

# DEVELOPMENT PLAN by CATUIRAN HYDROPOWER CORPORATION

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## *TREE PLANTING DEVELOPMENT PLAN*

Pursuant to the conditions of the Environment Compliance Certificate (ECC) issued by DENR for the Catuiran hydropower Plant Project.



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## **I. INTRODUCTION**

### **A. SCOPE AND RATIONALE**

The Lower Catuiran Hydro Power Plant Project is located at Barangays, Banuton, Balite and Malvar, Naujan, Oriental Mindoro, and has entered into Memorandum of Agreement with the Department of Environment and Natural Resources for the tree planting activities and establishment of Green Buffer Zones within and along the periphery of the project site to help attenuate noise levels, abate heat and absorb some pollutants emissions pursuant to the conditions of the Environment Compliance Certificate (ECC) issued by DENR for the Catuiran hydropower Plant Project. In addition to this, the company will also provide seedlings of fruit bearing trees to the IP's in the area to help them improved the sources of livelihood.

### **B. DEVELOPMENT OBJECTIVES**

#### **B.1. GENERAL OBJECTIVE**

In general, the main objective of this development plan is to comply with the conditions set forth under the conditions stipulated in ECC-R4B-1381-0007 issued to Catuiran Hydropower Plant Project.

#### **B.2. SPECIFIC OBJECTIVES**

Specifically, this development plan aims the following:

- a. Plant trees that will serve as green buffer to attenuate noise, abate heat and absorb pollutants emission from the power plant;
- b. Establish tree plantation within the project site , watershed area surrounding in order to help prevent soil erosion and surface run-off and;
- c. Provide livelihood program by providing and help establish fruit trees plantation for the three IP's in the area such as those from Barangay Balite, Banuton and Caburo.



## II. SITE DESCRIPTION

### PHYSICAL CHARACTERISTICS

Generally, the watershed area was transformed into cultivated perennial crop farms with randomly-mixed agro-forestry in primary and secondary forest areas. People survived mainly on upland farming where their farms lots are planted with cash/permanent crops such as sweet potatoes, banana, cassava, coconuts and fruit trees. Some areas were devoted to plantation of upland rice (camuros). After harvest, they again till and continuously plant the land in the agricultural area. The primary forest is dominated by indigenous and endemic species of forest trees and generally located on the high slopes where cutting of trees is limited and extremely difficult thus allowing the trees to grow and mature. These mature trees are 10 to 20 meters in height with diameter-at-breast-height (DBH) of 20 - 35 cm. There are, however, few stands of exotic species that may have been brought about by natural regeneration and/or purposive planting of introduced species. The primary forest also includes the protection forest area, identified by the tribal community. The classification of the said areas as primary forest highlights the presence of mature endemic forest trees and the importance of protection and conservation of highly sloping areas and of "sacred" areas among the indigenous community.

### 1. LOCATION/AREA

The location/area is presented herewith in the form of mapping units with technical descriptions. (Figure A to D). A separate print out of thematic maps attached.



