Operational Agrometeorological Services: National Perspectives

Operational Agrometeorological Services in the Philippines

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Abstract

The Philippines is an agricultural country. Almost half of the country's total land area is devoted to various agricultural crops, which makes the agriculture sector a major contributor to economic development. However, there are times that agricultural production falters to meet the population's food requirement thus affecting the country's economic condition. Dramatic increases or decreases in agricultural output have been, in most cases, associated with occurrence of severe weather events and changes in the climate system. Typhoons with its associated strong winds and rains and the global phenomenon, called El Niño, have contributed significantly to the large annual variability of the country's agricultural production.

Introduction

The increasing need for better weather and climate information, e.g., weather forecasts, climate outlooks, drought advisories, typhoon bulletins, and other agrometeorological services that serve as a valuable tool in decision-making processes has made the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) an indispensable partner of the agricultural community.

Figure 1. Location map of the Philippine archipelago.

The Philippine archipelago is geographically located between latitude $4^0$23'N and $21^0$25'N and longitude 116^0E and 127^0E (Figure 1). The total land area of the Philippines is 300 thousand square kilometers or 30 million hectares and is composed of 7,107 islands and islets. It constitutes two percent of the total land area of the world and ranks 57th among the 146 countries of the world in terms of physical size.

Three prominent bodies of water surround the archipelago: the Pacific Ocean on the east, the South China Sea on the west and north, and the Celebes Sea on the south. This position accounts for much of the variations in geographic, climatic, and vegetative conditions in the country.

Alluvial plains, narrow valleys, rolling hills, and high mountains characterize the topography of the bigger islands, particularly Luzon and Mindanao. The highest mountains are found in Mindanao and Luzon, with the altitudes varying from 1,790 to 3,144 meters. Most of the smaller islands are mountainous in the interior, surrounded by narrow strips of discontinuous flat lowlands, which constitute the coastal rims. The shorelines of both large and small islands are irregular.

Socio-Economic Profile

As of 2000, the Philippines is home to around 76 million people and is one of the most populous countries in Asia and the world. While most of the population still resides in the rural areas, urban migration has increased steadily. In 1996, total urban population constituted 55 percent of the total national population. Metro Manila with its continued influx of rural migrants makes it a very densely populated place; more crowded than Metro Tokyo or Metro Paris according to studies. About 13 percent of the country's population resides in Manila's limited land area, representing a mere 0.2 percent of the country's total land area.

The country is divided geopolitically into 17 regions, Regions I-XIII, the National Capital Region (NCR), the Cordillera Administrative Region (CAR), the Autonomous Region of Muslim Mindanao (ARMM), and the Caraga Region. There are 73 provinces and 60 cities across the archipelago with Manila as the capital. From 1991 to 1996, economic indicators reflected national growth. In 1996, GNP grew to 6.9 percent and GDP to 5.7 percent.

Its principal products are: textiles, pharmaceuticals, chemicals, food processing, and electronics assembly. The natural resources include: forests, crude oil, and metallic and non-metallic minerals.

Philippine Climate

The country's climate is tropical and maritime and is influenced by large-scale atmospheric patterns that bring in substantial amounts of rain almost all year round. It is characterized by a relatively high temperature, high humidity, and abundant rainfall. Rainfall distribution varies regionally, depending upon the direction of the moisture-bearing winds and the location of the mountain ranges. Mean annual rainfall varies from 965 to 4,064 millimeters annually, with the eastern parts of the country receiving the greatest amount of rainfall and the southernmost part of Mindanao receiving the least. Mean annual temperature is 26^oC. January is the coolest month, with a mean temperature of 25^oC, while May is the warmest with a mean of 28^oC.

Tropical cyclones have a great influence on the climate and weather conditions of the Philippines, affecting rainfall, humidity, and cloudiness. They generally originate in the region of the Marianas and Caroline Islands in the Pacific Ocean. Their movements follow a northwesterly direction, sparing Mindanao from being directly hit by a majority of the typhoons that cross the country. This makes the southern Philippines very desirable for agriculture and industrial development.

