Component Two

Environmental Resources and their Use

COMPONENT TWO

ENVIRONMENTAL RESOURCES AND THEIR USE

Environmental resources are defined as "the naturally living and non-living components of the Earth, together constituting the biophysical environment, which may provide benefits to humanity"[3]. In this light, Component 2: "Environmental Resources and Their Use" focuses on the stocks and changes in stocks of these resources brought about by human activities. Statistics under this component are mostly concerned with the monitoring of the availability, consumption and use of environmental resources.

Component 2 is deeply connected to the Physical Flow and Asset Accounts of the System of Environmental-Economic Accounting (SEEA) 2012 Central Framework. These accounts aid policymaking on the consumption and use of environmental resources. The main goal of the flow accounts is to record the physical amount of resources from the environment, within the economy and back to the environment. Asset accounts, on the other hand, are used to monitor the stocks of environmental resources and the changes in these stocks due to natural regeneration, extraction, reappraisals, reclassification and catastrophes. A number of the statistics compiled in this component, particularly those that concern the stocks and the extraction and use of resources, are essential in compiling these accounts.

This component also contains statistics needed to derive indicators necessary in monitoring the achievement of the Sustainable Development Goals (SDGs). Most of the core indicators recommended under the component are anchored on issues like food security (SDG 2), availability of clean water (SDG 6), sufficiency of energy (SDG 7), and maintenance of life on water and land (SDGs 14 and 15, respectively). Forests are also given emphasis for their numerous benefits—provision of resources and mitigation of global warming (SDG 13). Overall these statistics are linked to the end goals of responsible consumption (SDG 12), sustainable growth (SDG 8), and innovation (SDG 9).

There are six subcomponents in Component 2, as stated in the FDES. These are mineral resources, energy resources, land, soil resources, biological resources and water resources. However, only four of these subcomponents were covered in this compendium. Twenty three out of the 30 core statistics in Component 2 recommended in the revised version of the FDES 2013 were compiled for 2016. Details covering the compilation of these statistics are detailed per subcomponent below.

[3] System of Environmental-Economic Accounting 2012 Central Framework

2.1 Mineral Resources

Minerals are defined as the "elements or compounds composed of a concentration of naturally occurring solid, liquid, or gaseous materials in or on the earth's crust"[4]. These include metals like gold, silver and aluminum, and non-metals like precious gems, sand, and clay. By definition, coal and petroleum resources are also considered as non-metallic minerals, but due to their capacity to provide energy, they are included in Subcomponent 2.2. Energy Resources.

Mineral resources do not regenerate on any human timescale, and thus are considered non-renewable. This implies that the rate at which they are extracted is also the rate of their depletion, and points to the concern on the monitoring of the availability and extraction of these resources. FDES 2013 recommends that the stocks of commercially recoverable mineral resources and the levels of extraction for each resource be recorded.

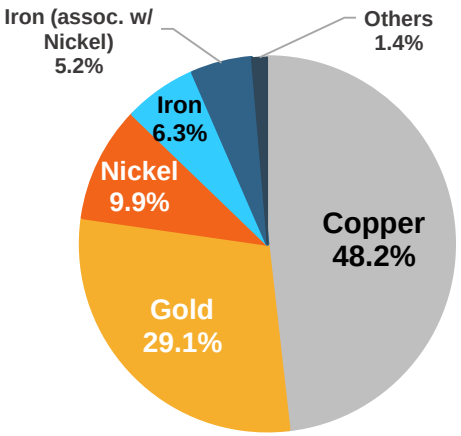
2.1.1 Metallic and Non-metallic Mineral Resources/Reserves

The Mines and Geosciences Bureau provided the Mineral Resource/Reserve Inventory as of 2015 and Volume of Mineral Production for 2006 to 2015 for the core statistics under this topic.

The Metallic Mineral Resource/Reserve Inventory shows the amount of reserves of ten (10) metallic minerals, with copper and gold having the largest and second largest shares at 7.38 billion metric tons (MT) and 4.46 billion metric tons, or 48.1 percent and 29.1 percent of the total amount of reserves, respectively. The SOCCSKSARGEN is the richest region with these two minerals, having 4.28 billion MT and 2.27 billion MT of copper and gold in deposits, respectively.

Nickel, iron and iron associated with nickel also comprise 9.9 percent, 6.3 percent and 5.2 percent of the total amount of metallic reserves, respectively. Other metallic minerals that can also be found in the country are aluminum, chromite, silver, zinc and manganese.

