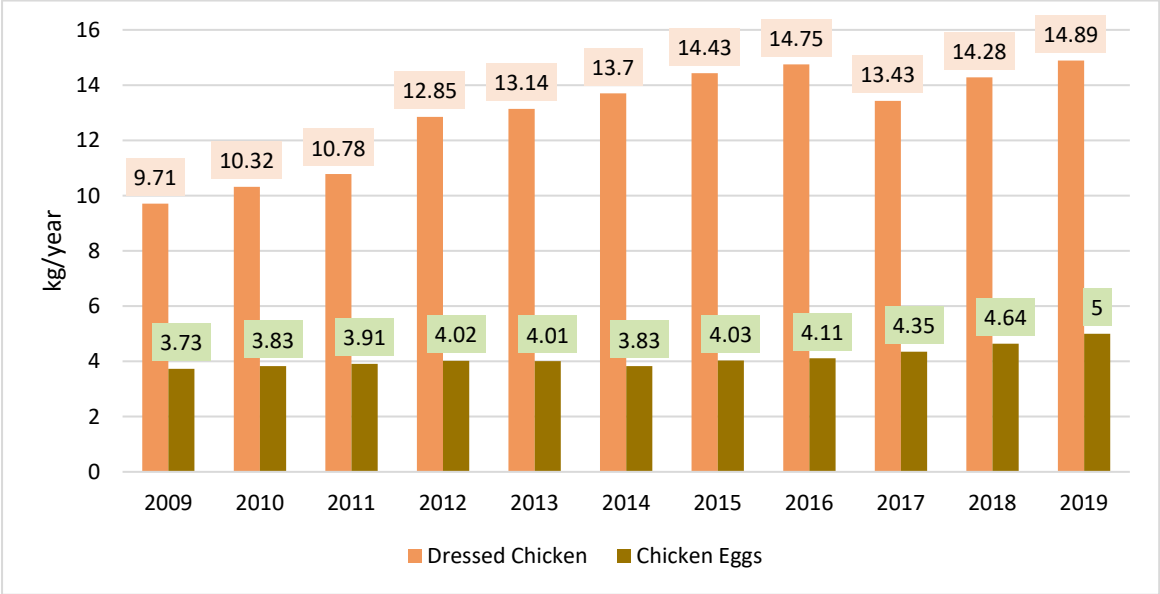


Note: 2020 is still preliminary data
Source: PSA

2.2.3. Consumption trends

On average, each person in the Philippines had increasing consumption of chicken meat and eggs from 2009-2019, except for an 8.9 percent drop in 2017 for dressed chicken, which is the same year when there was a decline in chicken inventory. (Figure 26).

Figure 26. Consumption of Poultry Products per capita (kg/year), 2009-2019

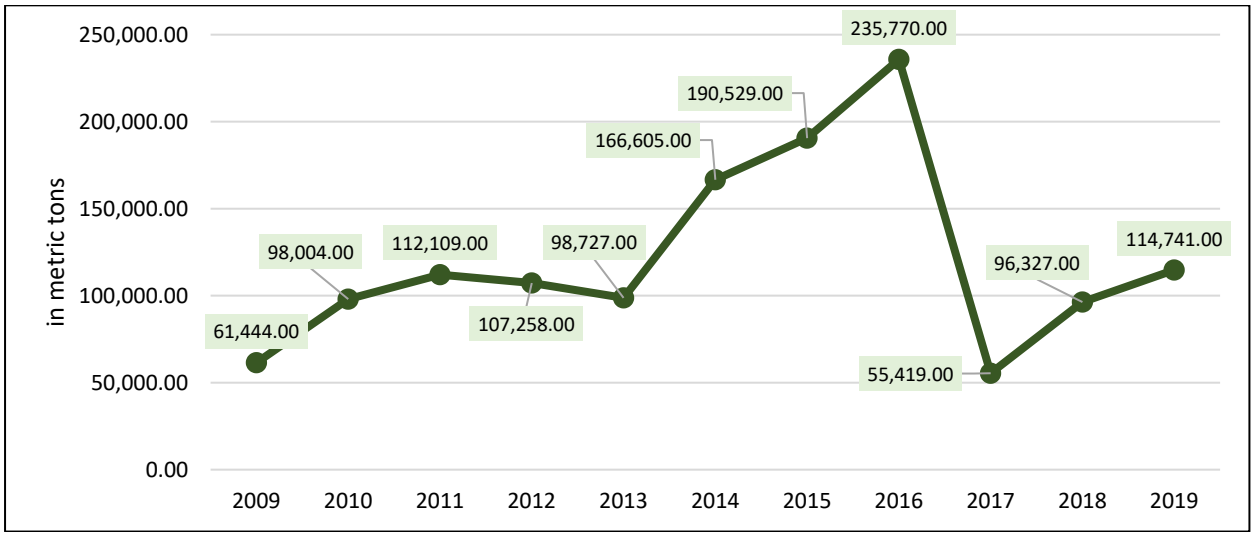


Note: Parameter used is quantity available for consumption
Source: Supply Utilization Accounts, PSA

2.2.4. Trade trends

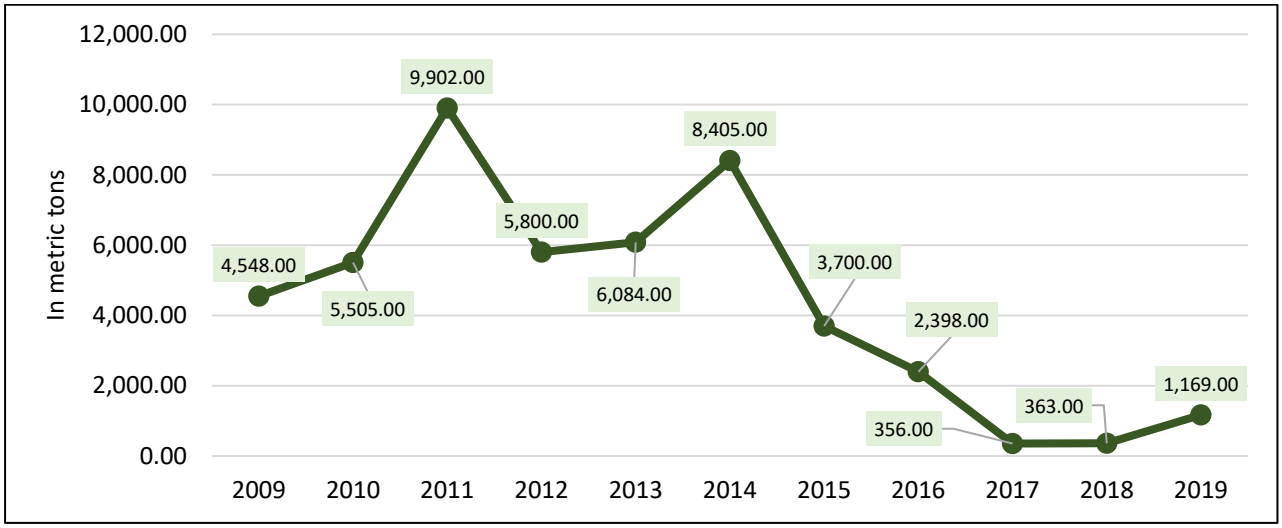
Imports for dressed chicken are significantly higher than the exports. The trend of the imported products follows the trend of the import dependency ratio (IDR) as shown in Figures 27-29.

Figure 27. Dressed chicken imports, 2009-2019



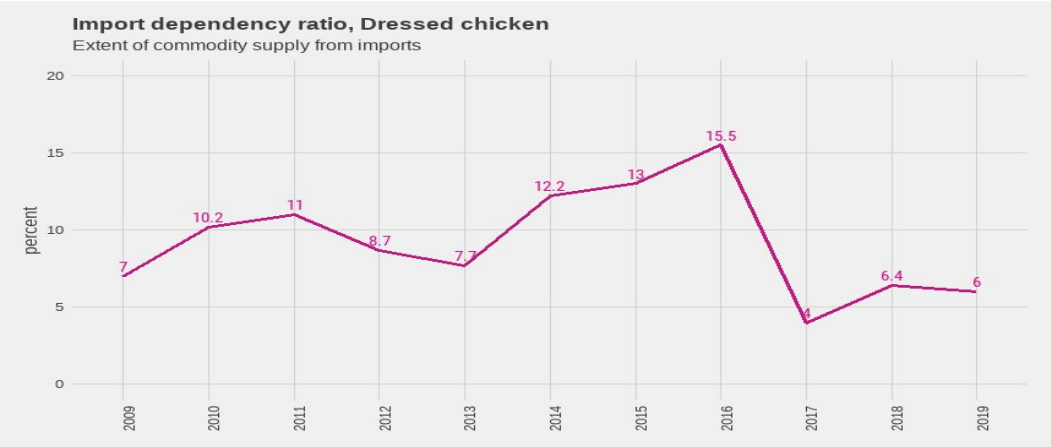
Source: PSA

Figure 28. Dressed chicken exports, 2009-2019



Source: PSA

Figure 29. Import dependency ratio of dressed chicken



Source: PSA

2.2.5. Other relevant data (prices)

In the poultry industry, data from the PSA indicate that backyard farmgate prices are relatively higher than commercial farmgate prices (Table 6 and 7). The presence of economies of scale and lower cost of inputs (especially farms with feed millers) in commercial farms could be affecting the difference in prices.

From 2019-2020, a decrease in farmgate price of broiler is observed in the top producing regions, Central Luzon, CALABARZON and Western Visayas. While for chicken egg, there is an upward movement of farmgate prices across regions.

For chicken broiler, the data suggests that the top chicken producing regions (Central Luzon, CALABARZON and Western Visayas) have relatively lower commercial farmgate prices compared to other regions.[3]

For chicken egg, the trend observed from the data is that the Visayas regions appear to have relatively highest commercial farmgate price than in other island groups; while regions in Mindanao appear to have relatively lowest commercial farmgate price.

Table 6. Farmgate price, chicken broiler* by region and farm type, 2018-2020

	2018		2019		2020	
Region	**Backyard**	**Comm-ercial**	**Backyard**	**Comm-ercial**	**Backyard**	**Comm-ercial**
REGION III (CENTRAL LUZON)	113.99	83.58	113.94	77.10	108.43	73.87
REGION IV-A (CALABARZON)	91.66	84.14	102.55	91.78	101.72	83.06
REGION IV-B (MIMAROPA)	105.30	97.55	112.14	98.19	120.93	114.77
REGION VI (WESTERN VISAYAS)	..	91.56	..	88.18	..	84.38
REGION VIII (EASTERN VISAYAS)	..	..	..	61.50	..	102.72
REGION IX (ZAMBOANGA PENINSULA)	..	83.05	..	92.95	103.20	97.72

[3] Due to limited data in backyard farmgate prices, comparison across regions could not be made.

REGION XII (SOCCSKSARGEN)	..	91.59	..	85.21	..	..

Note: Unit is peso per kilogram (liveweight) for broiler; Regional price used here is the arithmetic mean of the average prices of the provinces.
*Data refers to Chicken Broiler, other breed: Chicken of foreign breed raised for meat purposes usually disposed of within 45-46 days.
[..] Data not available (including for other regions not in the table).
Source: PSA

Table 7. Farmgate price, chicken egg* by region and farm type, 2018-2020

Region	2018		2019		2020	
	Backyard	Comm-ercial	Backyard	Comm-ercial	Backyard	Comm-ercial
CORDILLERA ADMINISTRATIVE REGION (CAR)	5.66	5.10	..	5.70	..	6.03
REGION I (ILOCOS REGION)	6.83	5.02	..	5.21	..	5.70
REGION II (CAGAYAN VALLEY)	..	..	..	..	..	5.80
REGION III (CENTRAL LUZON)	..	4.37	..	5.08	..	5.73
REGION IV-A (CALABARZON)	..	4.45	..	5.05	..	5.61
REGION IV-B (MIMAROPA)	6.22	4.85	6.91	5.44	7.67	5.87
REGION V (BICOL REGION)	..	4.23	..	5.06	..	5.31
REGION VI (WESTERN VISAYAS)	..	5.34	..	5.35	..	5.87
REGION VII (CENTRAL VISAYAS)	..	5.31	..	5.44	..	5.90
REGION VIII (EASTERN VISAYAS)	5.58	..	5.54	5.40	6.19	5.94
REGION IX (ZAMBOANGA PENINSULA)	7.03	4.95	7.04	5.28	5.66	5.48
REGION X (NORTHERN MINDANAO)	5.16	4.78	..	5.00	..	5.28
REGION XI (DAVAO REGION)	6.19	4.68	6.30	5.05	8.25	5.07
REGION XII (SOCCSKSARGEN)	..	4.67	..	4.64	..	5.28
REGION XIII (CARAGA)	..	5.25	..	5.34	..	5.60
AUTONOMOUS REGION IN MUSLIM MINDANAO (ARMM)	12.88	..	..	..	..	..

Note: Unit is peso per piece for egg; Regional price used here is the arithmetic mean of the average prices of the provinces
*Data refers to Chicken egg, other breed (not native)
[..] Data not available
Source: PSA

2.3. Dairy (cattle and buffalo) industry

2.3.1. Overview of the industry

Dairying is one of the major income sources of small-scale farmers in the country, facilitated through the programs of the Philippine Carabao Center (PCC) and National Dairy Authority (NDA) with particular focus on production, processing, and marketing of dairy products. Two of the animals used for milk production in the country are buffalo/carabao (Bubalus bubalis Linn.) and cattle/cow (Bos taurus Linn.). A variety of liquid and solid processed dairy products are formed from both animals such as fresh/pasteurized milk, flavored milk, yogurt, pastillas, ice cream, and milk soap among others.