Figure A: Presents the location map of Malvar, Naujan

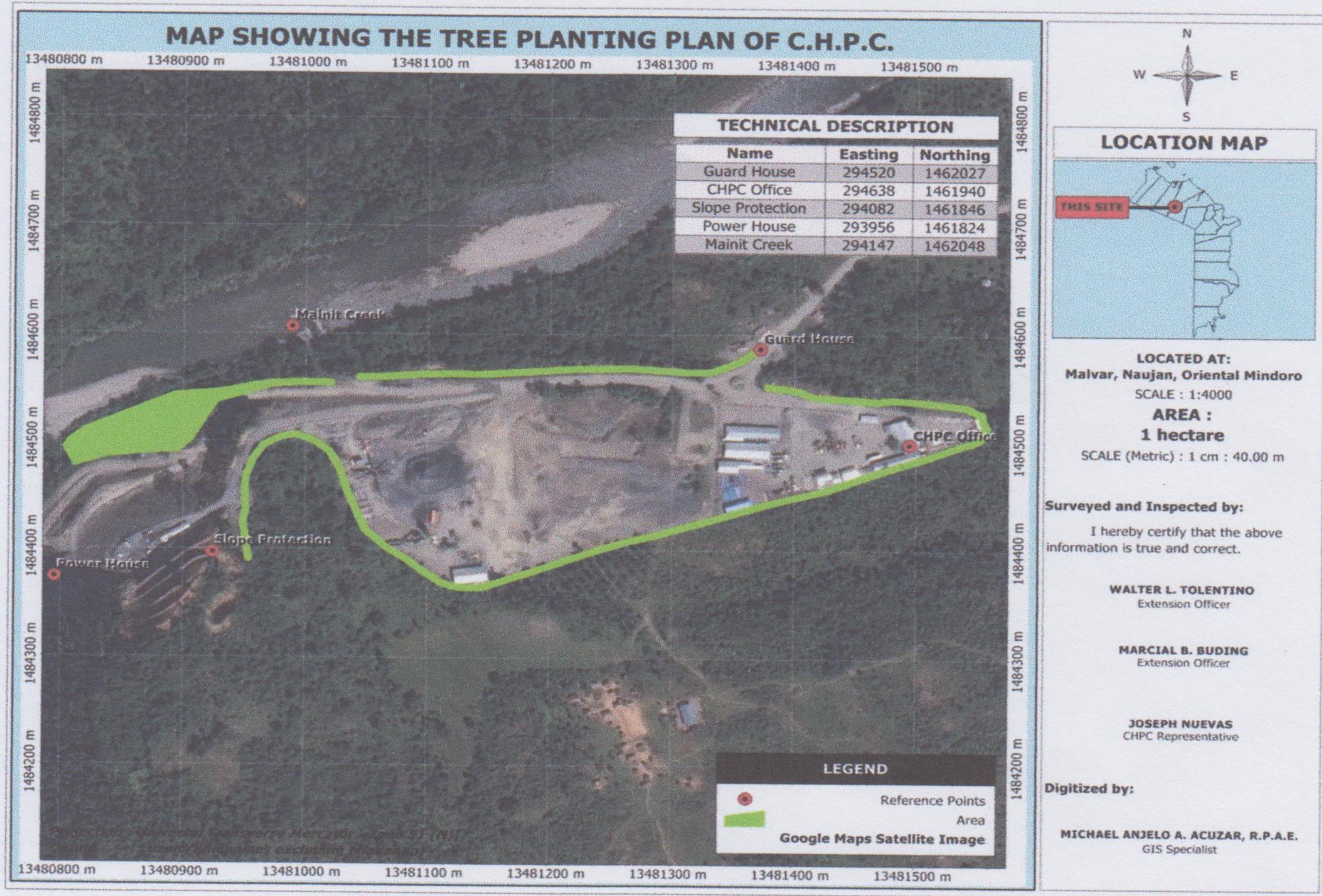


Figure B: Presents the location map of Balite, Naujan