Figure 2.1. Percent Distribution of Metallic Minerals in the Philippines in 2015

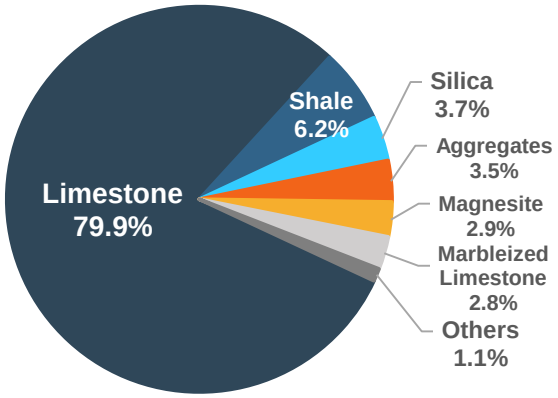


Source: Mines and Geosciences Bureau

[4] United Nations Framework for the Development of Environment Statistics 2013 (Final official edited version)

Meanwhile, twenty-one non-metallic minerals were recorded under the Non-Metallic Resource/Reserve Inventory. Limestones are the most abundant, with over 30.7 billion MT or 79.9 percent of the total non-metallic mineral deposits. The biggest deposits of limestone can be found in Central and Eastern Visayas, wherein 9.9 billion MT and 6.2 billion MT of deposits can be found, respectively.

Figure 2.2. Percent Distribution of Non-Metallic Minerals in the Philippines in 2015



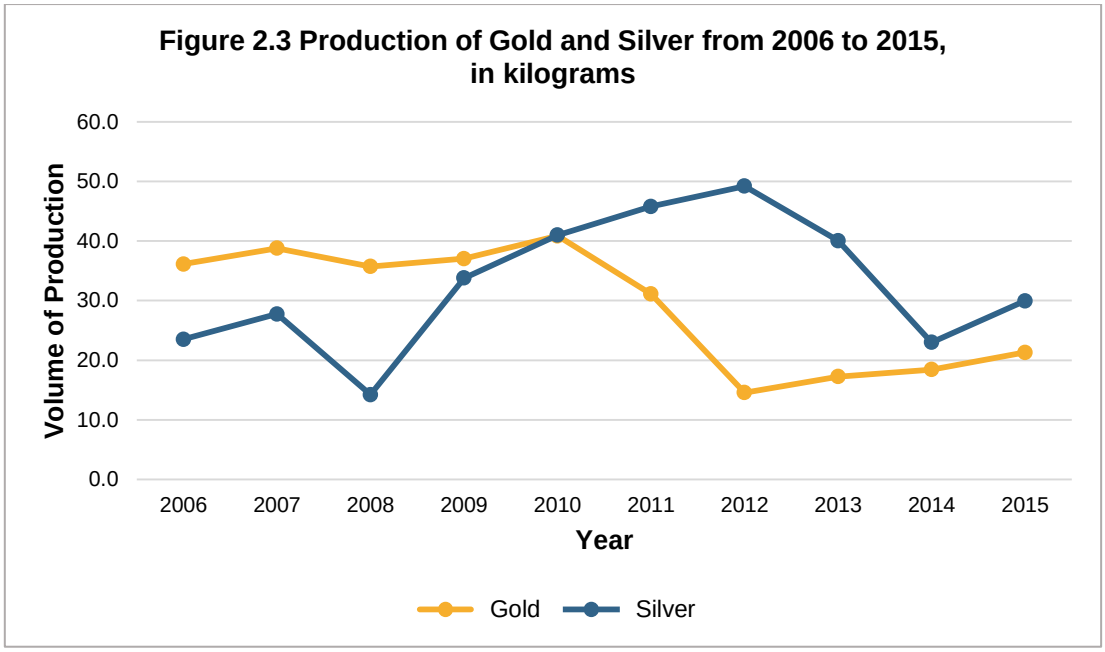
Source: Mines and Geosciences Bureau

2.1.2 Mineral Production

A summary of the levels of production of 72 mineral products is presented in Table 2.2. These are classified into precious metals, base metals, clays, construction materials, limestone for agricultural and industrial use, fertilizer materials, miscellaneous materials, cement raw materials and cement.

Figure 2.3 shows the production levels of precious metals gold and silver from 2006 to 2015. From 2006 to 2009, gold production exceeds that of silver. However, after they almost equal in 2010, silver production has been greater than gold until 2015. Among the other metallic products, the most produced is nickel ore directly shipped from the country, with production amounting to almost 3.6 thousand MT in 2006 and growing tenfold to 32.5 thousand MT in 2015.