These farms can be divided into two economic scales: small-scale and semi-commercial. The former has less than 20 head while the latter raises between 20 and 25 head. The country's milk

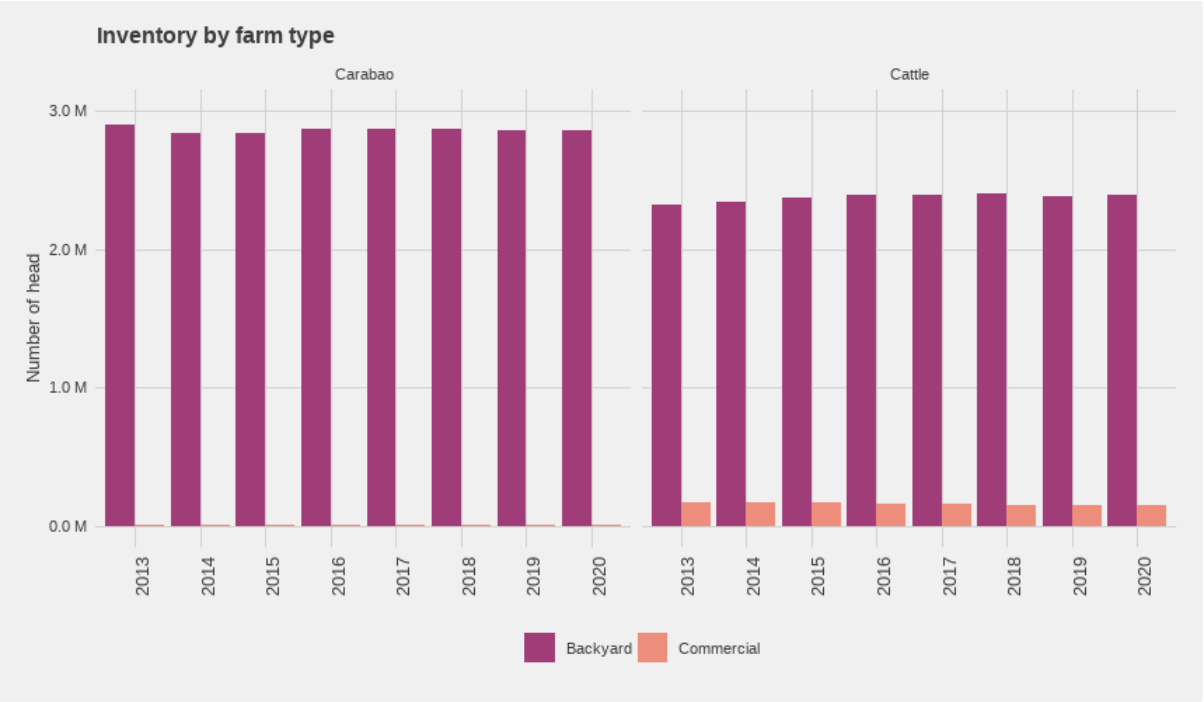
production is comprised of 70 percent dairy cattle coming from areas with government assistance, mostly characterized as small-scale farms. One observation for semi-commercial however, is that they are all members of dairy cooperatives which provides ease for regulation and oversight.

Per literature and KIIs, there are few to zero commercial dairy farms in the country.

Backyard operations dominate much of the carabao and cattle farms, numbering between 2.8 and 2.9 million head for carabao and around 2.3 million head for cattle. The figures are in great contrast with commercial farms which have an annual inventory ranging from 10,000 to 12,000 head for carabao and 150,000-180,000 head for cattle (Figure 30).

While there is no specific breakdown on dairy commercial and backyard production, comparisons with the inventory imply that local milk production is heavily supported by backyard operations, and it supports the earlier observation that commercial farms are limited.

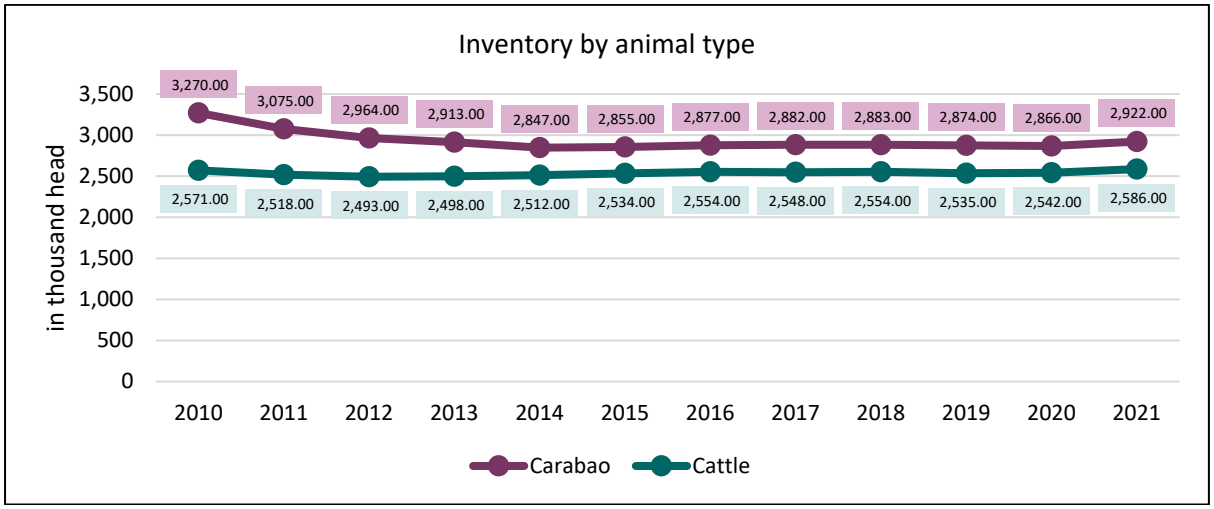
Figure 30. Inventory of carabao and cattle by farm type, 2013-2020



Source: PSA

Carabao inventory is higher than cattle in livestock production with a gap of almost 500,000 head. However, it should be contended that the numbers in Figure 31 are not disaggregated among dairy, slaughter, or work thus while carabao is more numerous in cattle, it does not directly equate to bigger dairy buffalo production.

Figure 31. Inventory of carabao and cattle in thousand head, 2010-2021



Source: PSA

Farm practices

A large portion of the country's livestock, particularly those raised under smallholder production systems is combined with crop-based farming systems. This arrangement involves managing two or more species of farm animals, particularly common among smallholder farms. One practice observed under backyard buffalo and cattle production systems is paiwi in which an animal (usually a breeding female) is entrusted to another farmer for its care and management until it produces an offspring. In the case of paiwi among male carabaos, the owner and caretaker share the net profit when the animal is sold or earnings when the animal is hired for draft purposes (Status of the Philippine Genetic Resources 2003). Other practices on particular processes are discussed hereafter.

Reproduction. Natural mating and artificial insemination are both considered as reproduction methods. Dairy cattle can be bred from 15 months to three years of age while dairy buffalo takes four to five years before being able to breed. Both of these animals can only carry one calf at a time for nine months but can reproduce every year. The PCC has lodged the encouraged use of artificial insemination under their Genetic Improvement Program to increase the number of buffalo.

Feeding. Female ruminants are fed lactating feeds or concentrates two to three times a day. These are supplemented with napier grass, rice straws with molasses, sugarcane leaves, and block salt to increase milk yield. Upon giving birth, their calves consume around one to two liters of milk a day to accelerate their growth. Bulls, on the other hand, are used as draft animals in the arm and thus subsist with available grasses in the vicinity.

Housing. Individual housing is usually done with less than three head while communal housing is for farms exceeding three head. Materials used include concrete and GI sheet roofs.

Health provision. Good disease management is tied with routine sanitation e.g. clean drinking water, clean pens, delousing, deworming, vaccination, and vitamin injections.

Milking. Manual milking and milking machines are two types of extraction methods, the former done by farmers with one or two head and the latter done by more than three head. Dairy buffalo's highest average volume of raw milk is four to seven liters a day for about four to five months while its lowest during lean season averages around one to three liters per day over a duration of six to seven months. Best performing animals can produce ten liters per day per head for 300 days. The extracted milk is either stored on a plastic container or stainless milk cans.

Selling. Raw milk is usually sold to cooperative cum processors, small-scale processors, institutional processors, institutional buyers, and household end consumers. The price depends on the cost of production and/or the price agreed on by cooperative or association members.

For buffalo, ready-to-breed head would range from PHP 80,000-100,000 (Nueva Ecija prices) while pregnant head would sell for as high as PHP 120,000. A two-year old female would fetch an amount between PHP 50,000 to PHP 60,000 while males that are not for breeding would range between PHP 7,000 to PHP 10,000.

Value chain

The value chain model for dairy buffalo and cattle, presented in Figure 32, is composed of different segments or operations executed by different types of players. For the dairy buffalo and cattle value chains, these segments are broken down into input provision, production, milk collection, processing, marketing, and consumption. The value chain for the dairy industry does not differ from the general framework used for the different value chain industries.

Input provision. Input providers include agricultural supply stores, the local government units, regional units, government/institutional units (PCC and NDA), and private sectors. Basic inputs such as feeds (grasses and concentrates), medicines, even animal sperms, and other items used for the production are supplied by input providers.

Production. The process of producing raw material. Includes animal reproduction, feeding, cleaning of pens, healthcare management, and milking. Dairy farmers are considered the main key players.

Milk collection. The process of collecting milk from dairy farmers after the extraction from dairy animals primarily done by milk collectors. Milk extracted is delivered either to the processing centers or picked up by the milk collectors. If channeled to the latter, the raw milk will undergo further processing to become dairy products. Note that some milk farmers/producers directly process their raw milk (producer cum processor), and some do retail (producer cum processor cum retailer).

Processing. The process of transforming raw milk into different dairy products such as pasteurized/fresh milk, flavored milk drinks (chocolate, ube, mocha, etc.), yogurt, cheese, pastillas, and milk soaps. Processes like pasteurizing and homogenizing are performed to arrive with different milk products.

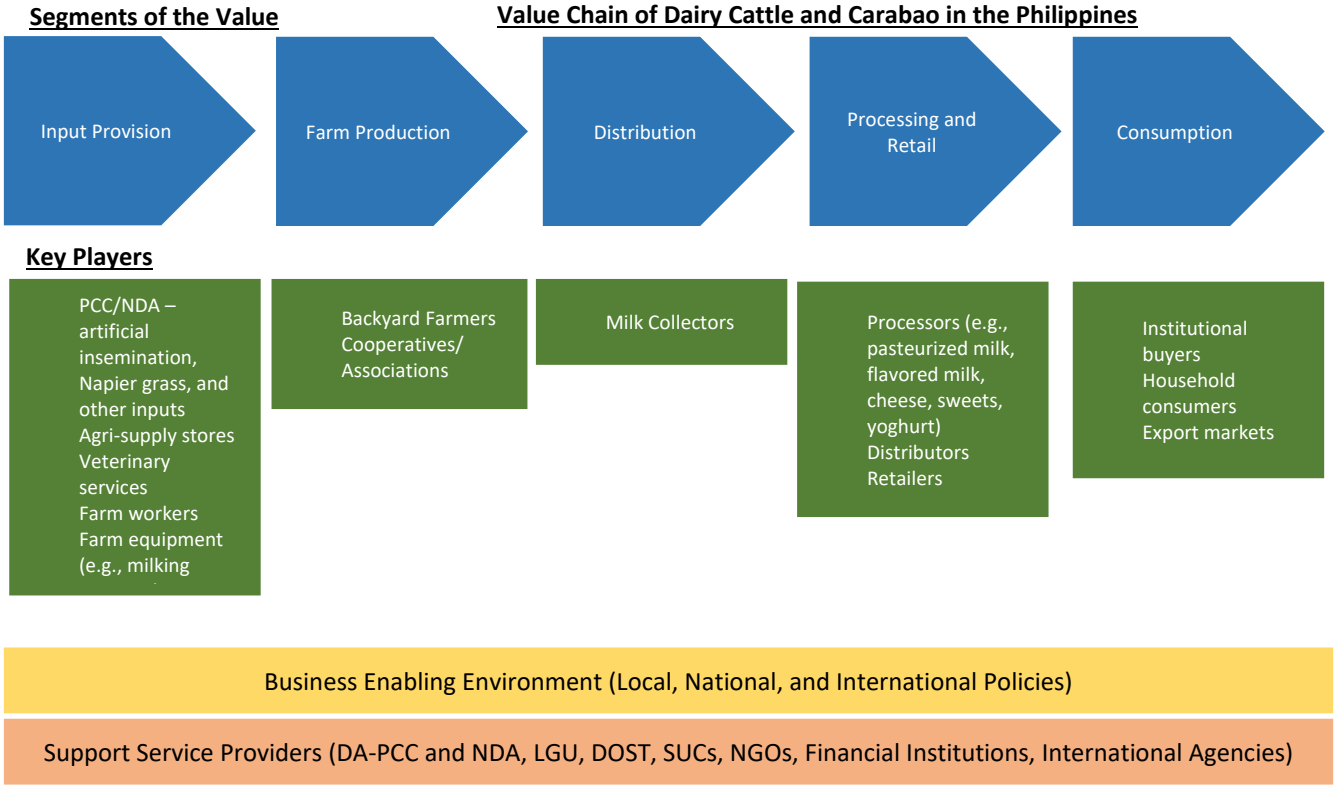
Processing centers are usually owned by cooperatives, by government (i.e. Milka Krem of PCC, DITRI, etc.), or independent/individual owners.