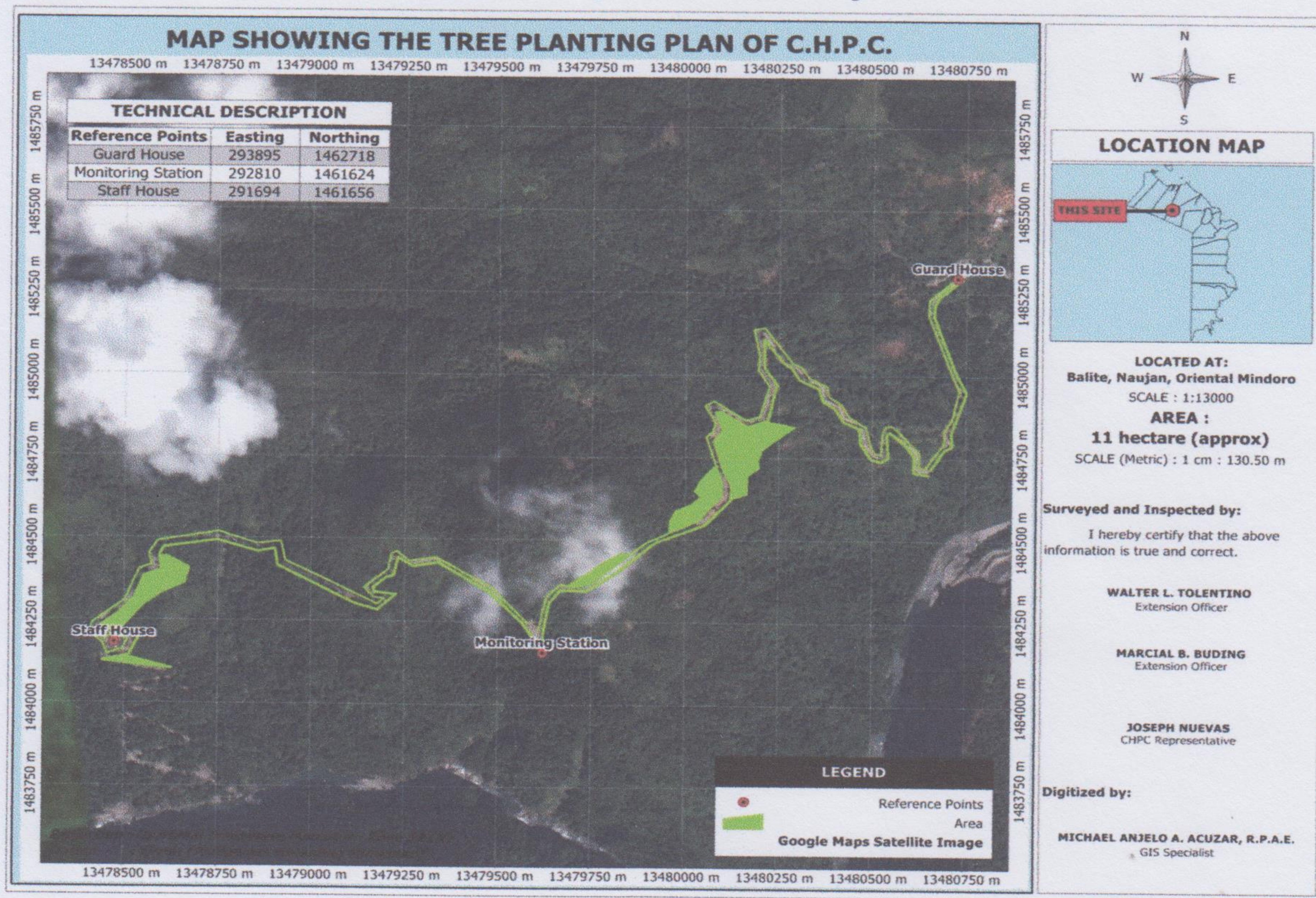




Figure C: Presents the location map of Banuton, Naujan

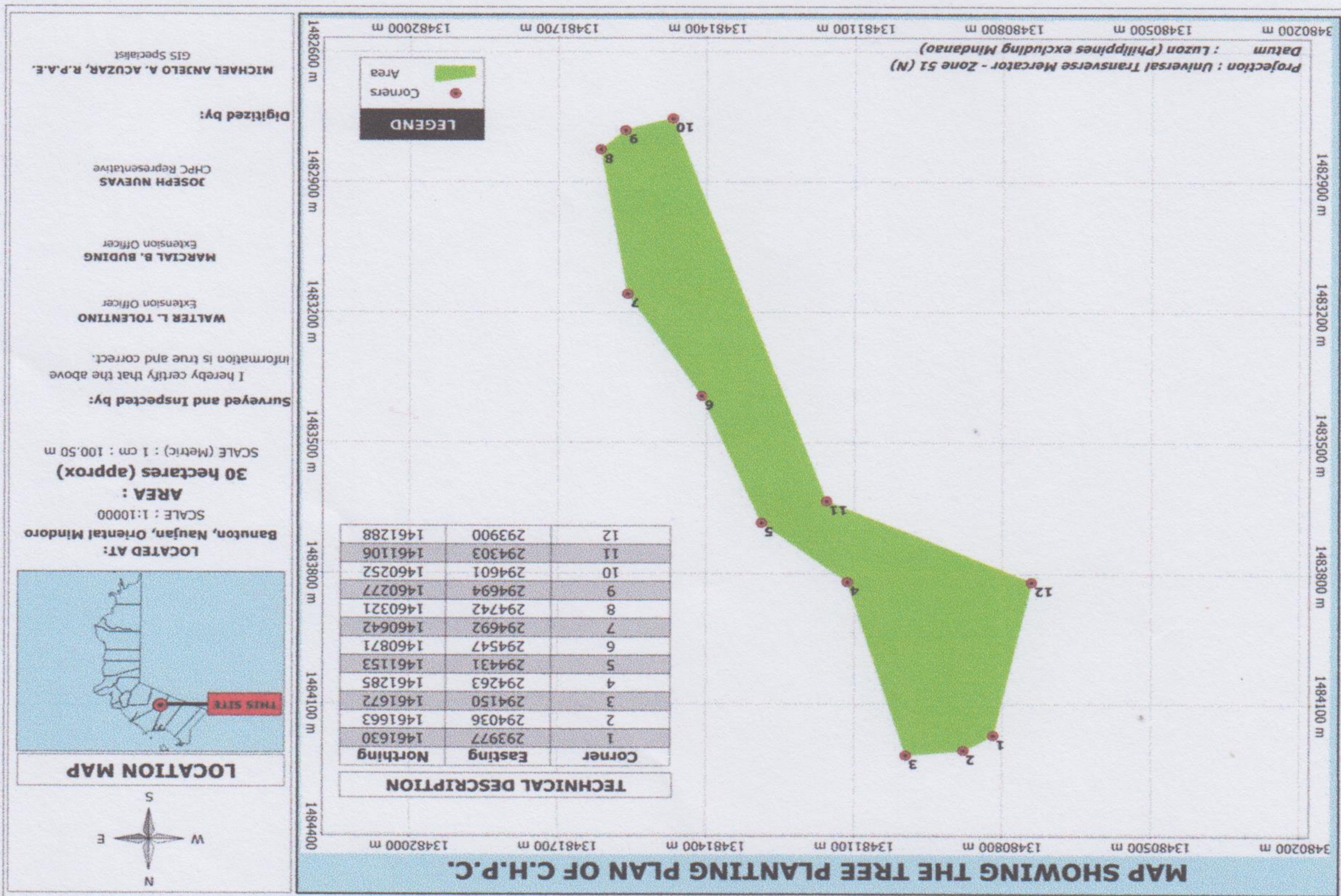
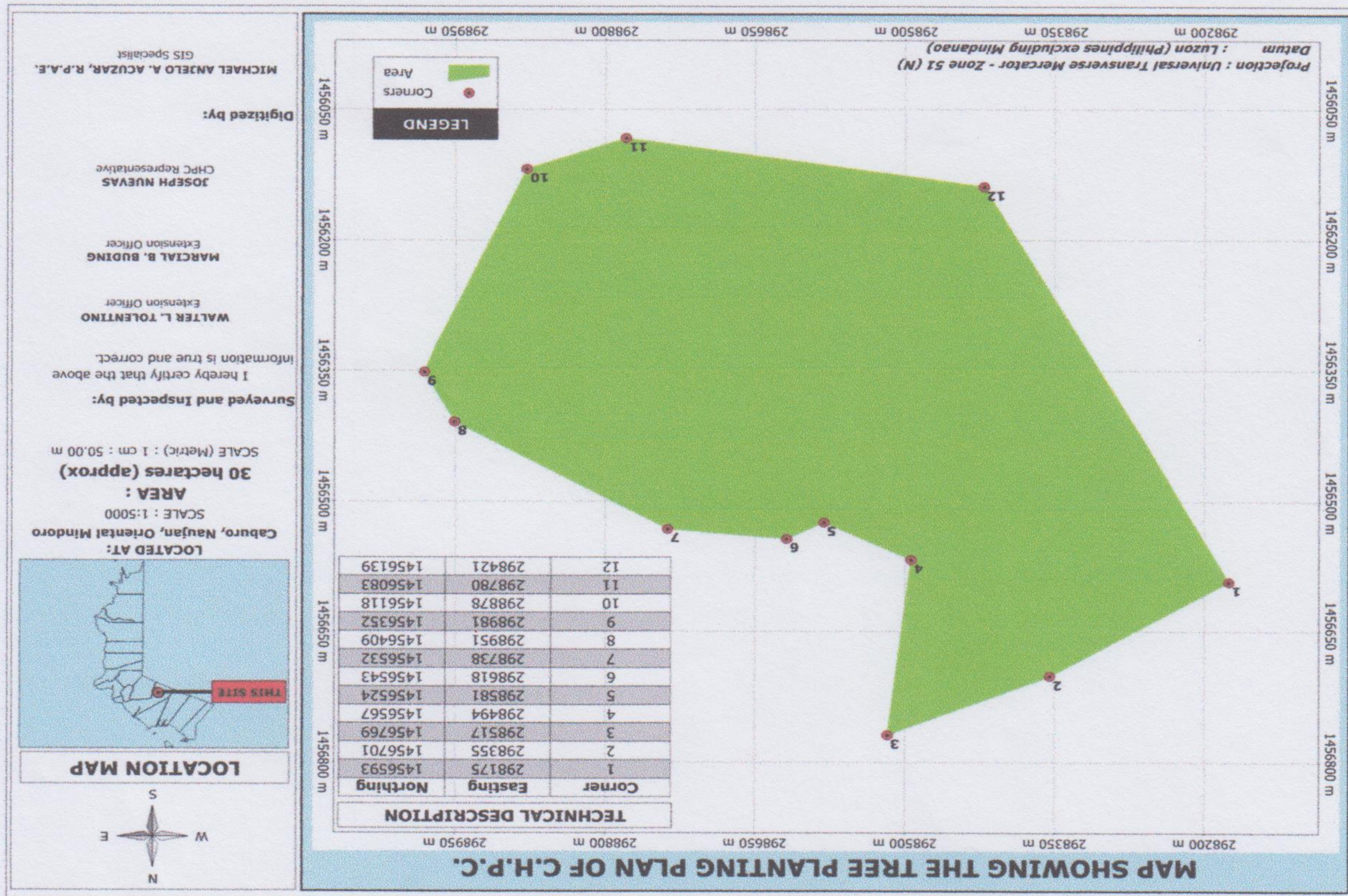