Sand and gravel production, the most produced construction materials, grew almost threefold in a span of ten years from 2006. Aggregates, the second most produced construction material, grew threefold in the span of ten years from 2.2 million cubic meters in 2006 to 6.9 million cubic meters in 2015.



Source: Mines and Geosciences Bureau

2.2 Energy Resources

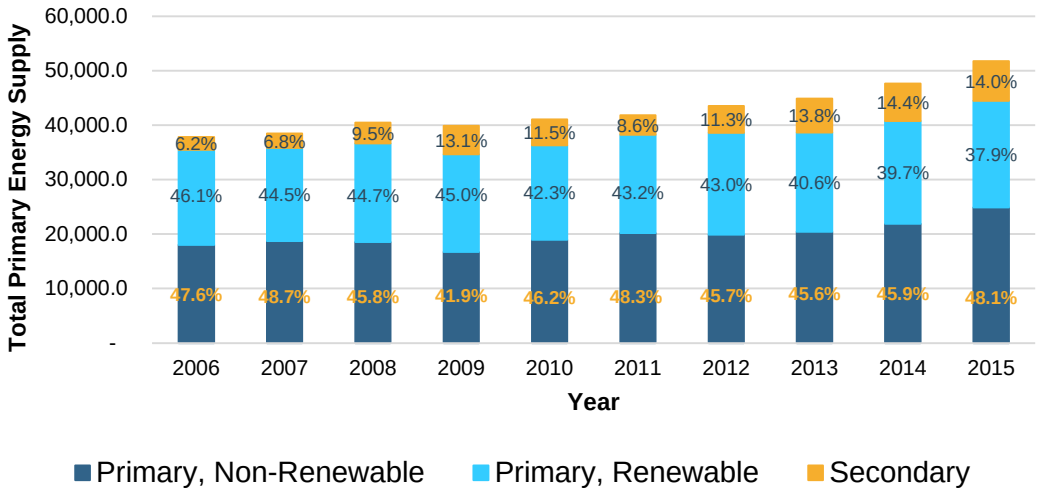
Based on the revised FDES 2013, energy resources may include all fossil fuels (coal, natural gas and oil), peat resources and uranium ores. As implied in the previous subcomponent, these resources are also non-renewable, thus the recording of its stocks and changes in stocks are also necessary. The FDES also recommends the compilation of statistics on the energy supply and consumption of energy from both renewable and non-renewable sources, particularly to track energy efficiency and sufficiency.

The compendium focused on the compilation of statistics on the production, trade and use of energy only. For the seven core indicators under this topic, the Department of Energy provided the Energy Balance Tables (EBTs) from 2006 to 2015 in tons of oil equivalent (kTOE), an energy unit. These indicators include: the total production of energy; the production from non-renewable and renewable energy sources; production from primary and secondary sources; total energy supply; and the final consumption of energy. Although not core statistics, the level of imports and exports of energy are also included in the EBTs.

Figure 2.4 shows the breakdown of the country's Total Primary Energy Supply (TPES) by type of energy source, as sourced from the EBTs. TPES is the sum of the domestic production of energy and imports, less the exports of energy and storage changes. Primary energy sources are those sources of energy that directly came from the environment, whereas secondary sources are sources of heat or energy that has undergone prior processing from primary or other secondary energy sources. Non-renewable sources in the EBTs include coal, natural gas, and crude oil and condensate. Energy from renewable sources include that from hydro, geothermal, solar, wind, biodiesel and ethanol. Oil products are the only secondary sources of primary energy supply.

As shown in the figure, the level of TPES exhibits a gradual increase through the years. Energy from primary, non-renewable sources exceed that of the primary, renewable sources by only a few points. The share of renewable sources has decreased over ten years, primarily due to the increase in the share of primary non-renewable and secondary energy sources in the TPES.

