



## Soil Types and Geographical Forms of the Degraded Uplands of Bohol, Philippines

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**Abstract** The main objective of this study was to identify the soil types and geographical forms in the degraded uplands of Bohol. This was accomplished by gathering secondary data from concerned institutions and from previous research results. Bohol is geographically located between 123°40' and 124°40' East longitude and extends from 9°30' to 10°15' North latitude, in the central portion of Visayas. It is generally flat and plain with only few mountainous areas at the northeastern portion suitable for massive cultivation of agricultural products. Some of these mountainous areas, particularly those preserved from degradation, can serve as habitat for interesting flora and fauna as well as natural land forms that travelers look for, such as the landform for which Bohol has been noted, the Chocolate Hills. The existing general land use data of Bohol has 13 categories. The top three categories in terms of area are the agricultural land, timberland and infra utilities. Agricultural land constitutes about 66.54% of the province total land area while timberland is only 24.6%. Approximately 167,160 hectares or 40.6% of the total provincial land area have slope gradients of 0-8%, largely covering the central of northern areas which comprise the prime agricultural zone utilized or irrigated and rainfed palay and corn production. The areas with 8-18% slopes accounted for 29% which is mostly planted with coconut, corn and subsistence crops and open/idle and eroded land areas. The rolling to mountain areas with slopes of 18% and above cover about 123,930 hectares or 30% of Bohol land area. Areas with slopes of 18% and above have been disturbed and exploited particularly for subsistence farming. Soil types of the degraded uplands of Bohol are of different soil classification. The most extensive soil type is Ubay clay which occurs from the central (Carmen and Sierra Bullones) to the north and northeastern (San Miguel to Alicia) and northwestern areas of Bohol. Faraon clay predominates at the southern municipalities of Lila, Dimiao, Valencia and Garcia Hernandez.

**Keywords** soil types, degraded uplands, rainfed palay, subsistence farming

### INTRODUCTION

Bohol is an island province in Central Philippines. With a land area of 4,821 square kilometers (1,861 sq mi) and a coastline 261 kilometres (162 mi) long, Bohol is the tenth largest island of the Philippines.

The terrain of Bohol is basically rolling and hilly, and about half the island is covered in limestone. Near the outer areas of the island are low mountain ranges. The interior is a large plateau with irregular landforms. Chocolate Hills are more than 1,200 uniformly cone-shaped limestone hills named for the grass growing on the hills that turns brown in the summer, making the landscape look like chocolate mounds.

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industrial site development because of their natural drainage capacity. Some of these mountainous areas, particularly those preserved from degradation, can serve as habitat for interesting flora and fauna as well as natural land forms that travelers look for, such as the landform for which Bohol has been noted, the Chocolate Hills, (Bohol Provincial Agriculture Profile, 2011). Cramb (2000) as cited by Newby and Cramb said that land degradation in densely-populated upland areas represents major environmental threats. (Newby and Cramb, 2007)

This study was done to identify the soil types and geographical forms in the degraded uplands of Bohol province through secondary data.

## **METHODOLOGY**

The island province of Bohol is the tenth largest island in the country. Geographically, it lies between 123 40' and 124 40' East longitude and extends from 9 30' to 10 15' North latitude This oval shaped province is located in the central portion of the Visayas lying between Cebu to the northwest and Leyte to the northeast. It has a land area of 4,821 square kilometres (1,861 sq mi) and a coastline 261 kilometres (162 mi) long (OIDCI, 2006).

Collection of data was mainly done through the access of secondary sources available in a particular government agency like the Office of the Provincial Agriculturist of Bohol, the Local Government Units and the Department of Agriculture of the national government of the Philippines. The researcher has also collaborated with the Agricultural Training Institute through the conduct of Focus Group Discussion with the upland farmers to validate the information on soil types and geographic forms in their respective areas.

The degraded agricultural upland sites being observed by the researcher include the farm communities of Carmen which is an interior municipality and central part of Bohol and the degraded upland farms of Mayana, Jagna and Taytay, Duero in the eastern part of the province.



**Fig. 1 The study site: Bohol, Central Philippines**

## **RESULTS AND DISCUSSION**

### **Geologic Features**

As manifested in the project preview of an Australian Center for International Agricultural Research (ACIAR) funded project, within the agricultural province of Bohol, 45% of the island is designated as agricultural land and supports 80% of the island's population. However, nearly two thirds of the agricultural land has a slope of greater than 18% and receives more than two metres of rainfall per year. In a previous ACIAR project, it was concluded that activities that have the highest adverse impact on

agricultural sustainability (and therefore long term economic sustainability) in the upper Inabanga (the largest watershed on Bohol), included: up and down cultivation on sloping lands, continuous use of nutrient-depleting crops such as corn and cassava, and extensive cultivation of steep upland soils (ACIAR, Bohol, 2012).