Marketing. For more effective marketing, strategies such as advertisements and promotions are utilized to increase the sales of dairy products. Packaging is also done at this stage to attract more buyers. There are instances wherein farmers/producers sell raw milk directly to consumers; and processors sell processed milk directly to consumers

Consumption. Consumers are categorized into two, namely: institutional buyers and end consumers. Restaurants, hospitals, hotels, and the likes are considered institutional buyers while end consumers are the households and walk-in buyers who avail of dairy products in the retail stores.

The segments/functions discussed above are influenced by four elements, namely: end-markets, business enabling environment, inter-firm relationships, and supporting services. The end markets emphasize the market trends, price structure of the final products and raw materials, and key suppliers and major markets and their linkages in the local and regional value chains. The business-enabling environment covers inspection/certification, and policies and regulations affecting the business growth and competitiveness of an industry. Inter-firm relationships refer to the type of coordination or cooperation in the value chain. Strong coordination between and among players through horizontal (e.g., farmer to farmer or processor to the processor) or vertical integration (farmer to processor or agent to livestock trader) is important to take advantage of market opportunities. Support services enable the different functions or vertical linkages in a value chain (e.g., financing, research and development, technology, logistics, advisory services, product design, and other services) (Lantican, et al., 2017).

Figure 32. Value chain of dairy cattle and carabao



Source: Key informant interviews, industry specialists (2021)

2.3.2. Production, inventory, and trends

India is the leading producer of buffalo in the Asian region with 109.8 million head and a total share of 55.4 percent in 2019 (Table 8). It primarily initiated technological development using scientific knowledge and tools in buffalo production, nutrition, reproduction, biotechnologies, and genetic improvement (Borghese and Mazzi 2005). Pakistan and China followed next with a total share of 20.2 and 13.8 percent, respectively, in the same year. However, the next seven countries that belonged to the Top 10 (Nepal, Myanmar, Philippines, Vietnam, Bangladesh, Indonesia, and Lao People's Democratic Republic) contributed less than five percent each.

For cattle, India also dominated the production in Asia with a 41.2 percent share in 2019. Unlike buffalo statistics, China ranked second, followed by Pakistan with 13.5 and 10.2 percent, respectively. Other top ten cattle-producing countries in Asia provided less than 10 percent each of the total production.

Table 8. Buffalo and cattle production in top 10 producing countries in Asia, 2015 to 2019

COUNTRY	VOLUME OF PRODUCTION BY TOP 10 BUFFALO AND CATTLE PRODUCING ASIAN COUNTRIES ('000 HEAD)					% Share in Asia's Total Production (2019)
	2015	2016	2017	2018	2019	
Buffalo						
India	110,314	110,175	110,181	110,140	109,852	55.36
Pakistan	35,580	36,600	37,700	38,848	40,002	20.16
China	27,025	27,170	26,506	27,119	27,338	13.78
Nepal	5,168	5,169	5,178	5,278	5,309	2.68
Myanmar	3,532	3,641	3,752	3,926	4,083	2.06
Philippines	2,855	2,877	2,882	2,883	2,874	1.45
Vietnam	2,524	2,519	2,492	2,425	2,388	1.20
Bangladesh	1,464	1,471	1,478	1,485	1,490	0.75
Indonesia	1,347	1,355	1,322	894	1,141	0.58
Lao PDR	1,165	1,177	1,189	1,200	1,210	0.61
Asia	***193,931***	***195,037***	***195,536***	***197,004***	***198,414***	***100.00***
Cattle						
India	188,167	189,347	190,513	191,754	193,463	41.16
China	63,196	63,539	61,987	63,418	63,542	13.52
Pakistan	41,241	42,800	44,400	46,084	47,821	10.17
Bangladesh	23,636	23,785	23,935	24,086	24,187	5.15
Myanmar	15,993	16,571	17,113	17,860	18,584	3.95
Indonesia	15,420	16,004	16,429	16,433	17,119	3.64
Nepal	7,242	7,303	7,347	7,376	7,385	1.57
Vietnam	5,367	5,497	5,655	5,803	6,060	1.29
Afghanistan	5,261	5,234	4,977	5,105	5,652	1.20
Mongolia	3,780	4,081	4,388	4,381	4,753	1.01
Asia	***443,741***	***450,423***	***453,368***	***461,775***	***470,014***	***100.00***

Source: FAOSTAT

Dairy industry needs to be revamped given the rationale that local milk production is only able to constitute five percent of the total demand for milk. This industry motivation is starting to

manifest in the annual growth rates of buffalo and cattle milk production at four and six percent respectively, based on 2015 data (Table 9). Contrary to the animal inventory presented earlier in Figure 31, dairy cattle comprise most of the production at 63.0 percent share, followed by dairy buffalo at 35.0 percent, and goat at two percent.

Under dairy buffalo, individual producers contribute 13.0 percent of the total production, followed by cooperatives, institutional, and commercial producers. For dairy cattle, individual producers also took the top spot with 24.0 percent share and cooperatives with 23.0 percent. Commercial were higher at 15.0 percent while government-owned only contributed one percent.

Table 9. Buffalo, cattle, and goat milk production (LME* in '000 L), Philippines, 2013-2015

Animal Type/Source	2013	2014	2015
Total	**19,526.42**	**19,727.52**	**20,386.13**
Cattle	65.0	63.7	63.4
Cooperatives	27.9	24.1	36.8
Gov't owned/Institutional	2.0	1.2	1.9
Commercial/Private	14.4	14.8	23.3
Individual	20.6	23.6	38.0
Carabao	33.6	34.8	34.9
Cooperatives	9.5	10.2	30.2
Gov't owned/Institutional	7.7	8.2	24.8
Commercial/Private	2.3	2.4	7.1
Individual	14.2	13.9	37.9
Goat	1.4	1.6	1.6
Total	**100.0**	**100.0**	**100.0**

Anime Type/Source	Milk Production Total, 2010-2015	Average milk production	Average annual growth (%)	% Share (2015)
Buffalo	38,640.97	6,440	4	35
Cooperative	*10,763.23*	*1,794*	*7*	*11*
Govt owned-Institutional	*9,159.72*	*1,527*	*5*	*9*
Commercial/Private	*2,608.51*	*435*	*7*	*2*
Individual	*16,109.51*	*2,685*	*1*	*13*
Cattle	70,131.31	11,689	6	63
Cooperative	*28,177.85*	*4,696*	*27*	*23*
Govt owned-Institutional	*3,704.47*	*617*	*3*	*1*
Commercial/Private	*11,380.48*	*1,897*	*104*	*15*
Individual	*21,272.64*	*3,545*	*17*	*24*
Goat	1,636.83	273	8	2
Total production	**110,409.00**	**18,402**	**5**	**100**

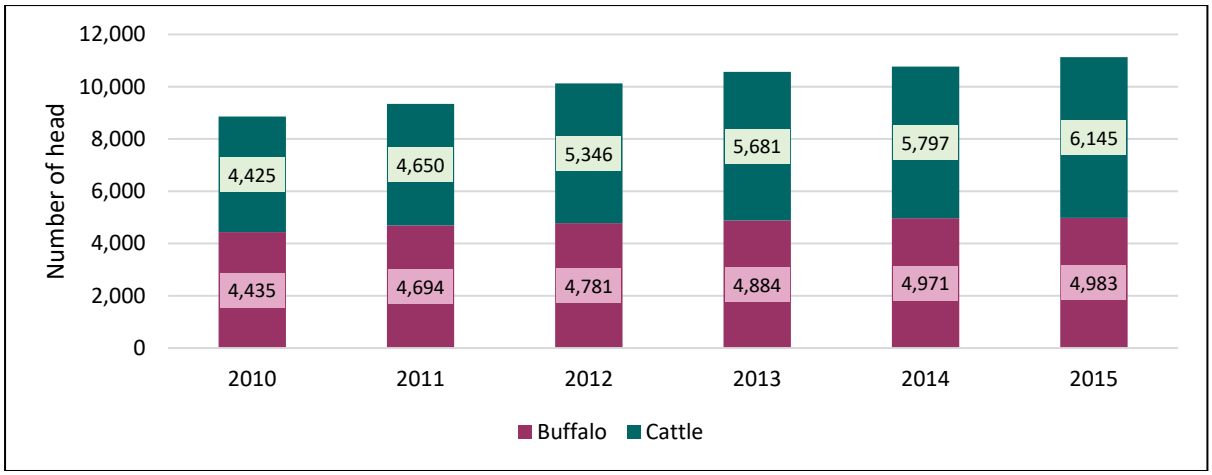
Note: LME = Liquid Milk Equivalent

Source: PSA 2016

Carabao and cattle against the milk line are proportionally low compared to the general inventory, but both are exhibiting increasing trend over the years. The latter has more or less a thousand-head gap with carabao. The total number of buffaloes in the milk line in 2015 was 4,983 head while cattle had 6,145 head, comprising 39.0 and 48.0 percent, respectively, of the total dairy inventory in the country (Figure 33). Dairy cattle are usually associated with ranchers and commercial farms which can better shoulder the high and intensive management requirements while dairy buffalo is preferred for smallholder farms.

Dairy animal importation is largely a government monopoly. Importation is thought to augment the inventory, but sources for breeding animals e.g. India, Italy, and Brazil are becoming limited. To increase the herd supply, agencies are providing funds for foundation breeders for dairy stocks, but these would be concentrated on dairy cattle and only made available for smallholder individual farmers. While the business module program of NDA has its advantages, the loan covers a minimum of 20 to 25 head which is too expensive for a backyard producer.