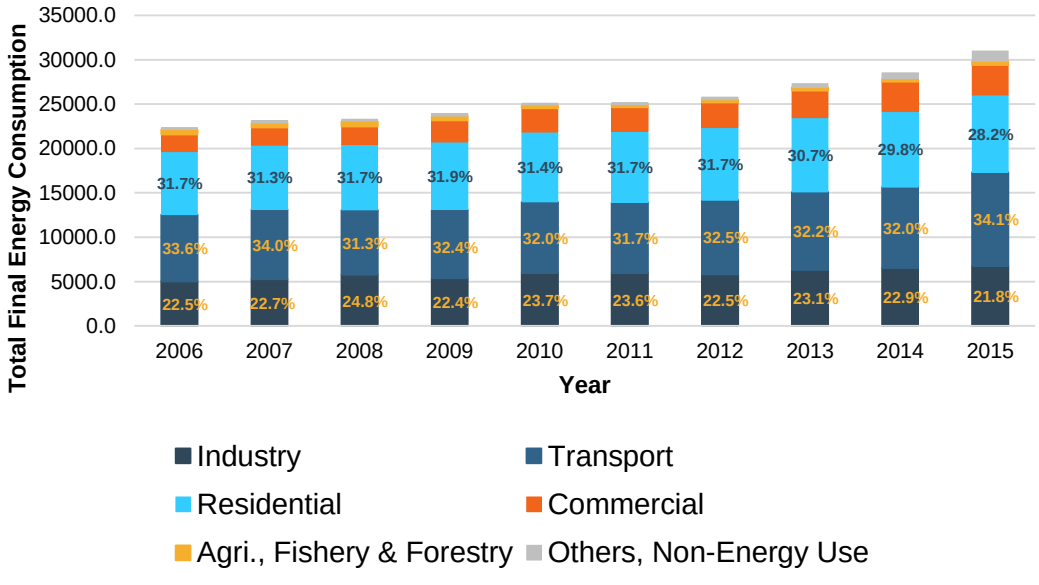
Figure 2.4. Total Primary Energy Supply By Type of Source from 2006 to 2015, in thousands of tons of oil equivalent (kTOE)



Source: Department of Energy

The total final energy consumption, broken down by sector, is shown in Figure 2.5. The Transport sector has been the top consumer of energy in the ten-year span, except for 2008 and 2011 wherein the Residential sector consumed the largest. The shares of the top three energy consumers—the Transport, Residential, and Industrial sectors—remained virtually constant, while that of the Commercial sector grew from 8.6 percent in 2006 to 10.9 percent in 2015.

Figure 2.5. Total Final Energy Consumption By Sector from 2006 to 2015, in thousands of tons of oil equivalent (kTOE)



Source: Department of Energy

2.3 Biological resources

Biological resources consist of animals, plants, fungi and bacteria. They are essential to humans as they provide food and other factors of production. Unlike mineral and energy resources, these resources regenerate depletion occurs when the level of harvest exceeds the rate of natural regeneration.

This subcomponent is comprised of statistics on natural and cultivated biological resources. This is further subdivided into five topics according to the FDES 2013: timber resources, aquatic resources, crops, livestock and other non-cultivated biological resources.

Data for the core indicator under timber resources is not yet available, and there are no core statistics needed to be compiled under “other non-cultivated biological resources”. The data for the seven core statistics compiled for this subcomponent are sourced from the Philippine Statistics Authority (PSA).

2.3.1 Aquatic resources

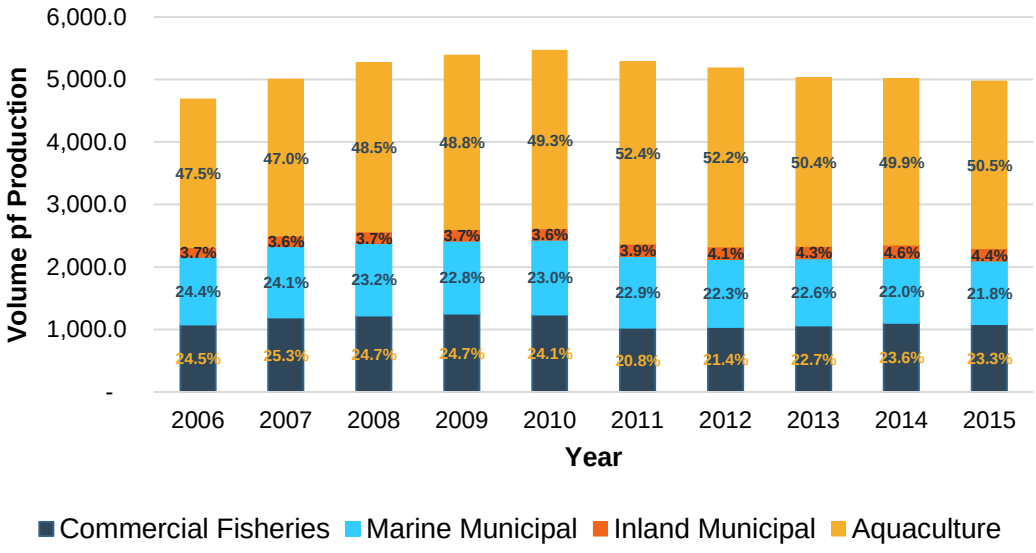
The core statistics under this topic includes the levels of fish capture production and aquaculture production. The data includes levels of production of different species of fish, crustaceans, molluscs and aquatic plants, and are disaggregated by region and province.