Bohol may have been developed from the magnetic tectonic mechanism which resulted from the under thrusting of the southwest Philippine Plates east of Samar Island and Surigao in Northern Mindanao. The Mines and Geosciences Bureau of the Department of Environment and Natural Resources showed eleven (11) major geologic formations in the Bohol mainland and offshore islands. The most extensive are Carmen formation, Maribojoc and Wahig limestones, Ubay volcanic and Kabulao conglomerates (OIDCI, 2006).



**Fig. 2 The degraded uplands of the central part of Bohol**

### **Physiography**

Bohol's mainland exhibits the following salient physiographic units. The east and west coast display northeast trending ranging up to 870 meters in elevation (Mt. Mayana) that drops steeply to the coast. These ranges reflect the major structural units of the island. The central (Carmen area) and northern part of the island (Trinidad) are vast expanses of relatively rolling plains and flat lands.

The development of beautifully-arranged, symmetrically formed "haycock hills" in Carmen-Batuan and Bilar - Balilihan area in the east central part of the island is suggestive of well-defined system of shears and joints. An elongated cluster of hills of moderate height lies in the northeastern part of the island (Ubay area).

An east-west ridge connects Alicia with Carmen

The Anda Peninsula and Loon Peninsula strongly suggest elevated plateaus, and

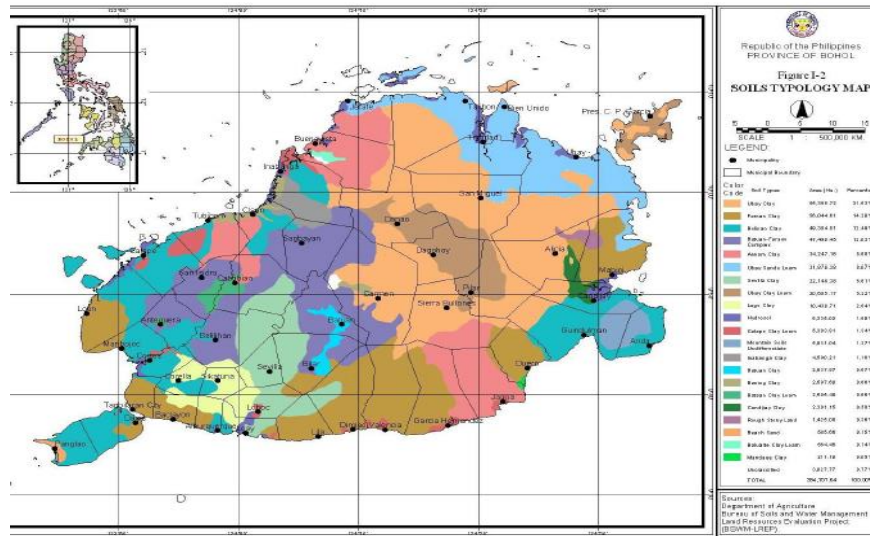
At least five different Plio-pleistocene terrace levels ranging in height from 10 to 300 meters have been etched both in Carmen sandstone and shales and Maribojoc limestones.



**Fig. 3 The severely degraded upland farms of Bohol**

## Soil Types

The Bureau of Soils and Water management–Land Resources Evaluation Project (BSW-LREP) identified 22 soil types within province. Of these soil typologies, the most extensive is Ubay clay occurring from the central (Carmen and Sierra Bullones) to the north and northeastern (San Miguel to Alicia) and northwestern areas. Faraon clay predominates at the southern municipalities of Lila, Dimiao, Valencia and Garcia Hernandez. The other soil types with relatively larger area coverage include the Batuan - Faraon complex, Ubay clay loam, Sevilla clay and Annam clay.



**Fig. 4 Map of soil types of Bohol**



**Fig. 5 Farmed steep slopes are common sites in the uplands of Bohol**

## CONCLUSION

Bohol is a limestone province with rolling and hilly terrain and has mountain ranges near the outer areas. The interior part is a large plateau with irregular landforms with the very distinct haycock formation called Chocolate Hills. The province has twenty two (22) soil types with Ubay clay occurring from the central to the northern part and Faraon clay predominates the southern part of the province.

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