Figure 33. Carabao/Buffalo and Cattle in the milk line, 2010-2015

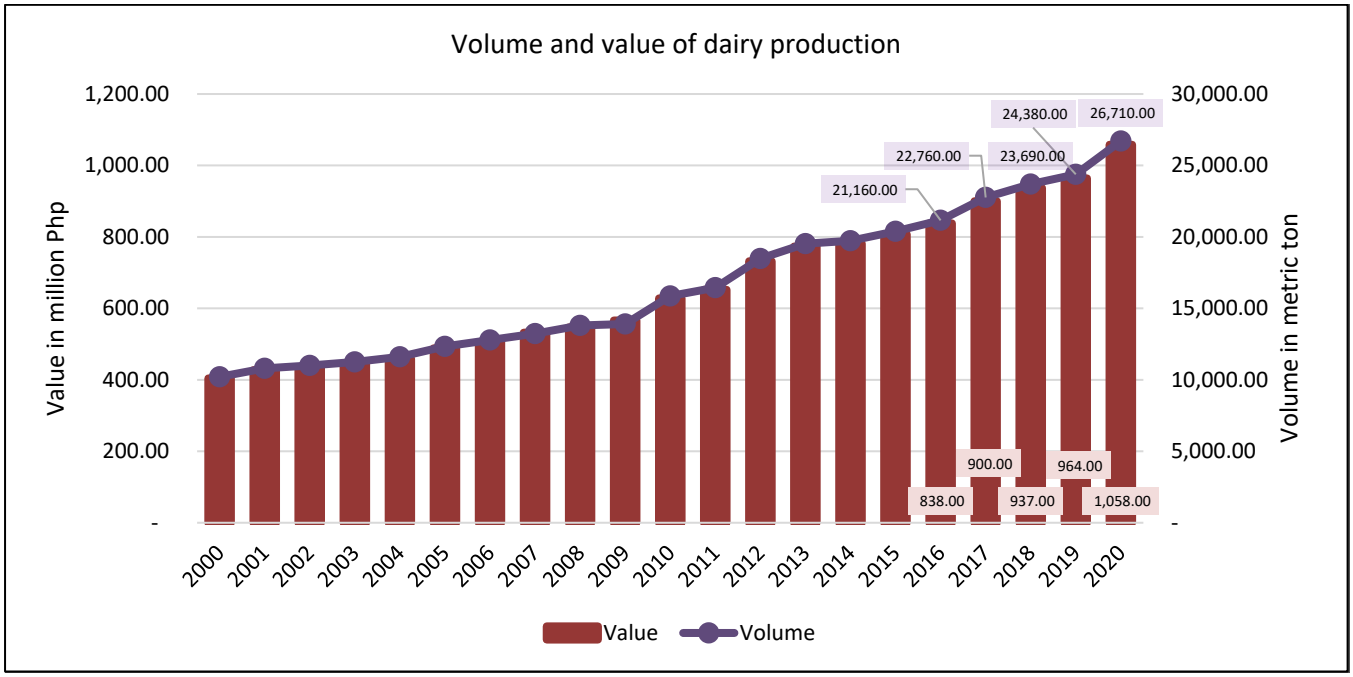


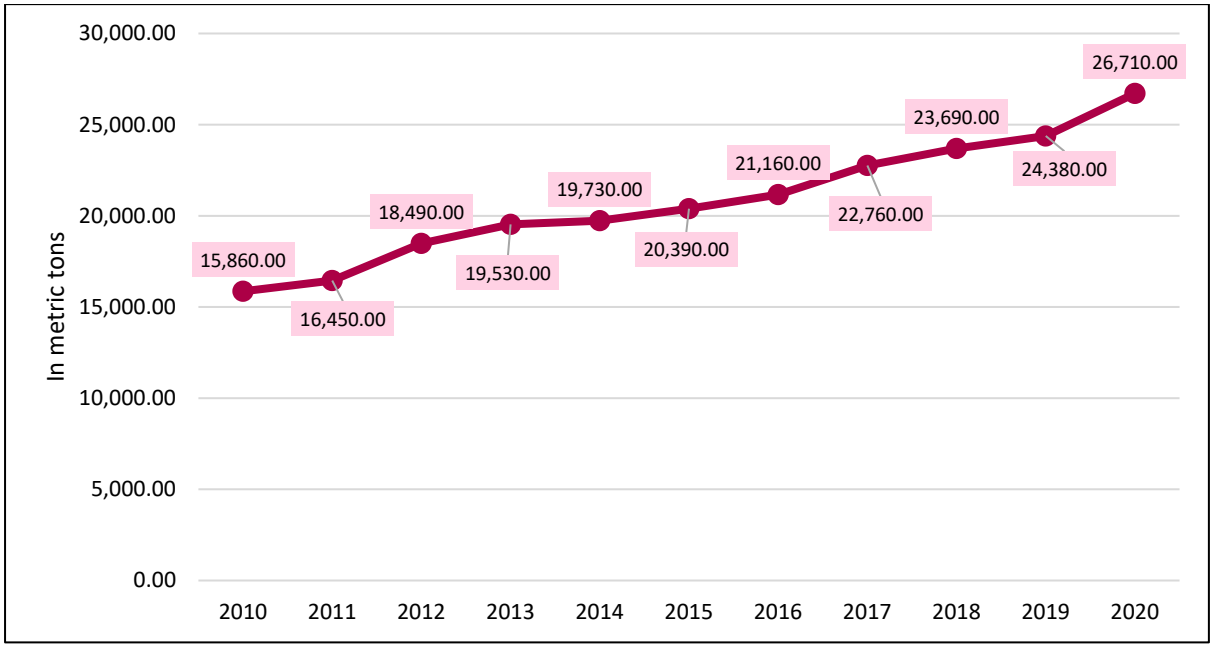
Source: PSA

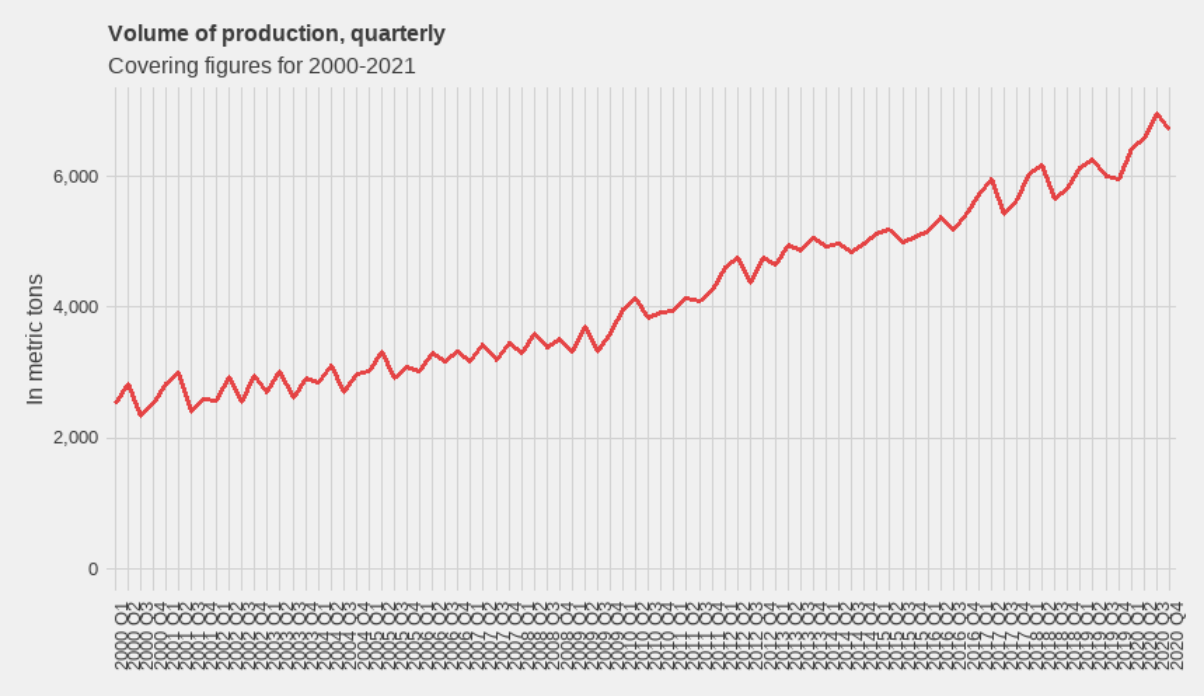
The increase in both inventory and dairy production can be attributed to the encouraged use of crossbred buffalo and cattle which produce more milk compared to the native ones. The PCC notes that crossbreeding has improved animal bodyweight by 60 percent and increased milk production from the one liter (native) to seven liters.

Regardless of dairy's retention on its increasing trend, production volume and value are the lowest among the other industries, ending at only 26,710 mt and PHP 1,058 million for 2020. This is largely attributed by PCC to the low general demand of consumers; there is greater preference for powder milk than ready-to-drink milk. PCAARRD substantiates with three factors: (1) low population of herd, (2) inadequate farm and environment conditions, and (3) lack of production system that will support high milk production.

Figure 34. Annual and quarterly dairy production, 2000-2020





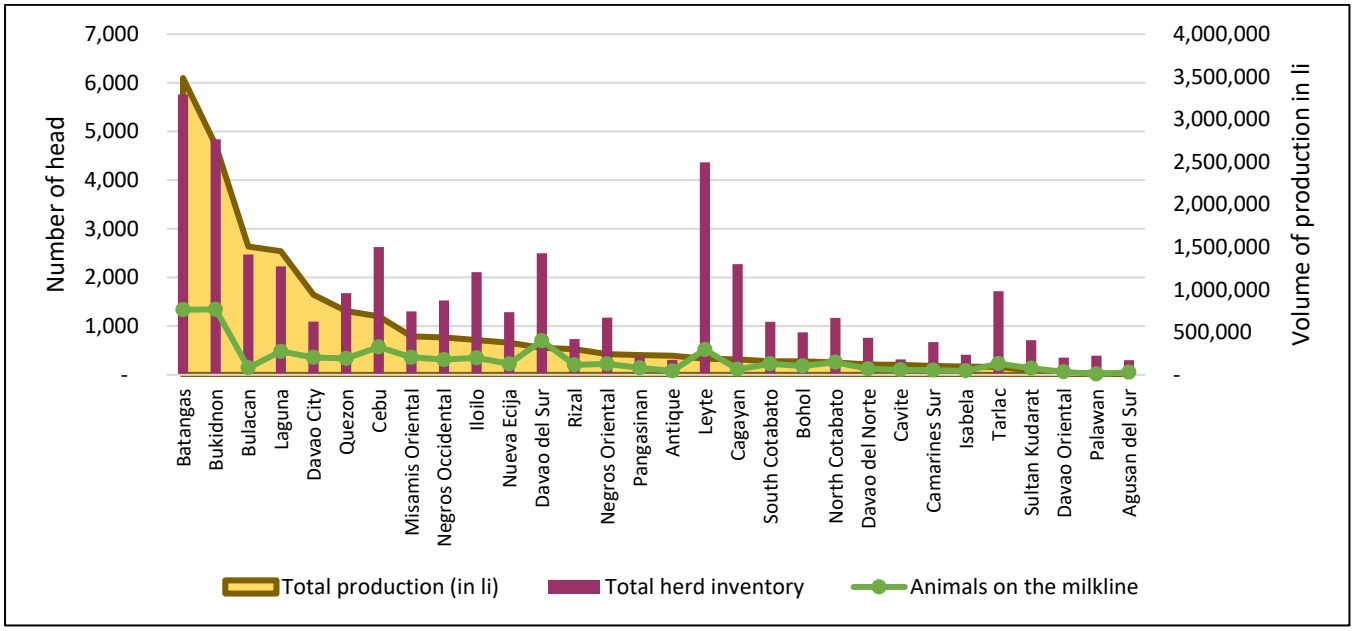


Note: Production includes all forms of dairy, value of production in constant prices

Source: PSA 2021

Profiles of the dairy production zones are also briefly presented in Figure 35. There are areas documented and closely monitored by the NDA. Among the listed zones, Batangas generated the highest production with 3.485 million liters, followed by Bukidnon with 2.698 million liters, and Bulacan with 1.51 million liters. The size of herd inventory and animals on the milkline do not necessarily reflect high production numbers. For instance, Leyte is third highest in herd inventory at 4,366 head but only produces 188,040 liters of milk. Bulacan, the third highest in production, has 144 animals on the milkline compared with Bukidnon which has 1,346 head and Batangas which has 1,338 head. PCC also documented 41 provinces with dairy buffalo production as of 2021 which they plan to extend to 70 provinces in the next few years.

Figure 35. Dairy production zone profiles as of 2020



Source: NDA 2020

In the regional aggregation shown in Table 10, Region IV-A (CALABARZON), comprised of Batangas, Laguna, Cavite, and Quezon, has the highest production, inventory, and animals on the milkline. Second on the production is Region X made up of Misamis Oriental and Bukidnon, and third is Region III with Bulacan, Tarlac, and Nueva Ecija. This is consistent with the numbers in Figure 36.

Table 10. Regional breakdown of production, herd inventory, and animals on the milkline as of 2020

Region	Total herd inventory	Animals on the milkline	Total production (in li)
Region I	380.00	143.00	232,650.00
Region II	2,688.00	197.00	279,160.00
Region III	5,479.00	597.00	1,975,440.00
Region IV-A	10,723.00	2,464.00	6,104,300.00
Region IV-B	392.00	15.00	19,000.00
Region V	673.00	96.00	104,980.00
Region VI	3,945.00	743.00	1,073,450.00
Region VII	4,674.00	979.00	1,090,170.00
Region VIII	4,366.00	521.00	188,040.00
Region X	6,143.00	1,705.00	3,150,470.00
Region XI	4,706.00	1,242.00	1,397,560.00
Region XII	2,970.00	620.00	358,780.00
Region XIII	302.00	52.00	10,130.00

Note: Regional aggregation follows the dairy production zones listed by NDA. Animals on the milkline and herd inventory are not disaggregated into carabao or cattle.

Source: NDA 2020

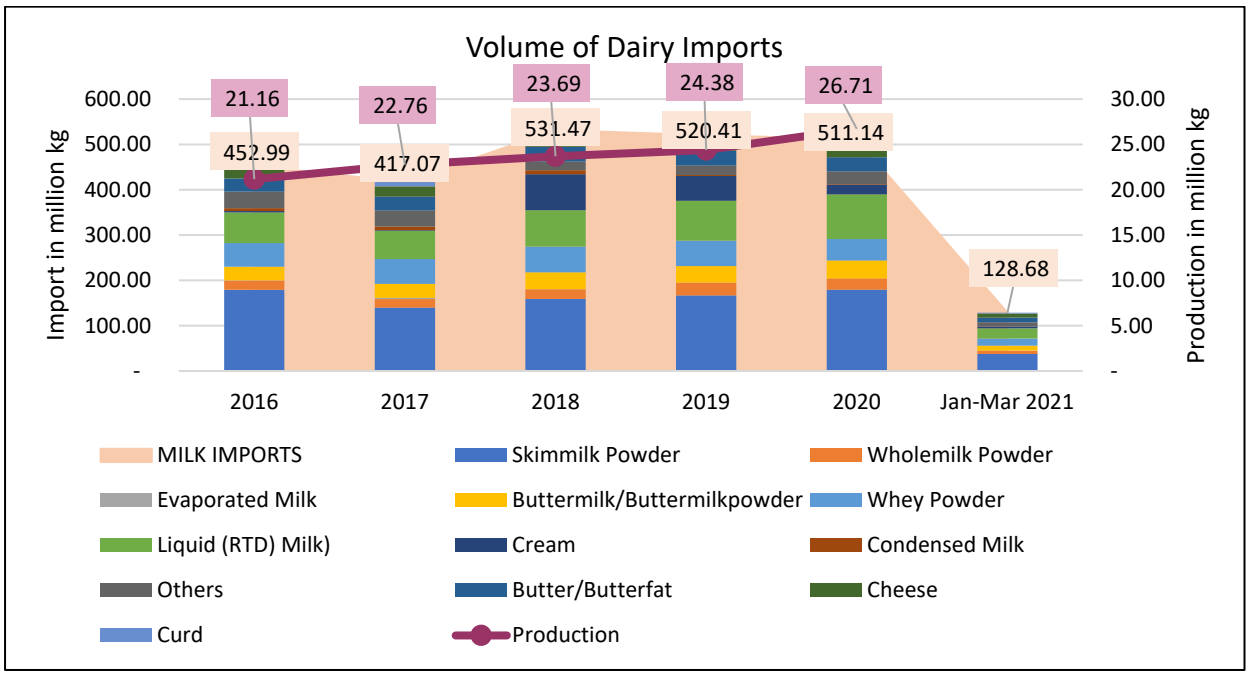
One possible reason for the increasing dairy production is the rising population of crossbred buffalo and cattle. Crossbred and purebred dairy animals produce more milk compared to the native ones.