Figure D: Presents the location map of Caburo, Naujan





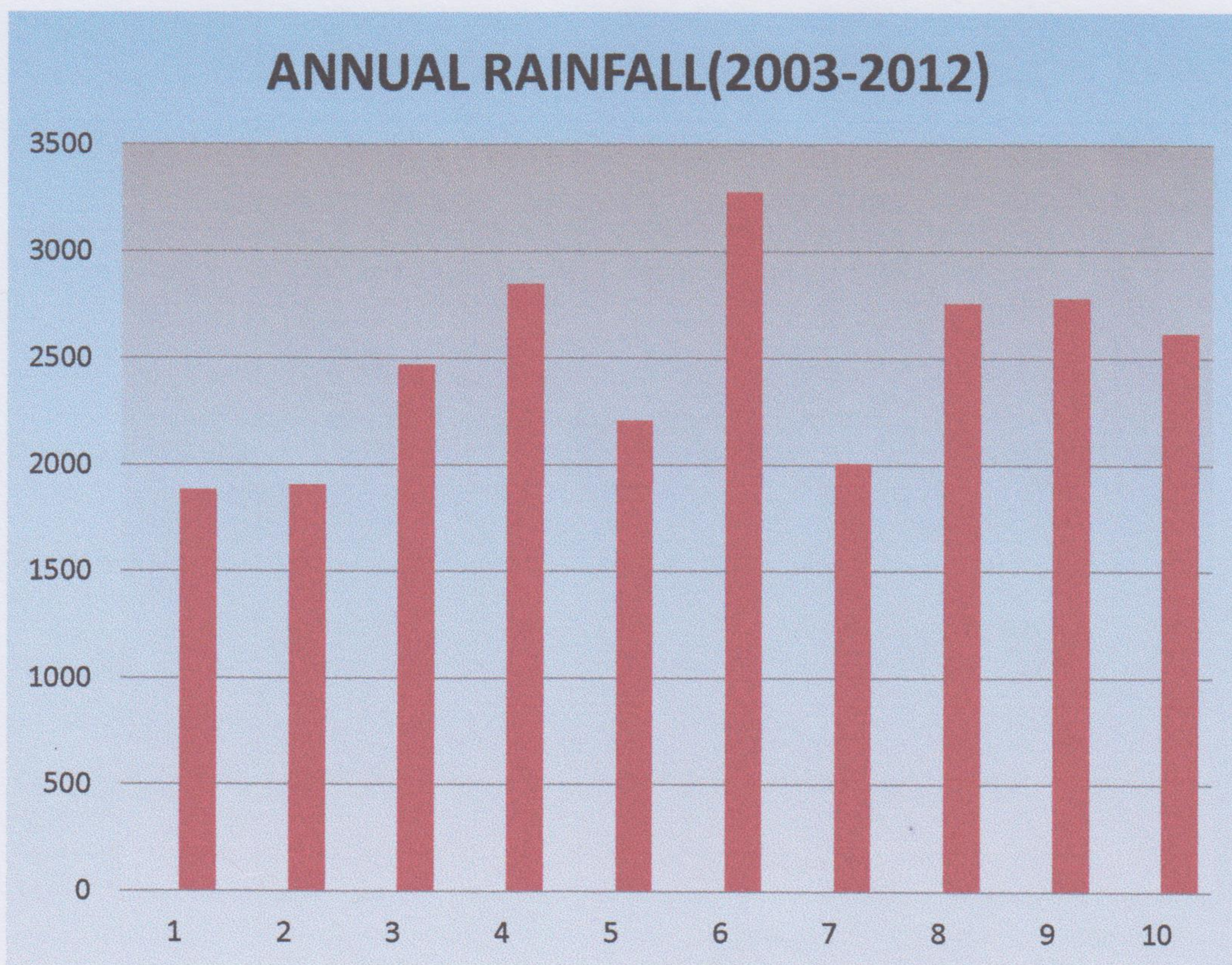
## 2. CLIMATE

The climate formation in the project site belongs to Corona Classification type III with very short dry period lasting for about two to three months. Maximum rainfall occurred from the month of June up to November (Figure 1).

It is often visited by typhoon and southwest monsoon every year.

There are averages of sixty (60) typhoons that visited and crossed Oriental Mindoro. The most frequent month where typhoon mostly visited are the months of October to December of every year (DOST-PAGASA).

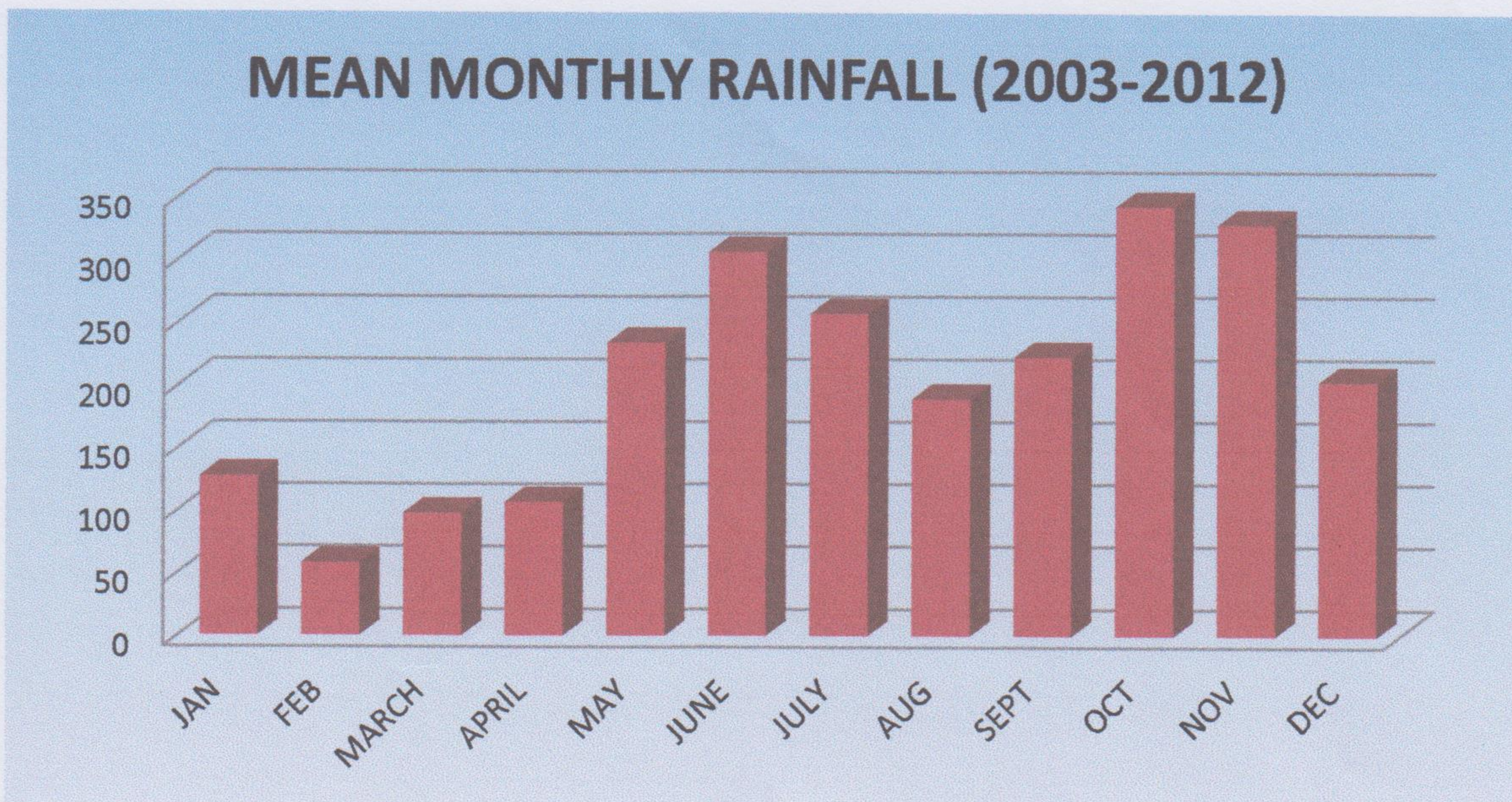
**Figure 1: Annual rainfall distribution of Naujan, Oriental Mindoro**