Statistics on fish capture production are divided into three: commercial fisheries, inland municipal fisheries, and marine municipal fisheries. Commercial and municipal fishing differs in the capacity of fishing vessels or boats used. Commercial fishing is the catching of fish using boats with a capacity of three (3) gross tons, either for trade, business or profit beyond subsistence, or sports. Municipal fishing utilizes fishing vessels with three (3) gross tons or less of capacity. Aquaculture production, on the other hand, is presented according to the type of environment (brackish water, freshwater or marine water); and type of facility (ponds, pens, cages, or reservoirs). Oyster, mussel, and seaweed farming is also included under Aquaculture. Statistics on fish capture and aquaculture production are provided by the Philippine Statistics Authority.

Figure 2.6 shows that total fish production peaked in 2010 with almost 5.5 million metric tons of fish and aquatic produce. However, it decreased from thereon, settling at over 4.9 million metric tons in 2015. Fish capture declined after 2010, decreasing from around 2.6 million metric tons to over 2.3 million metric tons in 2011, then remained stable in the succeeding years.

Aquaculture provides for around half of the supplies of fish and other aquatic resources in the country. The other half, is mainly provided by commercial fishing and marine municipal fishing. Seaweed production was at its highest in 2011, reaching a level of 1.8 million metric tons; and a recorded level of over 1.5 million metric tons in 2015.

Figure 2.6. Fish Production by Type of Fishery from 2006 to 2015, in thousand metric tons



Source: Philippine Statistics Authority

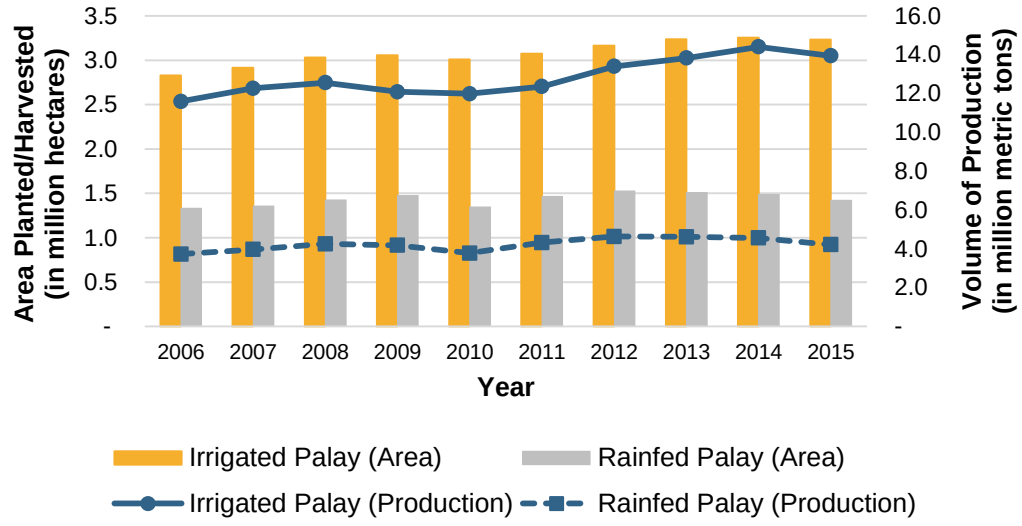
2.3.2 Crops

Four core statistics are compiled for Component 2 under this topic. These are: amount produced, area planted, area harvested and amount used of inorganic fertilizers. Statistics for area harvest and area produced are not differentiated and are compiled in the same table. The amount used of inorganic fertilizers is presented in two ways: by area applied and harvested, and the amount applied by grade. Data on the amount used of natural fertilizers and pesticides are not available.

The amount of production and area planted/harvested covers palay, corn and 66 other crops. Statistics on the volume of production and area planted/harvested for palay and corn are also presented for irrigated palay, rainfed palay, white corn and yellow corn. The most recent collected statistics on the use of inorganic fertilizers includes up to 2014 only. The area applied and harvested with inorganic fertilizers area also available for palay and corn only. Total palay production amounted to 18.1 million metric tons in 2015, or a 2.8-million increase from its level ten years before. Area planted/harvested of palay increased by almost half a million hectares from 4.2 million in 2006 to about 4.7 million hectares in 2015. Area planted/harvested with corn decreased by 8.7 thousand hectares in a span of ten years from 2006. Nonetheless corn production increased by more than 1.4 million metric tons in the same span of time.