Moreover, the adoption of new technologies and the upgrading program of the PCC and NDA resulted to increased milk yield. The Genetic Improvement Program (GIP) of both PCC and NDA aims to develop a breed that is very well adapted to the local environment.

2.3.3. Trade trends

Given the trends and implications on domestic production, it follows that import figures would be significantly higher to close the gap in consumer demand. Cumulative transactions of all processed forms in liquid milk equivalent (e.g. milk and cream (skim milk and whole milk powder, buttermilk, whey powder, liquid milk, evaporated and condensed milk, cream, and others), butter/butterfat, cheese, and curd) are presented in Figure 36. Production figures are juxtaposed against milk imports, and the latter is about 20 times higher than the former. Making up bulk of the imports are skim milk and ready to drink milk.

Figure 36. Dairy imports vis-à-vis domestic production, 2016-2020

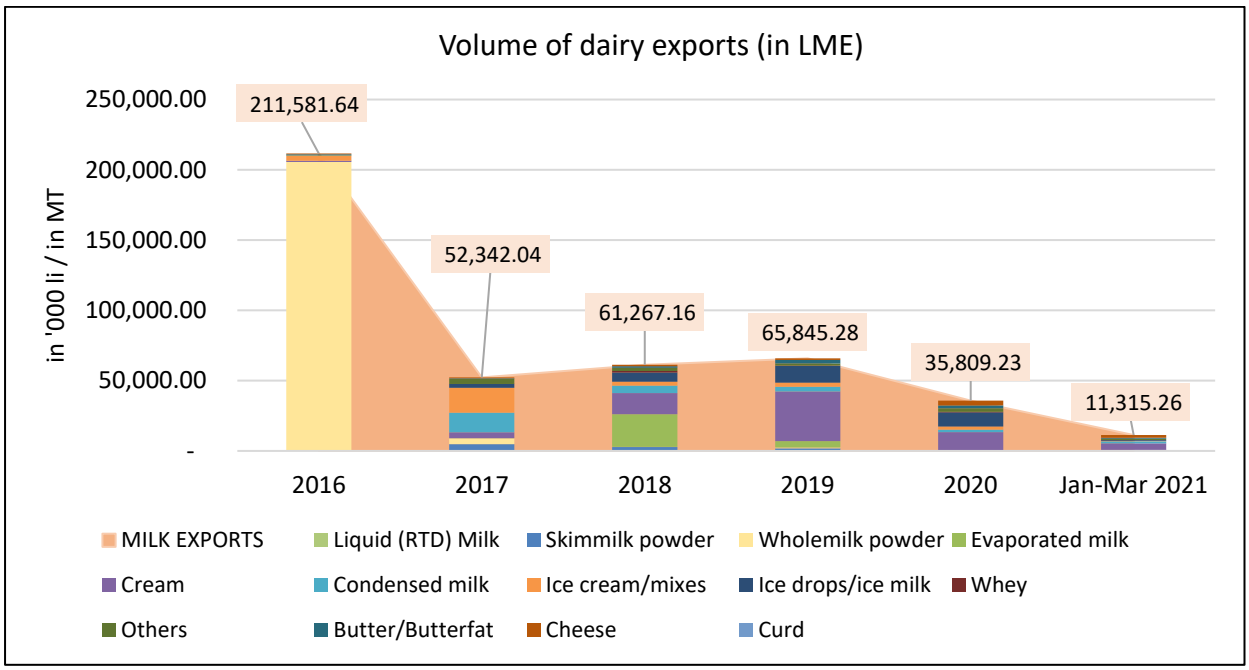


Note: Figures in pink textbox are production while figures in light orange are milk imports

Source: NDA for import, PSA for production

Exports are very high in 2016 as seen in Figure 37, reaching almost 211.681 million liters, majority of which came from whole milk powder. This disappeared in the ensuing years, greatly bringing down the export volume to only 52.34 million liters, about four times lower than the previous year's amount. This has been replaced by ice cream mixes and condensed milk in 2017, evaporated milk in 2018, and cream for 2019 and 2020. Little could be inferred as of yet for 2021 figures. Per PCC's validation, most of the country's exports are re-exported, indicating that these are surpluses from imported products.

Figure 37. Dairy exports, 2016-2020



Source: NDA

The largest volume of cattle exported by the country was in 2013 with 13,689 head (Table 11). This can be accounted to the Herd Build-up Program partnered with the Palit-Baka Scheme of the NDA which accelerated the increase of our local dairy stocks and dairy milk production which resulted in a higher export volume the following year (https://nda.da.gov.ph/). This led to the decline of imported dairy cattle in 2013 from 23,275 (2012) head down to 15,857 head. The lowest volume exported was in 2018 with only 10 head equivalent to USD 8,000.

On the other hand, there is no available data for the buffalo trade for the Philippines. Per the PCC, 100 head of Italian buffalo were only imported that year and dispersed to different cooperatives nationwide as part of the Paiwi Program (individual, family, and business module) of the PCC.

Table 11. Philippine exports and imports of dairy cattle, 2010 to 2019

Animal	2011	2012	2013	2014	2015	2016	2017	2018	2019
Cattle									
Export									
Quantity (head)	-	1,497	13,689	6,225	-	-	-	10	-
Value ('000 US$)	-	796	10,951	6,567	-	-	-	8	-
Import									
Quantity (head)	15,491	23,275	15,857	20,854	24,762	14,202	1,427	13,107	16,516
Value ('000 US$)	11,094	19,551	18,574	22,117	28,925	16,517	4,162	11,534	16,824

Source: FAOSTAT

2.3.4. Other relevant data (prices)

Farmgate price of cattle for slaughter is the highest at PHP 128.71, closely followed by cattle for fattening at PHP 127.61 and cattle for breeding at PHP 124.41 (Table 12). It was evident that cattle fetched higher prices than carabao in all aspects: breeding, fattening, slaughter, and work.

Primary data gathered in KIIs show a disparity between buffalo and cattle production of almost PHP 30 per liter of raw milk (PHP 62.50 for buffalo and PHP 90 for cattle). PCC states that farmgate price for dairy buffalo milk stands at PHP 65 per liter across the country. Producers close to Metro Manila and hubs with high buying capacity fetch a high amount of PHP 80 while Mindanao producers only price their milk at PHP 60. The competitiveness of locally produced milk comes into question as imported pasteurized fresh milk in retail markets cost only a fraction above PHP 80.00.

Table 12. Average national farmgate prices for carabao and cattle

	2018		2019		2020	
	Backyard	**Commercial**	**Backyard**	**Commercial**	**Backyard**	**Commercial**
Carabao for Fattening	94.22	..	103.72	..	124.19	..
Carabao for Slaughter	101.31	110.27	105.53	123.78	110.28	..
Carabao for Work	92.35	..	101.16	..	107.74	..
Cattle for Breeding	124.41	..	..	..	..	..
Cattle for Fattening	104.27	..	113.02	..	127.61	..
Cattle for Slaughter	117.92	120.66	122.42	124.73	128.71	..
Cattle for Work	105.33	..	110.22	..	120.12	..

Note: [...] Data not available

Source: PSA

Among the regions, the highest farmgate price for backyard producers listed in Table 13 is in Region II for both cattle and carabao (PHP 187.69 and PHP 165.16 per kg, respectively) while the lowest is in Region VI for cattle at PHP 92.3/kg and carabao in Region X at PHP 82.65/kg. PSA's data does not include prices for raw milk.

Commercial prices are relatively higher than backyard scale. Cattle for slaughter is also significantly higher than carabao. Both commodities are recorded the highest in Region III at PHP 183.33 per kg for cattle, and PHP 161.36 per kg for carabao (Table 14). Moreover, some regions do not have recorded average prices for commercial prices which infer that there may not be commercial scale operations in these regions.

Table 13. Backyard farmgate price for carabao and cattle for slaughter (peso per kg)

Region	2018		2019		2020	
	Carabao	Cattle	Carabao	Cattle	Carabao	Cattle
CAR	108.53	129.68	109.78	138.23	119.9	139.33
Region I	117.16	130.04	121.36	139.08	129.48	142.47
Region II	153.8	163.51	159.93	172.9	165.16	187.69
Region III	102.36	118.97	109.66	122.5	111.22	129.61
Region IV-A	103.22	111.85	106.7	121	105.9	124.77
Region IV-B		144.5		154.76		163.25
Region IX	87.61	110.61	81.86	105.75	88.85	117.75
Region V	131.76	141.61	134.39	144.95	131.87	148.77
Region VI	77.8	87.98	83.44	90.23	87.98	92.3
Region VII	73.37	87.69	82.71	93.49	93.43	103.19
Region VIII	129.6	120.21	130.99	107.38	129.22	107.1
Region X	78.16	87.02	80.3	91.19	82.65	97.61
Region XI	91.61	119.47	102.17	128.78	101.52	137.66
Region XIII	82.85	101.24	87.23	103.43	94.85	104.63
Region XIII	80.53	98.88	89.61	104.72	101.47	112.06
ARMM		133.41		140.37		150.95

Source: PSA

Table 14. Commercial farmgate price for carabao and cattle for slaughter

Region	2018		2019		2020	
	Carabao	Cattle	Carabao	Cattle	Carabao	Cattle
CAR	124.98	134.58	129.71	142.86	127.72	147.76
Region I		131.6		142.32		139.07
Region II	107.86	109.76	125.22	110.18	125.89	120.21
Region III	130.39	158.67	155	170.49	161.36	183.33
Region IV-A		115.95		116.83		130.14
Region IV-B		169.4		158.85		164.99
Region V	107.94	134.21	111.4	153.43	124.3	146.23
Region VI		96.45		91.43		98.83
Region VII		73.69	95.54	59.17	90.71	
Region VII		90	91.14		80.7	
Region X		108.25		114.07		111.48
Region XI	75	99.18	75	109.28	75	119.51
Region XI	75	99.58	75	99.19	112.5	122.63
Region XII		118.09				
Region XIII			100		106.83	
ARMM						

Source: PSA

3. Competitiveness assessment[4]

Cost and returns data for swine, chicken and dairy production were collected from key informant interviews and previous literature to assess the profitability and competitiveness comparing the backyard and commercial scale of operations.

3.1. Swine

Table 15 presents the assumptions for the cost and returns data for swine production, covering both backyard and commercial scale. Operations are of the hog fattening/finishing type and involves two cycles per year. Considerations also include the number of head by operation scale, liveweight, mortality rate and estimated value of selected costs. Projections are also estimated at 6 years for commercial and 3 years for backyard, in the assumption that these are the lifespan of swine housing. The source for costs and returns figures is Curibot et al (2019) using 2020 prices.

Table 15. Assumptions for swine production cost and returns

Item	Backyard	Commercial
Operation type	Hog fattening/finishing	Hog fattening/finishing
Cycles per year	2	2
Number of head at 90kg liveweight	40	1,408
Mortality rate	1%	1%
Repairs and maintenance, yearly	1% of building, vehicle	1% of building, vehicle
Land value	1,187,186.57	15,351,550.51
Land rent	10% of land value	10% of land value
No. of years used in projection	3	6

Estimated cost and returns for backyard and commercial scale operations are presented in Table 16. About PHP 151 thousand is invested in backyard operation for building (with lifespan of about three years) and vehicle; while it is about PHP 3.5 million for commercial operation (housing with lifespan of about six to 10 years). In the year presented, a commercial farm with 1,408 hogs can incur net income of about PHP 4.9 million, which is about 40 percent beyond the initial investment on housing and vehicle. Meanwhile a backyard farm with 40 hogs can collect income of about PHP 47 thousand, which is about 30 percent of the initial investment on housing and vehicle. Comparatively, the data suggests that net return per kg liveweight is almost three times higher in commercial operation at PHP 39.15, versus PHP 13.06 in a backyard operation.

In terms of operating costs, ratio to gross returns is 89 percent for backyard operation, and 68 percent for commercial. Among cost items, feeds has the highest share in commercial operation (57.2%), followed by cost of stocks (hogs for fattening) (22.5%). For backyard, cost of feeds likewise has the highest share in operating costs (36.7%), followed closely by land rent (30.0%). But overall, estimated cost per kg liveweight is lower in commercial operation (PHP

[4] Multi-year cash flow projections are being validated with industry experts. Finalized cost and return tables will be included in the succeeding report.

81.62) than in backyard operation (PHP 107.71). The only cost item wherein backyard is lower than commercial is in cost of feeds (about PHP 40 in backyard and PHP 47 in commercial).

Six-year period projections for commercial scale indicate an internal rate of return (IRR) of 139 percent. The high value comes from the data suggesting that the net returns in the first year already makes up for the estimated investment on the building and vehicle. Net present value (NPV) for the six years amounts to PHP 17.9 million. For backyard operation, a 3-year period projection indicates an IRR of -3 percent, and an NPV of about PHP -34 thousand. Data indicate small disparity between revenue and cost for backyard farming.