Source: DOST-PAGASA, Quezon City

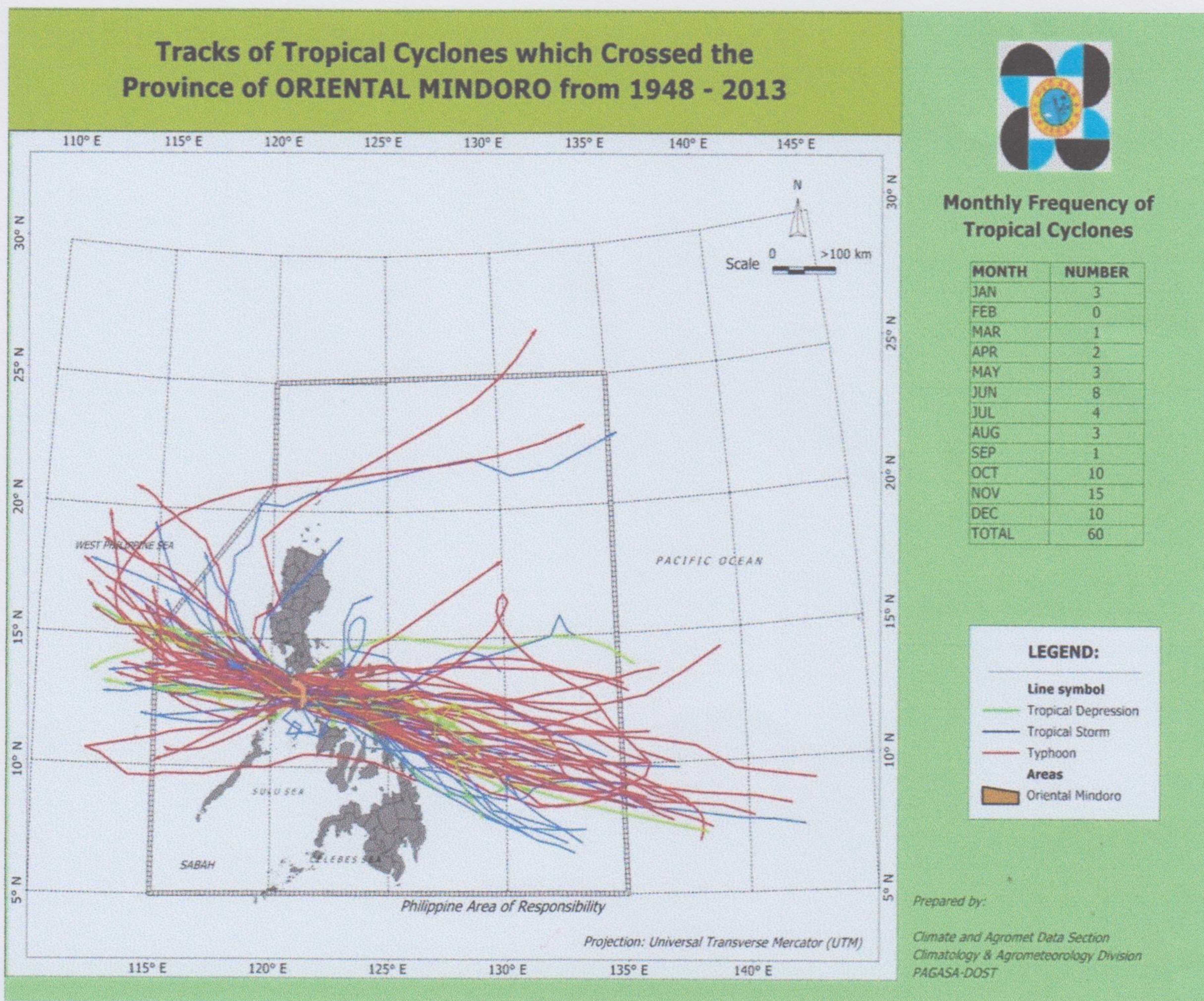


Figure 2: Mean Annual Rainfall of Naujan, Oriental Mindoro



Source: DOST-PAGASA, Quezon City

Figure 3: Tracks of tropical cyclones which crossed Oriental Mindoro



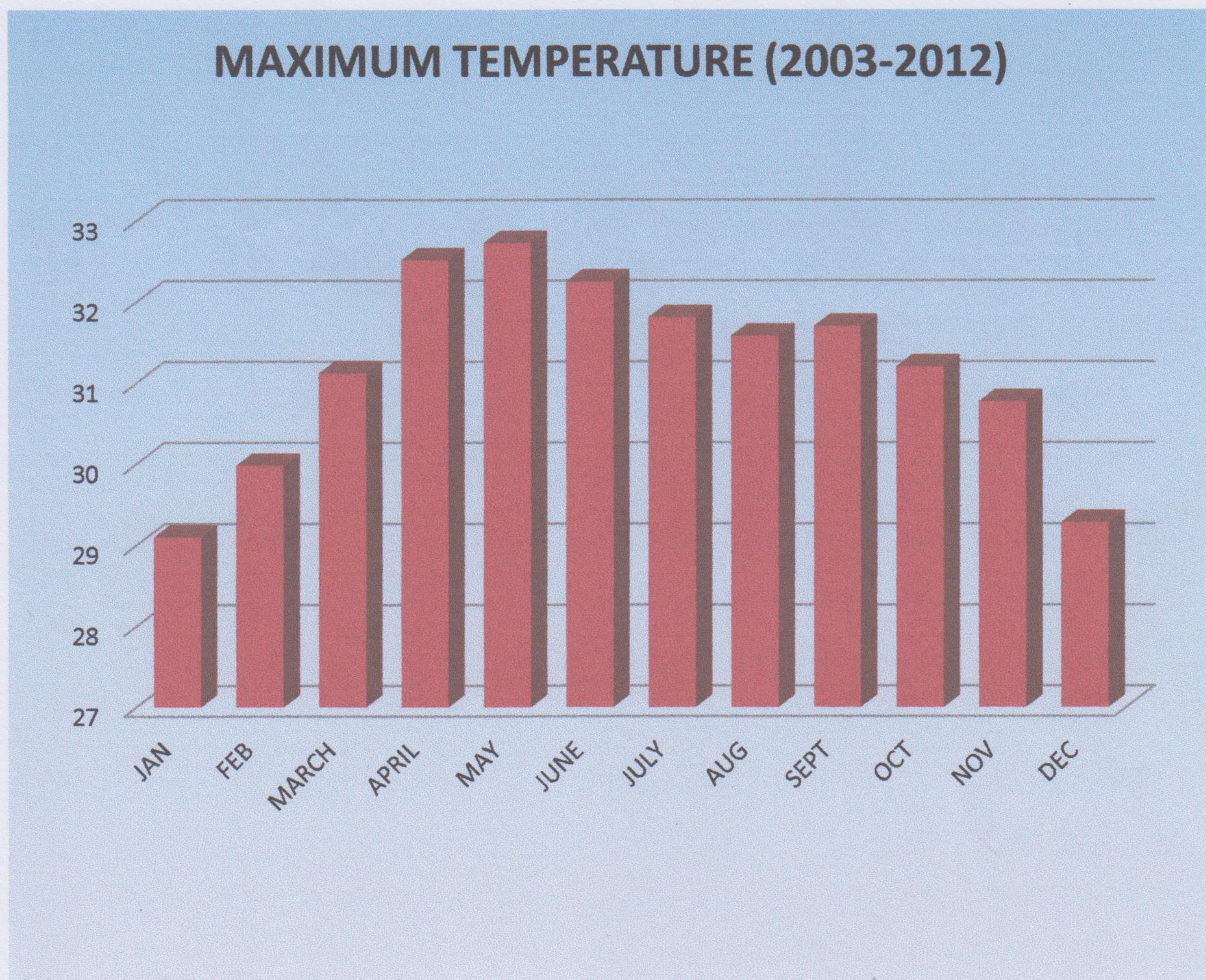
Source: DOST-PAGASA, Quezon City