The area of planted/harvested irrigated and rainfed palay are shown in Figure 2.7. Land with irrigated palay is double that of rainfed palay area planted/harvested. However, production of irrigated palay is thrice bigger than production of rainfed palay. Over ten years starting 2006, the land used for irrigated palay grew by 400 thousand hectares, while land used for rainfed palay increased by almost 91 thousand hectares. Production of irrigated palay, meanwhile, increased by 20.2 percent or 2.3 million metric tons in the ten-year span. Rainfed palay production grew by 13 percent or 480 thousand metric tons from 2006 to 2015.

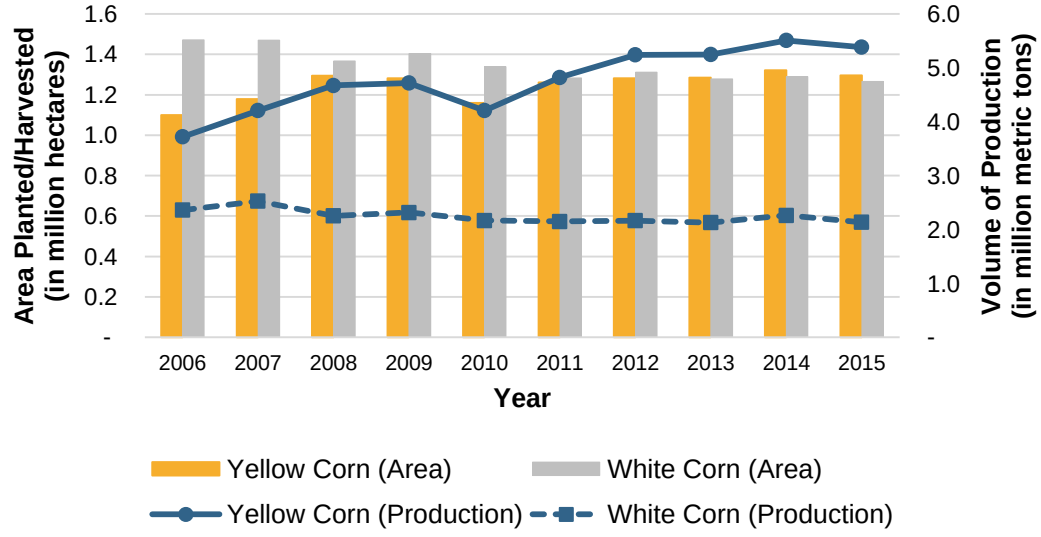
Figure 2.7. Area Planted/Harvested and Volume of Production: Irrigated and Rainfed Palay from 2006 to 2015



Source: Philippine Statistics Authority

As shown in Figure 2.8, area used for white corn decreased from almost 1.5 million hectares from 2006 to over 1.2 million in (what year). White corn production also decreased after reaching its peak at 2.5 million metric tons in 2007, amounting to 2.1 million metric tons over 2015. Area planted/harvested with yellow corn has increased by 18 percent over ten years from 1.1 million hectares in 2006, while yellow corn production grew by almost 45 percent from a level of 3.7 million metric tons in (what year?).

Figure 2.8. Area Planted/Harvested and Volume of Production: Yellow Corn and White Corn from 2006 to 2015



Source: Philippine Statistics Authority

Data shows a significant shift to coconut planting in 2010, as area planted/harvested grew by almost 175 thousand hectares. Planting/harvesting area of bananas grew until 2012, but declined in the next years and settled at 443 thousand hectares in 2015. Area planted with

sugarcane declined by almost 50 thousand hectares in 2010, but increased in the subsequent years. Cassava plantation area reached a peak at 221 thousand hectares in 2011, before declining to a steady 217 thousand hectares in the next three years. Picking up in 2015, area planted/harvested of rubber amounted to 222 thousand hectares. It also displayed a steady growth from 2006 to 2015, growing the fastest by 32 thousand hectares from 2013 to 2014.

Sugarcane and coconut are the largest produced crops in terms of volume, with production amounting to 22.9 million and 14.7 million metric tons respectively, in 2015. Banana production steadily grew from 6.7 million metric tons in 2006 to 9 million metric tons in 2015. Cassava production also exhibited a steady growth, increasing by 55 percent from 1.7 million metric tons of produce in 2006 to 2.7 million metric tons in 2015.