Although generally blessed with abundant rainfall all year round, some areas in the country encounter water supply difficulties while other areas face serious water problems most of the time due to the uneven distribution of rainfall with respect to time and space. This is further exacerbated by the occurrence of extreme climate events such as floods and droughts associated with the El Niño/La Niña phenomena. Based on rainfall distribution, the country has four climate types (Figure 2):

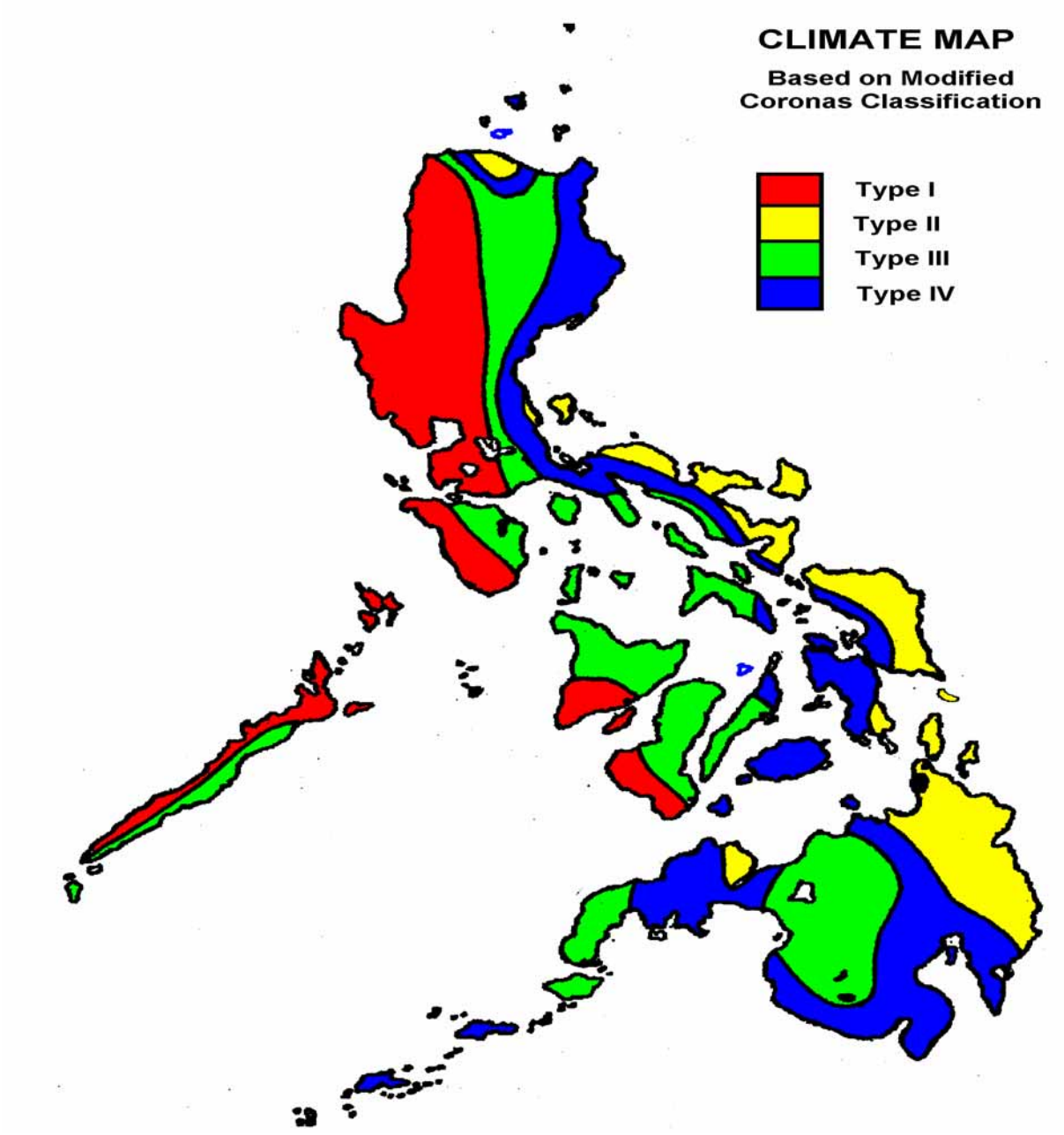

Figure 2. Climate map of the Philippines based on modified Coronas classification.

Type 1 -- two pronounced wet and dry seasons, wet during the months of June to November and dry from December to May. The controlling factor is topography. Areas under this type are shielded from the northeast monsoon and, even in good part, from the trade winds by high mountain ranges, but are open only to the southwest monsoon and cyclonic storms.