**a. TEMPERATURE**

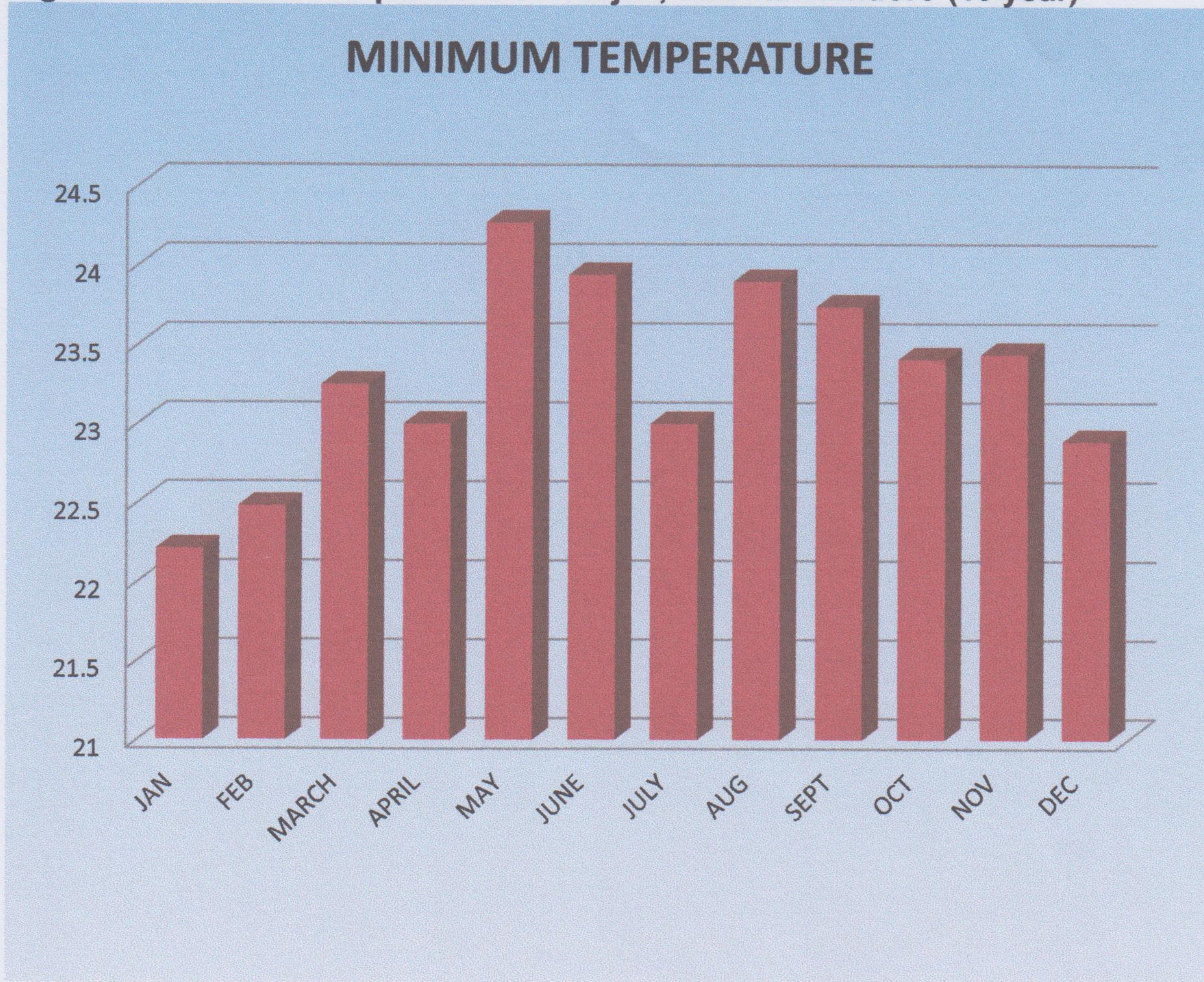
Average temperature range from a maximum of 32.52 degrees centigrade Celsius to a minimum of 21.7 degree Celsius the coldest months are December and January (Figure 5). The month of May has the highest temperature recorded at 32.73 degree Celsius (Figure 4)