Table 16. Cost and returns for swine production, by scale of operation (2018 prices)

Item	Backyard	% share	Commercial	% share
Investment cost	**148,000.00**		**3,450,000.00**	
Building	68,000.00		3,350,000.00	
Vehicle	80,000.00		100,000.00	
Returns	**424,800.00**		**14,952,960.00**	
Output, kg deadweight	3,600.00		126,720.00	
Selling price (PHP/kg liveweight)	118.00		118.00	
Operating costs	**373,612.00**	*100.0*	**9,970,666.00**	*100.0*
Cost of stocks	64,000.00	*17.1*	2,252,800.00	*22.6*
Cost of feeds	137,692.00	*36.9*	5,724,007.00	*57.4*
Cost of veterinary supplies	4,320.00	*1.2*	114,480.00	*1.1*
Electricity and water	15,600.00	*4.2*	26,968.00	*0.3*
Labor	36,000.00	*9.6*	352,411.00	*3.5*
Land rent	116,000.00	*31.0*	1,500,000.00	*15.0*
Net returns	**51,188.00**		**4,982,294.00**	
Cost per kg of liveweight	103.78		78.68	
Net return per kg liveweight	14.22		39.32	
IRR	2%		144%	
NPV (10% discount rate)	74,937.08		18,249,189.25	

Source: Curibot et al (2019)

3.2. Chicken

3.2.1. Broiler cost and returns

For broiler, cost and returns (Table 18) assumes six cycles per year, traditional/conventional housing and 500-bird capacity for backyard operation, and tunnel vent housing and 10,000-bird capacity for commercial operation,[5] and by scale of operations, different mortality rates and number of years used in the projections (similar to that of swine) (Table 17). There are also assumptions on land rent, and repairs and maintenance.

Table 17. Assumptions for broiler production cost and returns

Item	Backyard	Commercial
Cycles per year	6	6
Housing type	Traditional	Tunnel vent
Capacity (number of birds)	500	10,000
Mortality rate	4%	2%
Repairs and maintenance, yearly	(used collected data)	1% of building, equipment
Land rent (PHP)	(used collected data)	10% of land value of PHP 796,347
No. of years used in projection	3	6

Note: source for land value for commercial operation: Curibot et al (2019) using 2020 prices

Hosing and equipment investment for a 500-bird backyard farm is estimated here to cost close to PHP 89 thousand (housing that could last for about three years), while for a 10,000-bird commercial farm, the amount is PHP 3.12 million (housing that could last for about six to 10 years) (Table 18). In the year presented, the scale of the backyard farm can get net returns of about PHP 53 thousand, which is about 60 percent of the initial investment on housing and equipment. Meanwhile, the commercial farm can incur PHP 918 thousand net returns from sales of liveweight chicken, which is about 29 percent of the initial investment on housing and equipment. The data further suggests that net return per kg is higher in backyard operations than commercial operations (PHP 11.51 versus PHP 8.68). In this case, selling price is lower in commercial than in backyard farming. Presence of economies of scale and lower cost of inputs, especially for commercial operators with feed milling, affect differences in prices. Based on data collected, cost per kg of chicken is lower in commercial operations (PHP 59.64) than in backyard operation (PHP 70.61).

Looking closely at the costs, operating costs is more than 80 percent of gross returns in both backyard and commercial operation (86% in backyard, 87% in commercial). Among the different cost items, feeds compose a major chunk of expenses in both backyard (62.2%) and commercial farming (52.3%), followed by cost of day-old chicks. The third highest cost in backyard is labor, while in commercial it is repair and maintenance. Comparatively, on a per kg liveweight basis, cost of feeds, utilities and labor are higher in backyard than commercial; while cost of veterinary supplies, and repair and maintenance are higher in commercial than backyard. It is noted that a tunnel vent housing is relatively costly, hence affecting repair and

[5] Traditional/conventional housing uses wood and/or bamboo or rattan slats for the frame, and galvanized iron (GI) sheets or nipa and cogon as roofing. Tunnel vent housing uses wood, GI sheets, aluminum/poly-vinyl carbonate (PVC), and other building materials, and has a ventilation system that removes excess heat and moisture, as well as minimizes dust and odor.

maintenance expenses. But overall, as previously mentioned, cost per kg is lower in commercial than backyard operations.

Using a three-year period projection, IRR is 36 percent for backyard, with NPV amounting to almost PHP 43 thousand. For commercial operation, projection indicates an IRR of 25 percent and NPV of PHP 1.3 million of net income for six years.

Table 18. Cost and returns for broiler production, by scale of operation (2018 prices, PHP)

Item	Backyard	% share	Commercial	% share
Investment cost	**27,100.00**		**3,200,000**	
Housing	2,600.00		2,500,000	
Equipment	24,500.00		700,000	
Returns	**35,986.00**		**9,582,155.00**	
Output, kg liveweight	334		124,015	
Selling price (PHP/kg liveweight)	108		77	
Sales of chicken			9,549,155.00	
Sale of sacks			33,000	
Operating costs	**26,004.00**	*100.0*	**8,820,0000**	*100.0*
Cost of day-old chicks	5,120.00	*19.7*	2,640,000.00	*29.9*
Cost of feeds	16,500.00	*63.5*	5,700,000.00	*64.6*
Cost of veterinary supplies	608.00	*2.3*	252,000.00	*2.9*
Electricity, fuel and water	1,200.00	*4.6*	58,500.00	*0.7*
Labor	2,216.00	*8.5*	94,500.00	*1.1*
Land rent	360.00	*1.4*	75,000.00	*0.9*
Net returns	**9,982.00**		**736,620.00**	
Cost per kg, liveweight	77.86		71.12	
Net income per kg, liveweight	29.89		5.94	
IRR	29%		10%	
NPV (10% discount rate)	16,374.21		8,172.14	

Source of data: Curibot et al. 2019

3.2.2. Layer cost and returns

For layer, cost and returns data covers 100-layer backyard operation and 10,000-layer commercial operation. Assumptions include, 80 weeks of production period, with a per production cycle of 42.5 weeks for backyard and 45 weeks for commercial. Mortality, selected price and cost, and years used in the projections are also indicated in Table 19. Moreover, the cost and returns data presented are for two years, one in 2020 and then a projected Year 2, in consideration of the production period of layers.

Table 19. Assumptions for layer production cost and returns

Item	Backyard	Commercial
Number of layers (ready to lay pullets)	100	10,000
Productivity period of layers (weeks)	80	80
Length of one productivity cycle (weeks)	42.5	45
Laying productivity rate	80%	80%
% broken eggs per day	2.5%	2.5%
Selling price of egg (PHP)	10.00	5.62
Mortality rate	6%	9%
Repairs and maintenance, yearly	1% of housing, cages, equipment	(used collected data)
No. of years used in projection	4	6

Note: source of data and assumptions: KIIs, 2021

As previously mentioned, the cost and returns data presented are for two years, in consideration of the production period of layers of 80 weeks (Table 20). A starting investment in backyard housing, cages, equipment, ready to lay pullets (RTLP), and working capital can cost about PHP 88 thousand (for 100-layer housing/cages with lifespan of about three to four years). For commercial faming, investment could cost around PHP 8.4 million (housing lifespan of about six to ten years).
Year 1 and 2 data on net returns for backyard operation average about PHP 45 thousand yearly, about half of the initial investment. For commercial, net returns reaches an average of PHP 3.7 million, which is about 45 percent of the initial investment.

Ratio of cost to gross sales is quite close for backyard and commercial operation, at about 80 percent and 71 percent, respectively (average for year 1 and 2). Among the estimated cost items, and similar to swine and broiler production, feeds has the biggest share of expenses in both backyard and commercial layer operations (57% and 93.4%, respectively). In addition, the next major cost item for backyard operation is labor (40 percent). Comparing the data on a per layer basis, costs are generally higher in backyard (close to PHP 2,000) than commercial (close to PHP 1,000). Two specific cost items where commercial cost is higher are in repair and maintenance, and to a small extent, labor (difference of PHP 2 per layer).

Using a three-year period projection, IRR is 44 percent for backyard, with NPV amounting to almost PHP 75 thousand. For commercial operation, projection indicates an IRR of 24 percent and NPV of PHP 3.4 million of net income for six years.

Table 20. Cost and returns for layer production, by scale of operation (2020, PHP)

Item	Backyard			Commercial		
	2020 (Year 1)	Projected Year 2*	% share	2020 (Year 1)	Projected Year 2*	% share
Investment cost	**88,016.24**			**8,406,235.00**		
Housing, cages, and equipment	25,000.00			3,750,000.00		
Ready to lay pullets (RTLP)	40,000.00			3,300,000.00		
Working capital requirement (1.5 months)	23,016.24			1,356,235.00		
Returns	**232,883.00**	**224,550.02**		**12,957,084.00**	**12,700,946.44**	
Sale of good eggs	232,050.00	218,127.00		12,887,784.00	11,727,883.44	
Sale of culled layers	-	5,640.00			910,000.00	
Sale of bags	333.20	313.21		69,300.00	63,063.00	
Sale of manure	499.80	469.81				
Costs	**186,129.92**	**179,652.12**	*100.0*	**9,426,475.00**	**8,692,195.00**	*100.0*
Feeds	108,864.00	102,332.16	*57.0*	9,009,000.00	8,198,190.00	*94.3*
Vaccines	3,265.92	3,069.96	*1.7*	170,000.00	154,700.00	*1.8*
Utilities	1,000.00	1,000.00	*0.6*	20,000.00	20,000.00	*0.2*
Land rent	1,000.00	1,000.00	*0.6*	27,600.00	27,600.00	*0.3*
Hauling expense			*0.0*	3,000.00	2,730.00	*0.0*
Repair and maintenance		250.00	*0.1*	-	92,100.00	*1.1*
Labor	72,000.00	72,000.00	*40.1*	196,875.00	196,875.00	*2.3*
Net returns	**46,753.08**	**44,897.90**		**3,530,609.00**	**4,008,751.44**	
IRR	44%			24%		
NPV (10% discount rate)	74,665.52			3,396,037.51		

*Note: Data in Projected Year 2 does not involve replacement of RTLP, but in the IRR and NPV computations, replacement of RTLP is factored in.
Source of data: KIIs, 2021

3.3. Dairy

3.3.1. Dairy Buffalo/carabao

For dairy buffalo/carabao, the source of data and assumptions is the 20-buffalo milk production module of the PCAARRD using 2020 prices. Some of the major assumptions are presented in Table 21, which include information related to prices, productivity, mortality, and the period of projection considered (10 years).

Table 21. Assumptions for a 20-dairy buffalo/carabao milk production cost and returns

Item	*(PHP in 2020 prices)*
Price of raw milk/liter	62.98
Marketable milk	90% of milk produced
Milk production	6L/day
Breeder stock	20 heifer, 1 bull
Cost of breeder stock (heifer), PHP	34,989.50
Cost of breeder stock (bull), PHP	41,987.40
Breedable heifers	Bulgarian Murrah buffalo or crossbred
Breeding bull	Bulgarian Murrah buffalo
Bull to Cow ratio	1:20
Sex ratio of calves	1:1
Lactation Length:	
- Year 1	45 days
- Years 2–3	250 days
- Years 4–6	275 days
- Years 7–10	300 days
Mortality Rate:	
- Less than 1 year old	8%
- More than 1 year old	4%
Culling	
- Replacement of Breeding Bull	Every 4 years
- Culling of Cows (starts year 4)	10%/year
Calving rate per year	0.65
Projection (IRR and NPV-10%)	10 years

Source: Profitability analysis: 20-cow module buffalo milk production, PCAARRD, 2007

The cost and returns data for a 20-carabao milk production indicate that feeds compose the highest share in production cost (65.1%) followed by labor (33.6%), and a far third, veterinary drugs and biologics (Table 22). In terms of overhead cost, share of land is highest, followed closely by laborer's food cost (28.6% and 24.9%, respectively). Meanwhile, overhead cost composes 27 percent of total cost, i.e. sum of production and overhead.

Production cost is over a third of gross sales, suggesting gross income from sales of about PHP 866 thousand on average annually, using a projected 10-year data. Subtracting all costs, a net profit of about PHP 670 thousand is obtained. Further, if net inventory of animals is considered, the resulting net income is about PHP 717 thousand.

Initial investment for a 20-carabao module could cost an estimated PHP 1.9 million. This includes capital investment and working capital and startup costs.[6] A major component of capital investment is the breeder stocks (about 64%), and for pre-operating cost, animal feeds. A 10-year income projection indicate the amount of initial investment is approximately equivalent to the value of net profit for about four years. Moreover, an IRR of 25 percent, and an NPV of about PHP 2.07 million is estimated from the 10-year net income stream.

Table 22. Cost and returns for 20-dairy buffalo/carabao milk production (2020 prices, PHP)

Item	Amount (Year 0)	Amount (annual average, 10-year projection)	% share
Investment cost	**1,868,566.83**		
Capital investment	1,161,581.53		
Working capital and startup costs	706,985.30		
Gross Sales		**1,372,796.36**	
Income from Sales of Milk		1,136,267.32	
Income from Sales of Animals		236,529.04	
Production Cost		**506,934.84**	*100.0*
- Animal Ration (concentrates)		330,052.40	*65.1*
- Veterinary Drugs		6,413.58	*1.3*
- Farm Labor (direct)		170,468.86	*33.6*
Gross Income from Sales		**865,861.53**	
Overhead Expenses		**195,409.38**	*100.0*
- Land rent (P4,000/ha, 10 ha)		55,983.21	*28.6*
- Repair and Maintenance		6,997.90	*3.6*
- Office and Farm Supplies		6,997.90	*3.6*
- Utilities, Water, and Electricity		11,196.64	*5.7*
- Fuel and Oil		6,997.90	*3.6*
- Food Cost (laborer)		48,705.39	*24.9*
- Indirect Labor		15,395.38	*7.9*
- Fertilizer		9,517.14	*4.9*
- Depreciation		33,617.91	*17.2*
Net Profit		**670,452.15**	
Inventory Adjustments (net inventory)		46,885.93	
Adjusted Net Income		**717,338.08**	
IRR	25%		
NPV (10% discount rate)	2,070,070.95		

Source: Profitability analysis, 20-cow module buffalo milk production, PCAARRD, 2007 (Projected Income statement)
Notes: Figures are in 2020 prices.