Type 2 -- no dry season, with a very pronounced maximum rain period in December, January, and February. Regions belonging to this type are not sheltered from the northeast monsoon and trade winds or from the cyclonic storms.

Type 3 -- an intermediate type with no pronounced maximum rain period and short dry season, lasting from 1 to 3 months only. Areas under this type are only partly sheltered from the northeast monsoon and trade winds and are open to the southwest monsoon or at least to frequent cyclonic storms.

Type 4 -- uniformly distributed rainfall. The regions affected by this type receive the moderate effects of the northeast monsoon and trade winds as well as the southwest monsoon and cyclonic storms.

Overview of the Agriculture Sector

The Philippines is an agricultural country with a land area of 30 million hectares (ha), 47 percent of which is agricultural land. In the Philippines, prime agricultural lands are located around the main urban and high-population density areas. Land resources in the country are generally classified into forest lands and alienable and disposable lands. A total of 15.8 million ha are classified into forest lands, and 14.2 million ha are alienable and disposable lands. Out of the 14.2 million ha alienable and disposable lands, 13 million ha are classified as agricultural lands.

The total area devoted to agricultural crops is 13 million ha distributed among food grains, food crops and non-food crops. Food grains occupied 31 percent (4.01 million ha), food crops utilized 52 percent (8.33 million ha), while 17 percent (2.2 million ha) were used for non-food crops. For food grains, the average area utilized by corn was 3.34 million while rice occupied 3.31 million ha. Of the total area under food crops, coconut accounted for the biggest average harvest area of 4.25 million ha. Sugarcane with 673 thousand ha; industrial crops with 591 thousand ha; 148 thousand ha for fruits; 270 thousand ha for vegetables and root crops; 404 thousand ha for pasture, and 133 ha for cut-flowers. According to land capability, 78.31 percent of the alienable and disposable land is prime agricultural area, and 6.1 million ha are highly suitable for cultivation.

Farm Systems and Structure

A mixture of small, medium, and large farms characterizes Philippine agriculture. A majority of the farms in the country are small, averaging about 2 ha, and owned and managed by single families. In 1988, two-thirds of all farms were no larger than 3 ha. Eighty-five percent of all farms were no more than 5 ha. A typical farming system consists of a major crop, with rice, corn, and coconut as common base crops, and a few heads of livestock and poultry.

Agriculture in the Economy

Playing a vital role in the economy, the government wants to transform the country's agriculture into a modern, dynamic, and competitive sector. A sustained expansion of the national economy requires sustained growth in the agricultural sector.

Agriculture, including forestry and fishery, plays a dominant role in the Philippine economy. The country's population is predominantly rural (70 percent of the total) and two-thirds of this population depends on farming for their livelihood. In terms of employment, about one-half of the labor force is engaged in agricultural activities.

The agricultural sector's contribution to the economy was a substantial 23 percent of gross domestic product since 1995 when it registered a growth rate of 3.2 percent. The growth was mainly due to the expansion of the poultry, livestock, and palay sub sectors. Primarily, Philippine agriculture consisted of rice, corn, coconut, sugar, banana, livestock, poultry, other crops, and fishery production activities.

Agrometeorological Service in the Philippines

Philippine agriculture is dependent on climate and weather, and as such, the PAGASA is mandated to continuously render/contribute meteorological services supportive of the program thrusts of the Philippine government towards self-sufficiency in food and the attainment of a progressive and sustained economic growth without jeopardizing environmental safety.

Agrometeorological services in the country are delivered not only at the farm operation level but also at the strategic level where planning of agricultural operations, both short- and long-term, are included.

PAGASA Network of Observing Stations

The PAGASA operates a network of weather stations all over the country. Synoptic, agrometeorological, rainfall, climatological, upper-air, and radar stations, located all over the country, make up the entire network of observing stations. To cater to the needs of the agriculture sector, there are around twenty agrometeorological stations that the PAGASA operates in collaboration with state colleges and universities, government research institutions, and private entities. These operational stations provide the necessary meteorological and agrometeorological data required in the formulation of advisories, bulletins, warnings, and other weather and climate-related information. Observed data are transmitted to the central office and other users through single side-band radio circuits and telephone/fax lines.