**Figure 4: Maximum Temperature of Naujan, Oriental Mindoro**



Source: DOST-PAGASA



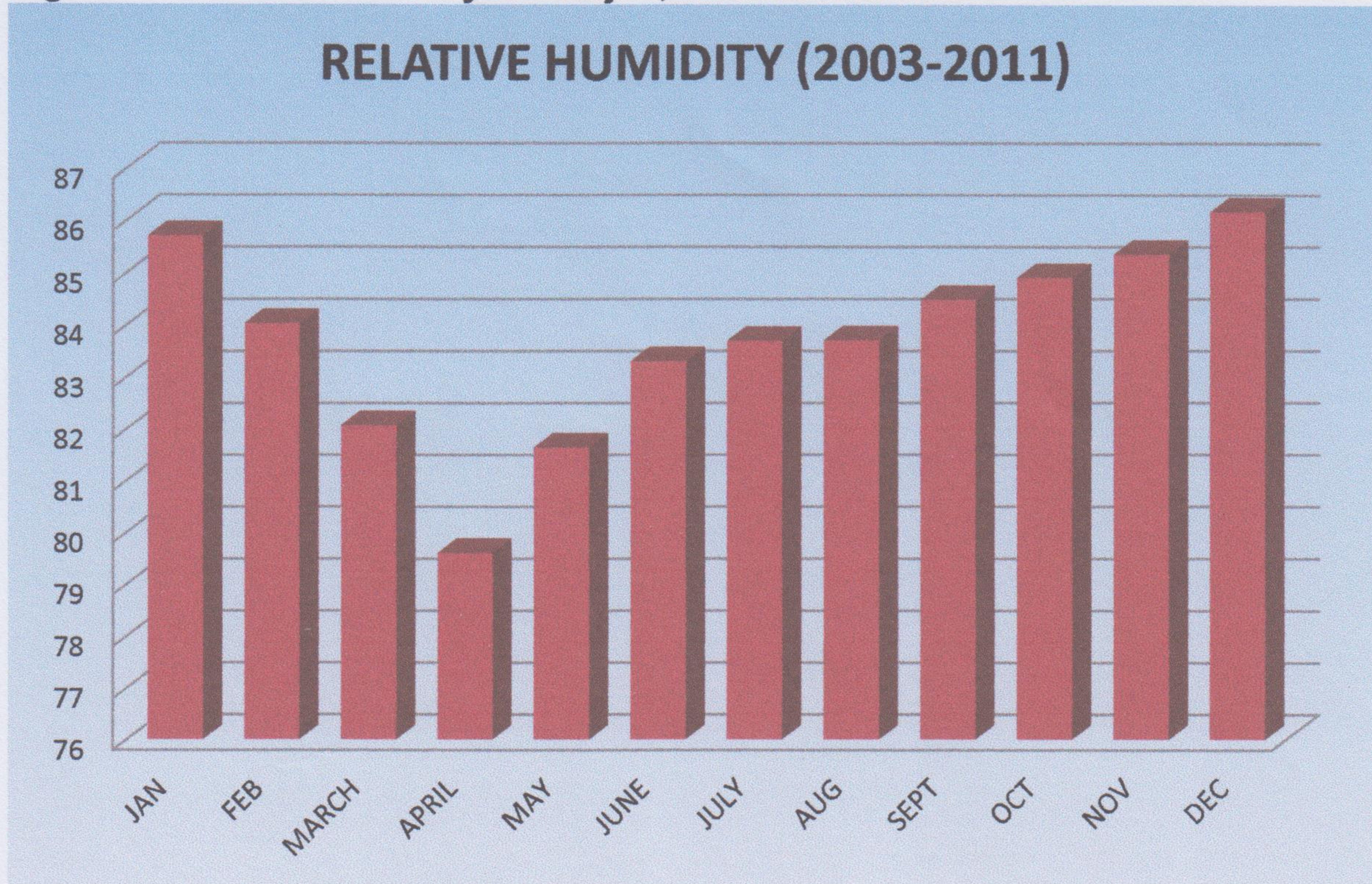
**Figure 5: Minimum Temperature of Naujan, Oriental Mindoro (10 year)**

Source: DOST-PAGASA, Quezon City

### RELATIVE HUMIDITY

Average relative humidity refers to the measure of the moisture content of the atmosphere. The month of December has the highest relative humidity at 86percent while the months of March and April have the lowest relative humidity recorded (Figure 6)



**Figure 6: Relative Humidity of Naujan, Oriental Mindoro**

Source: DOST-PAGASA, Quezon City

### WIND DIRECTION

Wind direction shifts about four times a year. The northeast monsoon prevails from August to December of the year and continues from January to March of the following year. In April, wind direction is east to northeast. In May and June it blows from the southeast. Finally, it becomes easterly in October.

### 3. TOPOGRAPHY AND DRAINAGE

The topography of the project area is from moderate to steep. Major concentrations of drainage of this area are towards the river and its tributary creeks. The drainage pattern of the project area is dendritic. These river systems move downward to the lowland communities. Many of these communities benefitted from the water flow because most of them utilized the water for domestic and irrigation purposes.



#### 4. GEOLOGY, SOILS, AND EROSION

The Province of Oriental Mindoro was formed out of the process of igneous activity during the Pliocene and Pleistocene period.

The land area in the mountain of Naujan was formed during the Pliocene to quarternary volcanic activity. It is composed of the andesitic/basaltic rocks materials. This upland area is composed of Bulacan and Luisiana clay loam series. Bulacan series has moderate to deep and well-drained soil that came from andesitic rocks and the Luisiana series has a deep but well drained soil that came from basaltic rock materials. While the fertile valley of the lowland area or the floodplains of Naujan were the subject of continuous deposition of fluvial sediments. Most of these low lying areas are devoted to rice productions.

The presence of some trees in the area provided sources of litter that are also sources of organic matter. Organic matter in the area help improve soil structure, conserve soil moisture, increase water holding capacity, give high cation absorption capacity, increase supply and availability of nutrients, reduce plasticity and cohesion, encourage granulation and serve as a good source of nitrogen compound.

#### 5. VEGETATION/ LAND-USE

These areas are now composed mostly of the second growth of forest. Remnants of old dipterocarp forest are found in the gullies, steep hills and top of the ridge and distributed sporadically. While some areas belong to Parang type of vegetation (grassland-brushland area) existing in the area. Some area with moderate slope is now planted with coconut, banana and fruit trees such as langka, durian, lanzones and rambutan.



## 6. LAND CLASSIFICATION

Land Classification of Naujan is forestland and A&D land. Forestland are those areas that falls within Barangays Arangin, Balite, Banuton, Caburo, Buhangin, Herrera, Magtibay, Malvar, Masagana, Montelago, Metolza, Sampaguita, San Andres, San Luis, Santiago, Sta. Isabel, and Paitan and covers an area of 12,750.3205 hectares. Mangrove forests of Naujan are also classified as part of timberland. Alienable and disposable of Naujan are mostly agricultural and residential area.