[6] Investment cost consists of: Capital investment for heifer and bull stocks, farm equipment, facilities and building; Initial working capital for land rent, utilities and farm supplies, repair and maintenance (Year 1), animal ration, fuel and oil, labor cost, veterinary drugs, pasture establishment.

Investment cost consists of: Capital investment for heifer and bull stocks, farm equipment, facilities and building; Initial working capital for land rent, utilities and farm supplies, repair and maintenance (Year 1), animal ration, fuel and oil, labor cost, veterinary drugs, pasture establishment.

3.3.2. Dairy Cattle/cow

The source of data and assumptions for dairy cattle is the 25-cow milk production module of the PCAARRD, using 2020 prices. Some of the major assumptions are presented in Table 23. It provides information about prices, productivity/production, mortality rate and number of years considered in the projected data.

Table 23. Assumptions for 25-dairy cattle milk production cost and returns

Item	*(PHP in 2020 prices)*
Price of raw milk/liter (PHP)	26.79
Cost of breeder stock (heifer), PHP	60,886.51
Cost of breeder stock (bull), PHP	54,797.86
Sex ratio (male:female)	50:50
Culling rate:	
- Breeding bull	Cull and replace bull every 4 years
- Cows	15% start at year 6
- Calves	2%
Conception rate	1st year-100%, succeeding-80%
Calving rate	1st year-100%, succeeding-95%
Percent of breeding cows on the milkline	1st year-100%, succeeding-76%
Milking period	300 days
Milk production	
- 1st lactation	10L/day
- 2nd lactation onwards	12L/day
Mortality Rate	
- Dams/bulls/replacements/yearlings	2%
- Calves	5%
Projection (IRR and NPV-10%)	10 years

Source: Profitability analysis: 25-dairy cow module, PCAARRD, 2010

Looking at costs using a 10-year projected data (Table 24), annual production cost is largely on feeds/concentrations as 76.7 percent, followed by labor (17.1%). Meanwhile, utilities, water and electricity, and fertilizer compose about two thirds of overhead cost (66.5% combined). Production cost is more than 80 percent of total cost (combining production and overhead).

With production cost about 44 percent of gross sales, the returns data indicate gross income from sales of about PHP 1.3 million. Moreover, considering all costs, there is an average annual net profit of PHP 1.06 million, over the 10-year projection. If the animal inventory on the 10th year, amounting to PHP 203 thousand is factored in, the adjusted net profit amounts to PHP 1.26 million.

PHP 6.16 million is estimated as initial investment for a 25-cow module. This includes capital investment and working capital and pre-operating expenses.[7] As land is assumed to be part of the capital investment, it covers about 53 percent of the cost (capital), followed by the dairy animals (30%). A 10-year income projection indicate the amount of initial investment is approximately equivalent to the value of net profit for about six years. Moreover, an IRR of 13 percent, and an NPV of about PHP 966 thousand is estimated from the 10-year net income stream.

Table 24. Cost and returns for 25-dairy cattle milk production (2020 prices, PHP)

Item	Amount (Year 0)	Amount (annual average, 10-year projection)	% share
Investment cost	**6,159,246.23**		
Capital investment	5,020,701.41		
Working capital and startup costs	1,138,544.81		
Gross sales		**2,270,702.63**	
From sale of milk		1,787,111.54	
From sale of dairy animals		483,591.09	
Production cost		**999,129.20**	*100.0*
Feeds/ concentrates		766,158.67	*76.7*
Mineral-salt mix		13,078.91	*1.3*
Breeding cost		15,221.63	*1.5*
Veterinary drugs and biologics		33,700.68	*3.4*
Farm labor		170,969.31	*17.1*
Gross income from sales		**1,271,573.43**	
Overhead expenses		**210,667.32**	*100.0*
Repair and maintenance		6,088.65	*2.9*
Office supplies		6,088.65	*2.9*
Farm tools		6,636.63	*3.2*
Utilities, water and electricity		73,063.81	*34.7*
Fuel and oil		21,919.14	*10.4*
Fertilizer		67,096.93	*31.8*
Depreciation		29,773.50	*14.1*
Net profit		**1,060,906.11**	
Inventory adjustment (inventory at Year 10)		203,726.25	
Adjusted Net Income		**1,264,632.37**	
IRR	13%		
NPV (10% discount rate)	966,314.18		

Source: Profitability analysis: 25-dairy cow module, PCAARRD, 2010 (Projected Income statement)
Notes: Figures are in 2020 prices. Inventory adjustment added.

[7] Investment cost consists of: Capital investment for heifer and bull stocks, land, farm equipment, facilities and housing, pasture establishment; Initial working capital for utilities and farm supplies, repair and maintenance (Year 1), fuel and oil, labor cost, breeding cost, veterinary drugs and biologics, business permit fee.

Investment cost consists of: Capital investment for heifer and bull stocks, land, farm equipment, facilities and housing, pasture establishment; Initial working capital for utilities and farm supplies, repair and maintenance (Year 1), fuel and oil, labor cost, breeding cost, veterinary drugs and biologics, business permit fee.

4. Key Challenges

4.1. Swine

The presence of viajeros remained one of the biggest challenges for both commercial and backyard hog raisers in the country. Interviews from commercial farm representatives revealed that this trading system doesn't exist in swine farms they have visited abroad. They lamented that the majority of the net sales goes to these viajeros instead of the producers (Interview, Cooperative Swine Farm, Batangas, 06 August 2021). One of the best practices they have seen in commercial farms abroad was the centralized slaughtering and cutting or processing of pork. This will not only enhance the quality of pork but also better control on market prices.

Prices of production inputs like feeds and veterinary supplies are also crucial in the overall success of the industry. However, the fluctuating prices have negative impacts in production especially for backyard hog raisers. One of the perceived competitive advantages of Cooperative Swine Farm that was interviewed was they produce their own feeds. This also had put them in a better position despite the ASF pandemic.

However, commercializing productions also give rise to other issues. The fast development of agricultural land for residential areas is affecting existing large-scale farms (Escandor, Amurao, Santos, & Benigno, 2020). This has an effect in the zoning of areas as well as securing permits. This is on top of different requirements and permits that have to be ensured to operate farms which require additional costs. Moreover, these regulations are being extended to backyard farmers, which is discouraging them to continue operations.

Amidst the struggle of the whole swine industry due to the effects of the ASF pandemic, the promotion of imported meat didn't help the local producers. In fact, a representative of one of the biggest commercial swine federation shared that their members cried foul as they felt there were no proper consultation from the industry leaders prior the implementation of the pork importation to address the supply of pork in the country (KII, President, Commercial Swine Federation, 11 August 2021). Members of the pork association federations also shared that as much as they are willing to share information to relevant agencies, the brewing distrust between the swine industry sector and the government agencies hampers the sharing of relevant information essential for informed policy making.

Lastly, COVID restrictions further hampered the movement of pork across borders. Permits have to be secured for every LGU that the product passes through. There is a need to consolidate these permits to reduce transportation costs, facilitate the swift movement of meat and meat products, as well as ensure that all products are safe for public consumption.

4.2. Poultry[8]

Industry players and specialists say that the Philippines is competitive in growing chicken. However, there are challenges in the industry that are affecting the performance of farms and the industry as a whole.

Philippine performance, for instance in terms of feed conversion ratio (FCR),[9] is described to be as good as that of its ASEAN neighbors. However, cost of inputs in the Philippines are higher in comparison. For instance, cost of production is pushed up by the high cost of feeds. Corn is an important component in feed formulation, composing about 50 percent of feeds by volume (about 70% of cost). Local corn, however, is more expensive that imported corn (PHP 22-24 versus per bag); hence, prompting industry players (integrators, feed millers) to prefer importation. Feeds can account for up to 70 percent of production cost; with backyard farms experiencing up to 80 percent of cost as corn is priced as high as commercial feeds. Within the Philippines, there is also concern in terms of corn quality. There are growth areas in the country that have no post-harvest facilities[10] which would ascertain quality in terms of moisture and toxin level that support desired qualities for storage and transport.

Logistics is also one component that is adding to the costs. For one, inter-island shipping costs has been observed to be high in the country.[11] Importing corn from Thailand, for instance, is observed to be cheaper than transporting corn from the southern Philippines to the main island of Luzon. In addition to corn, chicken and chicken products are also being transported from Visayas and Mindanao to Luzon, where there is majority of demand for chicken. And from Luzon, machineries for production are being transported to Visayas and Mindanao. Farms farther from commercial roads and that would have no farm-to-market roads also experience increased cost. Charges/fees for products crossing some local government boundaries also places additional cost.

Backyard farmers experience low productivity, high mortality especially the beginner-farmers, and inconsistent quality and supply. They lack access to technical support in terms of technology/research and development; business mentoring/advisory for instance on financial management, keeping records, securing original receipts which would be needed for transacting with companies; other extension services; as well as access to finance to help them expand their operations.

Furthermore, while there is some available information and data on important aspects of the industry, they are inadequately being publicized. Data on inventory, demand, importation, and other relevant market that are available come from different sources, and updated, timely release is a concern. Industry players have since communicated to the government the importance of having an information network/system which will be accessible to industry stakeholders. The availability of such market data became very important as the ASF and COVID-19 pandemic affected farm operations and consumer demand.[12] Moreover, there is no

[8] References for this section are the key informant interviews in 2021, Gonzales et al (2012), and Chang (2007).
[9] A productivity indicator computed as the ratio of animal weight at sale, to total feed consumed, on average.
[10] Moreover, according to a key informant interview, drying facility is be an important facility that the government can invest in.
[11] About 20 percent of total cost of goods, compared to less than 10 percent in other ASEAN countries, according to a key informant interview.
[12] For example, there was information shared from interviews that there was oversupply of eggs, and farmers resorted to burying unsold eggs.

official data on backyard and commercial production in poultry, which would have been useful in analyzing the performance and better targeting of industry programs.

Interviews with key informants suggest that participatory engagement between the government and private sector is not strong, for example in consultations for policymaking. Among others, importation and the competition with local industry appears to be a lingering issue. A roadmap for the industry, which is an implementation of the AFMA, could address challenges and issues toward productivity and competitiveness.

4.3. Dairy

It has been a general concern in the dairy industry that there is a small market demand for locally produced milk. Filipino consumers are not generally fresh milk drinkers and would prefer imports for processed products, including powdered milk.

A compounding concern is the logistics and packaging requirement which is an inherent challenge to the Philippines being archipelagic. Producers in KIIs have also reported milk spoilage during the pandemic. Raw milk must be refrigerated or sterilized to extend shelf life, but this entails large capital investment. A process contract with San Miguel is a temporary fix, but sterilization machinery and facilities are necessary investments in the long run.

The pandemic introduced an emerging problem in the extension aspect, particularly in information dissemination and technology transfer. The limitations on face to face interactions have fostered slow response from the farmers to new initiatives and policies. In prior cases, initiatives are seen beforehand to encourage adoption, but today's setting has made it difficult to measure the depth of engagement. For instance, dairy buffalo producers lack technical knowledge to detect animals in heat, resulting in non-pregnancy and reproductive inefficiency.

To revamp the dairy industry and to address its three pressing problems on market, herd inventory, and productivity, industry experts highlight prioritization of local genetic supply and foundation stocks. Following good genetics are good farm practices. This involves looking in depth into processing and marketing and establishing benchmarks of quality and handling. Facilities and machinery are necessary in the chain to ensure standard pasteurization and packaging before the products reach the market and consumers. Allowing direct provision to government health and food programs can be a way to ramp up consumption.

The industry can take advantage of the high demand of affluent consumers for fresh milk and products of native animals. Processed dairy products (e.g. cheese) can also be considered for export. But for the local dairy industry to be more competitive with the ability to substitute imported products, much investments have to be poured into production and process improvements, including technology, equipment, animal inventory and manpower capacity upgrades.

5. Assessment of current policies and programs

5.1. Relevant policy

Food safety (including drugs)
The Food Safety Act of 2013 (RA 10611) protects the public from food- and water-borne illnesses and unsanitary food. Two executive departments are mandated to oversee its implementation: the DA on monitoring fresh produce and meat; and the Department of Health (DoH) on packaged and processed food. The DA also implements the Meat Inspection Code of 2003 (RA 9296), which assigned the DA-National Meat Inspection Service (NMIS) to accredit exporting establishments in terms of hygiene and sanitation standards before they can send meat and food products in the country. A Meat Inspection Board (MIB) was also created to serve as the technical working group that looks into meat inspection and hygiene (Escandor, Amurao, Santos, & Benigno, 2020). Farm inputs like veterinary medicines are also monitored to ensure quality and safety. The Food and Drug Authority (FDA) Act of 2009 (RA 9711) and the DA Administrative Order (AO) 24 also regulate injectable veterinary drugs and chemicals and supplements that are incorporated in the feeds and drinking water of animals (Archawakulathep, Kim, Meunsene, 2014). These measures are also in place to avoid antimicrobial resistance due to improper use for animal drugs.