List of synoptic stations in the Philippines:

Alabat	Daet	NAIA
Ambulong	Dagupan	Pagasa Island
Aparri	Davao	Port Area
Baguio	Dipolog	Puerto Princesa
Baler	Dumaguete	Romblon
Basco	Gen. Santos	Roxas
Borongan	Guiuan	San Francisco
Butuan	Hinatuan	San Jose
Cabanatuan	Iba	Sangley
Cagayan de Oro	Iloilo	Science Garden
Calapan	Infanta	Tacloban
Calayan	Itbayat	Tagbilaran
Casiguran	Laoag	Tanay
Catarman	Legaspi	Tayabas
Catbalogan	Lumbia	Tuguegarao
Clark	Maasin	Vigan
Coron	Mactan	Virac
Cotabato	Malaybalay	Zamboanga
Cubi Point	Masbate	Zurriago
Cuyo	Munoz	

List of the PAGASA network of agrometeorological stations:

Albay	Isabela	N. Samar
Batanes	Laguna	N. Vizcaya
Camarines Sur	Lanao del Sur	Palawan
Capiz	Leyte	Quezon City
Davao	N. Ecija	Tagaytay
Ilocos Norte	N. Occidental	Tarlac

Agrometeorological Products

Good management and timing of agricultural activities could mean the difference between success and failure in agricultural production. Based on this premise, the PAGASA provides a wide range of agrometeorological products that would serve as primary tools in the formulation of plans and implementation of activities particularly at the farm level. Some of the products include:

- Farm Weather Forecast and Advisory
- Tropical Cyclone Warning for Agriculture
- Ten-day Regional Agri-weather and Advisories
- Philippine Agroclimatic Review and Outlook
- Crop Weather Calendar
- Agroclimatic Impact Assessment

Farm Weather Forecast and Advisory -- This is a daily farmcasting prepared and issued by the Climatology and Agrometeorology Branch (CAB) of PAGASA. Timely farm weather forecasts and advisories are made available to the farmers through an area-wide

agrometeorological network of stations. Information includes the weather forecast for agricultural areas, soil conditions, range of temperature, relative humidity, and agri-weather tips and advisories.

Tropical Cyclone Warning for Agriculture -- This is issued during the occurrence of tropical cyclones within or expected to enter the Philippine Area of Responsibility (PAR).

Ten-day Regional Agri-weather and Advisory -- The idea of a regional agri-weather forecast is to go along the regional administrative setup of our main client, which is the Department of Agriculture. It is also meant to make a "progressive improvement" over the broad generalities of a nationwide forecast, albeit in a tabulated form.

Crop Weather Calendars -- Planting calendars wherein the weather factors of rainfall, potential evapotranspiration, temperature, winds speeds, radiation, and others of significance to the plant's growth and development are incorporated to guide farmers on agricultural operations/decisions. This is the result of a matching process wherein a cropping season for a particular crop is recommended. This recommended growing season tries to approximate the optimum time wherein most of the crop requirements are met. Crop weather calendars are available for all the regions of the country and for various crops such as rice, corn, vegetables, and other crops.

Agroclimatic Impact Assessment -- The development of two agroclimatic indices, i.e., yield moisture index and generalized monsoon index, has led to the realization of this agrometeorological product that provides a wider perspective of the impacts of past seasonal climate (2 to 6 months), specifically rainfall, on standing crops in identified regions of the country. Issued at the end of the month, it serves as an additional tool for planners and decision makers in the formulation of mitigating strategies particularly for rice and corn crops.

Present and Future Thrusts and Initiatives

The present thrusts of the agrometeorological service are geared towards the government's economic development programs. With around 20 tropical cyclones that visit the country annually, typhoons cause loss of lives and damages property. Nevertheless, these disturbances also bring in the much-needed rains for irrigation and domestic supply. To address the problem on the recurrence of typhoons and floods, one major activity is focused on the enhancement of weather and flood forecasting capabilities. Upgrading of radar, synoptic, and agrometeorological stations to track incoming tropical cyclones and monitor extreme weather/climate events is one of the ongoing priority projects. The use of satellite information for real-time weather analysis, monitoring, and forecasting has been strengthened through the upgrading of existing satellite receiving facilities. GIS-based techniques have been formulated and developed to provide rapid assessment and evaluation of crop damages in typhoon prone areas. Strengthening the dissemination system and the efficient application of an effective damage mitigation method are also being put in place.