The area applied and the area harvested applied with inorganic fertilizers for palay steadily grew from 2005 to 2014. However, the area applied with inorganic fertilizer for corn declined in 2009, dropping by more than 327 thousand hectares from a level of 2.5 million hectares in the previous year. While this picked up in the following years, it declined again in 2015 with a total area of over 2 million hectares.

The grades of inorganic fertilizers listed in Tables 2.9.1 and 2.9.2 are Urea, Ammosul, Ammophos, Complete and Others. The data shows that average use of inorganic fertilizers increased in the ten-year period from 2005 to 2014, with Urea and Complete fertilizers being the most and second most applied type of fertilizers for both palay and corn. Among all regions, the Ilocos Region is the top user of inorganic fertilizers, consuming an average of 6.3 and 6.9 bags of fifty kilos respectively per year for palay and corn.

2.3.3 Livestock

Livestock, as defined in the FDES 2013, are animals raised by humans for commercial purposes, consumption or labor. Data for the only core statistic in this topic is collected from the Livestock Inventory as of January 1 of the indicated year. The species covered consist of cattle, carabao, hog, goat, chicken and duck. The statistics are also classified according to farm type (i.e. commercial or backyard), except for chicken, which is categorized into broilers, layers and native chicken.

For four-legged animals, commercial farms are those that satisfy one of the following: a) at least 21 adults and zero young; b) at least 41 heads of young animals; c) at least 10 heads of adults and 22 heads of young animals. For poultry, a commercial farm should satisfy any of the following criteria: a) 500 layers or 1,000 broilers; b) 100 layers and 100 broilers, if raised in combination; c) 100 heads of ducks regardless of age. Backyard farms refer to those that do not fall in the category of commercial farming.

Figure 2.9 shows the inventories of carabao, cattle, goat and hog from 2006 to 2015. As seen in the figure, the inventories were relatively constant from 2006 to 2010, ranging from 22.3 to 23.8 million heads, slightly decreasing from 21.8 million in 2011 to 21.1 million heads in 2015.

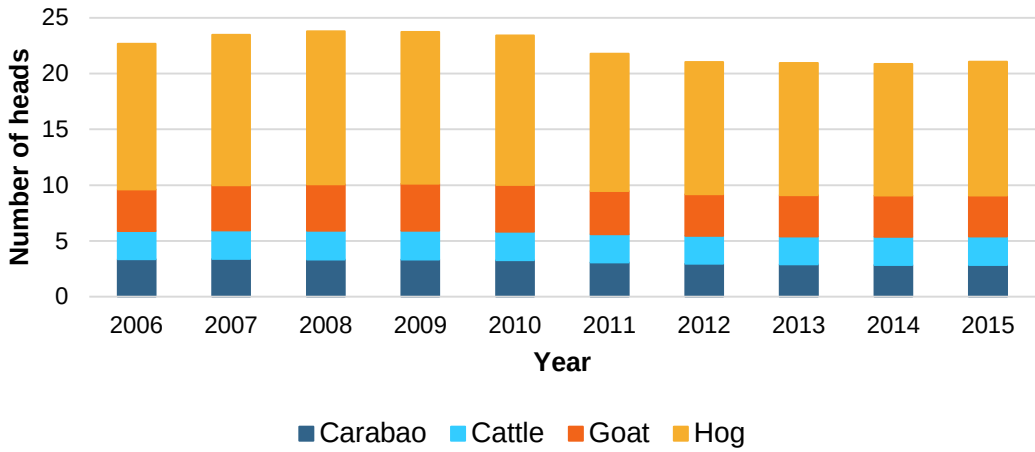
Overall, hogs comprise the biggest share of livestock as 127 million heads counted in the ten year span, with 69 percent raised in backyards and 31 percent raised in commercial farms. On the other hand, cattle had the least number with 25 million heads, most of which are in backyard farms (93 percent). Similarly, almost all the carabaos (99.7 percent) and goats (98.7 percent) are raised in backyard farms.

Ducks are mostly raised in backyard farms; with the largest number recorded in 2015 at over 3 million ducks. Based on inventory, the highest was recorded in 2006 with 11 million ducks, 77 percent of which were raised in backyard farms and 23 percent in commercial

farms. From 2007 onwards, duck inventories in the beginning of the year amount to 10 to 10.5 million ducks.