Disease management and surveillance
Disease management and surveillance are considered one of the most crucial control mechanisms especially with the persistent threat of zoonotic diseases like ASF.

Importing countries need to comply with importation procedures for live animals in accordance with DA Memorandum Circular 12 s2017. Animal movement within the country is also regulated. The DA Administrative Order 19 s2006 requires owners and subcontractors that all animals being transported are healthy by undergoing proper testing and acquiring certain certificates or passes. Some of the requirements include: livestock handlers license; veterinary health certificate; shipping permit; identification documents of both animals and owners; and journey plan.

Since the first ASF outbreak in 2019, the DA also implemented control strategies to mitigate the spread of the disease in the country. Through the DA Administrative Circular No. 12 s2019, zoning schemes, destocking, indemnification, and movement restrictions were strictly implemented across the country.

Environment and animal welfare
The Animal Welfare Act of 1998 (RA 8485) serves as the overarching law that promotes animal welfare in the country. It designates BAI to oversee and maintain safety and sanitary standards in animal keeping, including livestock and poultry production. To further ensure proper treatment and handling for swine, the DA also implemented AO 41 s2000 that summarizes standard operating procedures for proper animal care in hog farms, including during slaughter.

The Department of Environmental and Natural Resources (DENR) in compliance with Presidential Decree 1586 also requires registered farms to have environmental impact management plans, site development plans, wastewater treatment facility, and air pollution control facility to ensure that the environment is being protected.

Among LGUs, the Comprehensive Land Use Plan (CLUP) is a document that rationalizes the allocation and proper use of land resources, planning public and private land use in accordance with current and future requirements of a community. It classifies lands into zones or sub-zones, including those for agricultural production purposes, through local ordinances. A well-crafted CLUP is necessary to allow the sustained growth and operation of local livestock and poultry enterprises, while conforming to land use zonal classifications, and preventing issues with local settlements and ecological integrity concerns.

5.1.1. Swine

Tariff protection is the country's main trade policy tool. It is applied in 14 agricultural products and livestock, including live swine, goats, poultry, meat, and corn (OECD 2020). Exempted in this list are live horses, live bovine animals, and beef. Milk products receive 0-3 percent tariff, while corn MFN tariff is at 50 percent (35% in-quota). Corn tariff is a double-edged sword as it protects local crop growers, while raising the cost of animal feed for poultry and livestock, as the grain comprises about 50 percent of local feeds used (Sison 2014). To illustrate, the farmgate price of corn in 2018 the Philippines was 87 percent higher than that in the USA, explaining why the price of feed (PHP/ton) was at 24,000; more than double that of the US (10,813) and Brazil (11,669).

5.1.2. Swine special topic: African Swine Fever

In May 2021, the President released Proclamation 1143 which placed the whole country under a state of calamity due to the ASF outbreak (Gita-Carlos 2021). This enjoined all government agencies and LGUs to mobilize resources to mitigate the spread of the virus, assist local hog producers, and address supply deficits to maintain affordable prices for pork products.

To maintain affordable meat supply in the market, Executive Order (EO) 133 s2021 (Section 1) was released to increase the minimum access volume (MAV) of pork meat from 54,210 metric tons (mt) to 254,210 mt this year (Parrocha 2021). The Cabinet also issued the guidelines additional minimum access volume (MAV+) for the 200,000 mt, which divided the shipments to two batches: 140,000 mt or 70 percent should arrive within July to October 2021; and the remaining 60,000 mt or 30 percent, should arrive from November 2021 to January 2022 (DA Comms Group, 2021). To further protect consumers, EO 124 s2021 was released to set the price ceiling of pork and poultry, particularly in Metro Manila. It was followed by another EO which temporarily modified MFN rates for pork imports (fresh, chilled, frozen) from 10 percent to 30 percent (in-quota) and 20 percent to 40 percent (out-quota) after the 12th month of effectivity.

To encourage hog raisers to continue the business, DA launched a PHP 29.6 B twin program: the Integrated National Swine Production Initiatives for Recovery and Expansion (INSPIRE) and the *Bantay ASF sa Barangay* (BABay ASF) (Abao and Haas 2021). The former focused on hog repopulation and in ensuring stable supply of pork and pork products, while the latter enhanced biosecurity processes to halt the spread of the virus. The latter program had a total of PHP 1.5 billion budget for small loan programs to encourage backyard and semi-commercial swine producers in ASF-free regions. This fund is available through the DA-Agricultural Credit Policy Council and the Landbank of the Philippines (LBP) to support the restocking initiative in ASF affected areas.

The Office of the President also released EO 105 s2020 establishing a national task force to create policies and develop strategies to manage, contain, and control animal-borne diseases, including animal movement controls, quarantine, biosafety, surveillance, and waste disposal (Parrocha 2020).

The Animal Health and Welfare Division of the BAI also released an ASF contingency plan that provided guidelines for agencies and relevant stakeholders in implementing strategies to address the ASF spread in the country (BAI 2019). This document contained specific procedures for diagnosis, and enumerated prevention strategies for ASF spread, like banning pork imports, avoiding swill feeding, regulating entry at international ports, and conducting awareness campaigns.

5.1.3. Poultry

Some of the existing policy includes the EO 82 s2019, which reverted tariff rates for mechanically deboned poultry from 40 percent to 5 percent until end of 2020. The same was extended in 2021 thru EO 123 declaring that the current MFN tariff rate will be effective until December 2022 (Ochave 2021). Keeping the low tariff will prevent price increase in canned and processed meat products in the country, as mechanically deboned poultry meat is a main ingredient in processed canned goods.

There are Philippine National Standards (PNS) for eggs and egg products. One is the PNS for table eggs (PNS/BAFPS 35:2005), which states the minimum requirements being: fresh, clean and free from visible cracks, must be practically normal in shape, and must be free from foul odors. Another is the Code of Hygienic Practice for Eggs and Eggs Products (PNS/BAFS 209:2017) which is centered on hygienic and safety handling methods in the primary production of eggs and egg products for small and large-scale producers, aimed at addressing Salmonella and other microbial risks.

5.1.4. Dairy

Given the low market demand for fresh milk, the national government has put in place a milk feeding program subsequently addressing poverty and malnutrition issues while providing steady income flow to dairy farmers. This initiative is backed by the following policies.

RA 7884 also mandates any government nutrition program to source their milk supply from local producers upon coordination with NDA. Echoing this objective is Republic Act 11037 or “Masustansyang Pagkain para sa Batang Pilipino” largely overseen by DSWD and LGUs. It established supplementary feeding programs which incorporated fresh milk and milk-based products in meals given to undernourished children two to five years of age. A recent tie-up on a 120-day milk feeding program was conducted by DSWD and DA-PCC last April 2021, covering eight cities (Olangapo, Angeles, Lucena, Puerto Princesa, Iloilo, Tacloban, Zamboanga, and Bacolod) across the country with a total of 10,619 beneficiaries. Each child was provided 200 ml toned carabao’s milk for 120 days (PCC 2021).

Another supporting legislation is RA 11148 or the Kalusugan at Nutrisyon ng Magnanay Act which is a joint health feeding program directed especially to lactating women for the first 1000 days of a child’s life.

In line with all of these, an Inter-agency Milk Feeding Committee (IMFC) is tasked to oversee all milk programs and ensure transparency of transactions to feeding programs.

Apart from appropriated funds, the NDA is also carrying out a build-up of the Philippine Milk Fund accessible to local governments and other co-sponsors to encourage dairy production.

While there were RA 7307 or the Philippine Carabao Act and RA 7884 or the National Dairy Development Act of 1995, which were respectively intended to promote carabao and dairy production in the country, dairy production and processing still failed to take off. However, small islands of success in upgraded carabao and dairy cattle enterprises, particularly those supported by the government through cooperatives, show glimpses of local viability.

5.1.5. COVID19-related

Policies implemented during the COVID pandemic promoted the continuation of all agriculture-related activities, exemption from home quarantine of farmers provided that they follow safety protocols, opening of agricultural stores and animal clinics, and facilitated movement of essential farm personnel and food products through quarantine checkpoints (OECD 2020).

DA released food lane passes that allowed vehicles to transport essential food items across controlled areas, while the Philippine National Police (PNP) assigned cargo lanes for all forms of conveyance. This ensured the steady supply and access to essential food items by affected communities. All products and services from agricultural production to marketing were allowed to pass through quarantine checkpoints, although live poultry and livestock, including meat and meat products were required proper documentation based on DA Memorandum Circular No.5 2020.

5.2. Ways forward

Under mostly private sector stewardship, the livestock and poultry industries had manifested consistent growth for decades until recent shocks brought about by COVID19 and ASF starting 2019 affected sector performance. The dairy sector, although with policy prompting from passed legislations, still failed to take off. Government support were mostly through biosecurity and food security measures, inventory and stock upgrades, and protection from cheap imports (except for milk and dairy products).

Biosecurity measures on ASF were articulated to be mostly responsive and apt among commercial farms, contrary to the zero to minimal compliances among smallholder backyard producers. This implies that smallholder growers must be incentivized to actively contribute to disease control and management. The disclosure of localized disease transmission is hindered by the threat of losing big money. A mechanism for fair compensation and enterprise survival support must be put in place to effectively enjoin the cooperation of small growers in disease surveillance and control.

Industry insiders have indicated that poultry meat supply in the country depends mostly on commercial production, with very minimal share from backyard producers albeit their high inventory figure from them. Small raisers can take advantage of the growing native chicken industry, where there is a premium on the meat produced. The national government, including agricultural research institutions and the academe, can look more into native genetic improvement and breed stabilization, and facilitate their access to local markets.

For the local dairy industry to be more competitive with the ability to substitute imported products with domestic produce, much investments have to be poured into production and process improvements, including technology, equipment, animal inventory and manpower capacity upgrades. Additional legislation may also be required for institutional augmentation. There may be sense in possible organizational complementation and merging between PCC and NDA considering that they are dealing with large ruminants with similar husbandry requirements, and dairy products with comparable processing and marketing requisites. The seeming monopoly of government in dairy animal importation and genetic improvement must also be opened up to the private sector to facilitate inventory buildup.

Even with the pronounced advantages of commercial production setups, backyard growing still dominated for livestock, poultry and dairy. While this offered livelihood opportunities for smallholder farmers by taking advantage of family labor and available household resource, it is prone to operational inefficiencies and regulatory disadvantages. Backyard enterprises often contribute to local land use zoning conflicts, ecological integrity issues, biosecurity and food safety concerns.

But backyard industries can be made more efficient and profitable through apt cross-sectoral oversight, appropriate technology, good animal husbandry practices and applicable product standardization and packaging. Family owned and operated backyard set-ups must be operated as viable enterprises similar to commercial farms, while ensuring regulatory compliance in both production and marketing operations.

Smallholder growers can also benefit from proper organization. This will aid in the leveraging of stakeholder interests, as well as in the application of appropriate regulatory provisions from government. Capacity augmentation and technology transfer are also better channeled and implemented through organized groups. Such prompt us to revisit the farmer organizations as vehicles in addressing concerns on farmers' welfare and industry development. Both the national government and local government units have important roles to play in promoting sustained industry growths, while ensuring compliance with ecological integrity, land use zoning and bio-security statutes. Private-led livestock and poultry industries must be allowed to flourish, while addressing concerns on environmental pollution, conflicts with local settlements, and the spread of diseases.

Production and market risks and cross-cutting issues at both domestic and global levels necessitate a serious look at institutional strengthening. The private sector must be continuously incentivized to lead domestic industries, but the current risk landscape requires a more capable central authority that will look at both tactical and strategic options for sustained growth in the swine, poultry and dairy industries. Appropriate research and monitoring platforms must also be in place within industries to allow for responsiveness and proactivity.

Given the above findings, the study recommends the following:

1. Organize backyard producers into farmer organizations (FOs), and make membership in accredited FOs mandatory to receive government support
2. Link government policies and programs with FOs to a) facilitate delivery of services b) effectively enforce regulation and disease management measures
3. Equip LGUs to rationalize land use, organize and build capacity of FOs, and enforce food safety, health, environment, and animal welfare regulation
4. Incentivize individual smallholder growers to better participate in disease surveillance and control, and institute their own biosecurity measures and compliances.

5. Develop strategic plans and development roadmaps for swine, poultry and Dairy industries, including long term inventory and genetic improvement for dairy cattle and buffalo, with appropriate investment programming
6. Revisit policy on value chain components, including the production and trade of critical feed inputs like corn for poultry and swine, and forage and concentrates for dairy cattle and carabao
7. Build capacity among smallholder growers to improve productivity and farm to market linkage; encourage young entrepreneurs and the use of digital/online platforms
8. Invest on and sustain research and data collection as inputs to policy (animal health and performance, genetic improvement and native animal development, feed and feeding technology, product and market development, value chains and trade)
9. Pursue standardization of products, particularly, processed meat and dairy, and their packaging
10. Work on genetic improvement and inventory buildup for swine, poultry and dairy, including native animal improvement and breed stabilization, and market development.
11. Augment/strengthen institutional oversight at the industry and national levels for responsiveness, proactivity and sustained commodity system development

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