Chicken inventory rose consistently from 134 million in 2006 to 176 million in 2015. Native chickens make up the largest share in the inventory, at 76 million chickens recorded. This however, declined sharply by 3 million in 2008. Native chicken also slid down by over one million each both in 2011 and 2012, and by almost 200 thousand in 2013. Broiler chickens and layers, meanwhile, steadily increased in the ten year span, growing however, by 85 percent and 46 percent, respectively.

Figure 2.9. Livestock Inventory By Species from 2006 to 2015, in million heads



Source: Philippine Statistics Authority

2.4 Water resources

The subcomponent for water resources is focused on the following categories stocks: the flows of water to, from and within the country's territory; and the abstraction, use and returns of water.

Out of the core statistics concerning the inflows and outflows of water the only data collected was evaporation. Although the volume of evapotranspiration is recommended as a core statistic in the FDES 2013, based on PAGASA's statement, only evaporation is available. Evapotranspiration takes into account the vaporization of water in plant tissues, aside from the evaporation of water. Other core statistics recommended by the FDES are the volume of precipitation, which is also present in Component 1 (Environmental Conditions and Quality), and inflows from neighboring territories.

The second topic of the subcomponent on water resources dwells on the flow of water starting from abstraction to its return to the environment. The core statistics recommended by the FDES under this topic are the total amount of water abstraction, the amount abstracted from surface water, and the amount abstracted from renewable and non-renewable groundwater.

Data on actual water abstraction is not available as well, but a summary of water permit grants as of December 2015 was provided by the National Water Resources Board (NWRB). The summary consists of the number of permits, volume and discharge of water allocation, which are disaggregated by purpose, by region and by type of source (i.e. surface water or groundwater).

2.4.1 Water resource flows

For the core indicator on evaporation, information was gathered from eight monitoring stations, which are: PCA Bag-o Oshiro, Davao; Isu-Echague, Isabela; Dumangas, Iloilo; TCA Camiling, Tarlac; Cabanatuan, Nueva Ecija; PNAC Aborlan, Palawan; PSPC Mambusao, Capiz; and Central Mindanao University (CMU)-Musuan, Bukidnon.

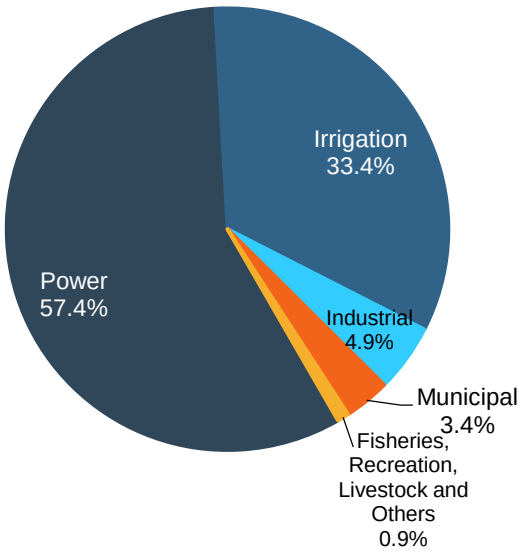
On average, of the highest recorded level of evaporation across the eight listed stations is the month of April. In 2009, six out of eight stations recorded the highest evaporation for the year on the month of March. In 2004, evaporation for majority of the eight stations was highest in May. On the other hand, the months with the lowest evaporation are January; November; and December. The monitoring stations with the most and second most average monthly evaporation recorded are: CMU-Musuan, Bukidnon and TCA-Camiling, Tarlac.

2.4.2 Abstraction of water

While there are more permits given to abstraction of groundwater, they correspond to only 1.9 percent of the total volume of allocated water. As shown in the Figure 2.10, overall, the largest share of total water allocation is allotted to power generation, which takes up 57.4 percent of the total groundwater and surface water allocation. Power generation took up the greatest share of surface water in 2015, with Cagayan Valley getting the biggest volume for this use with over 34,126 million cubic meters (mcm). Irrigation placed second with an allocation of 33.4 percent of the total water in the country. Central Luzon gets the most of the allocation for irrigation from surface water, acquiring 16,174 mcm of water.

The use of water for power generation and irrigation acquired the most allocation of surface water for other regions. The former amounts to a total of 94,119 mcm of surface water allocated, while the latter amounts to 31,718 mcm of surface water. Groundwater allocation, meanwhile, is mainly allotted for Municipal, Irrigation and Industrial purposes. There are 2,082 mcm of groundwater allocated for municipal purposes.

Figure 2.10. Percent Distribution of Total Water Allocated By Use in 2015



Source: National Water Resources Board (NWRB)