## C. SOCIO-ECONOMIC CHARACTERISTICS

### 1. DEMOGRAPHIC INFORMATION

#### a. Population and Density

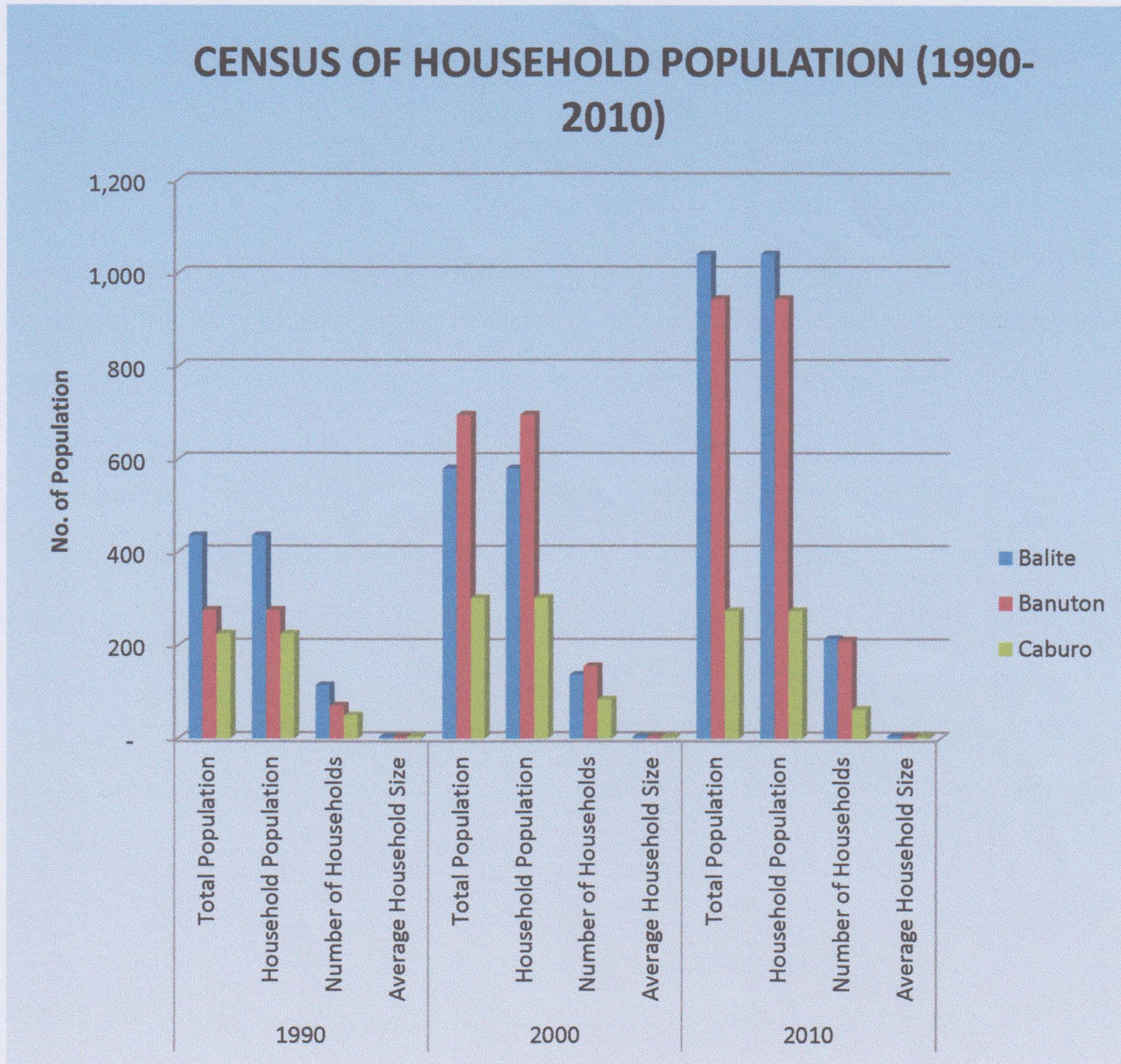
As of 2010 census of National Statistics Office the total population of Balite, Banuton and Caburo is recorded as 2,258 individuals living in 488 households. There is an increase of 1,321 individuals from 1990 to 2010 based on the census of population in the area (Figure 7).

#### b. Household Family size.

As of 2010, average size of household in the area is 4.56 (Figure 8).



Figure 7: Census of household population (NSO).

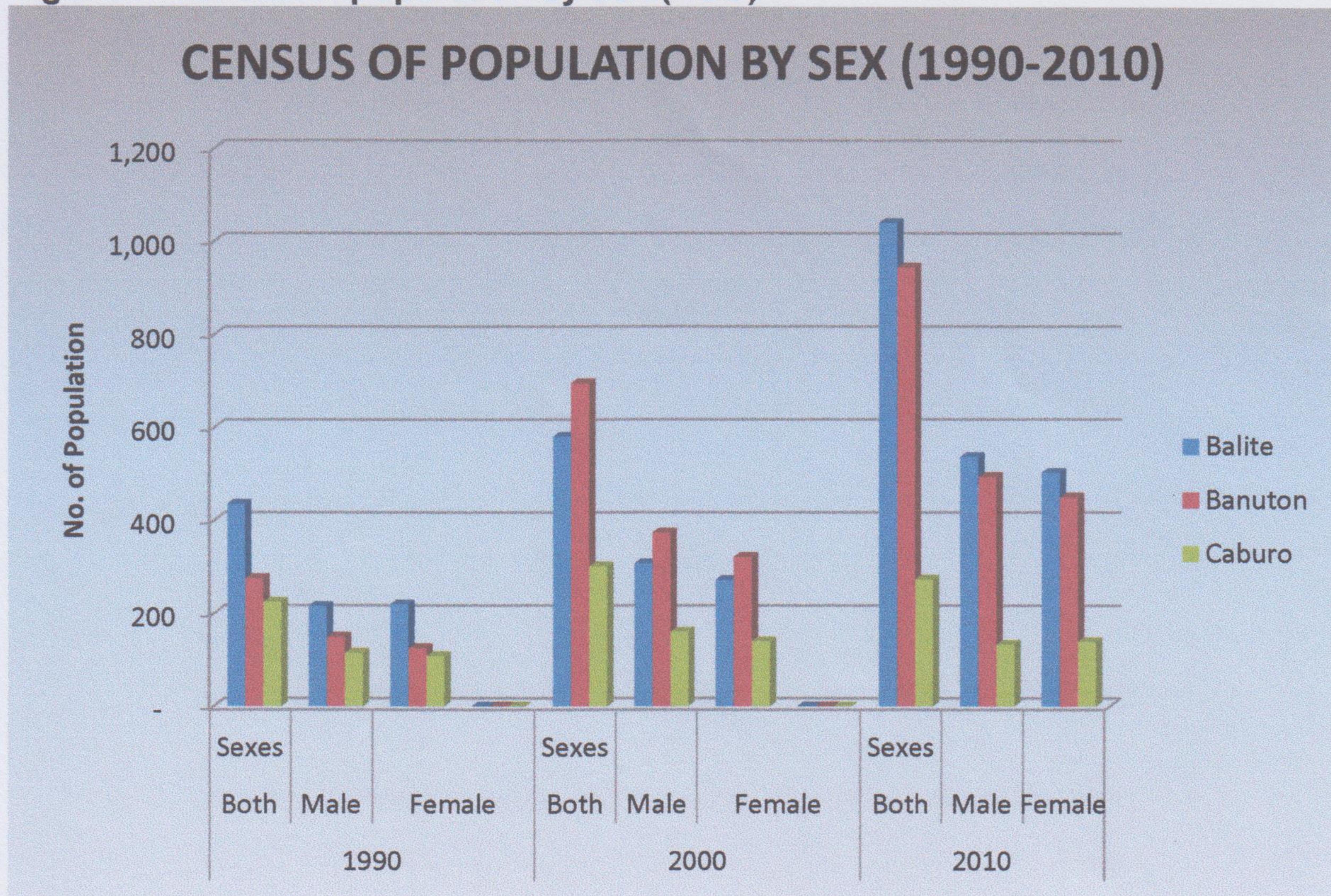


### c. Age Structure

Records of 2010 survey of populations by NSO in these three barangay shows the distribution of male and female shows that male is higher than female (Figure 8). The bulk of population of age bracket has the highest in number in the ages 5 to 19 years old Figure 9)



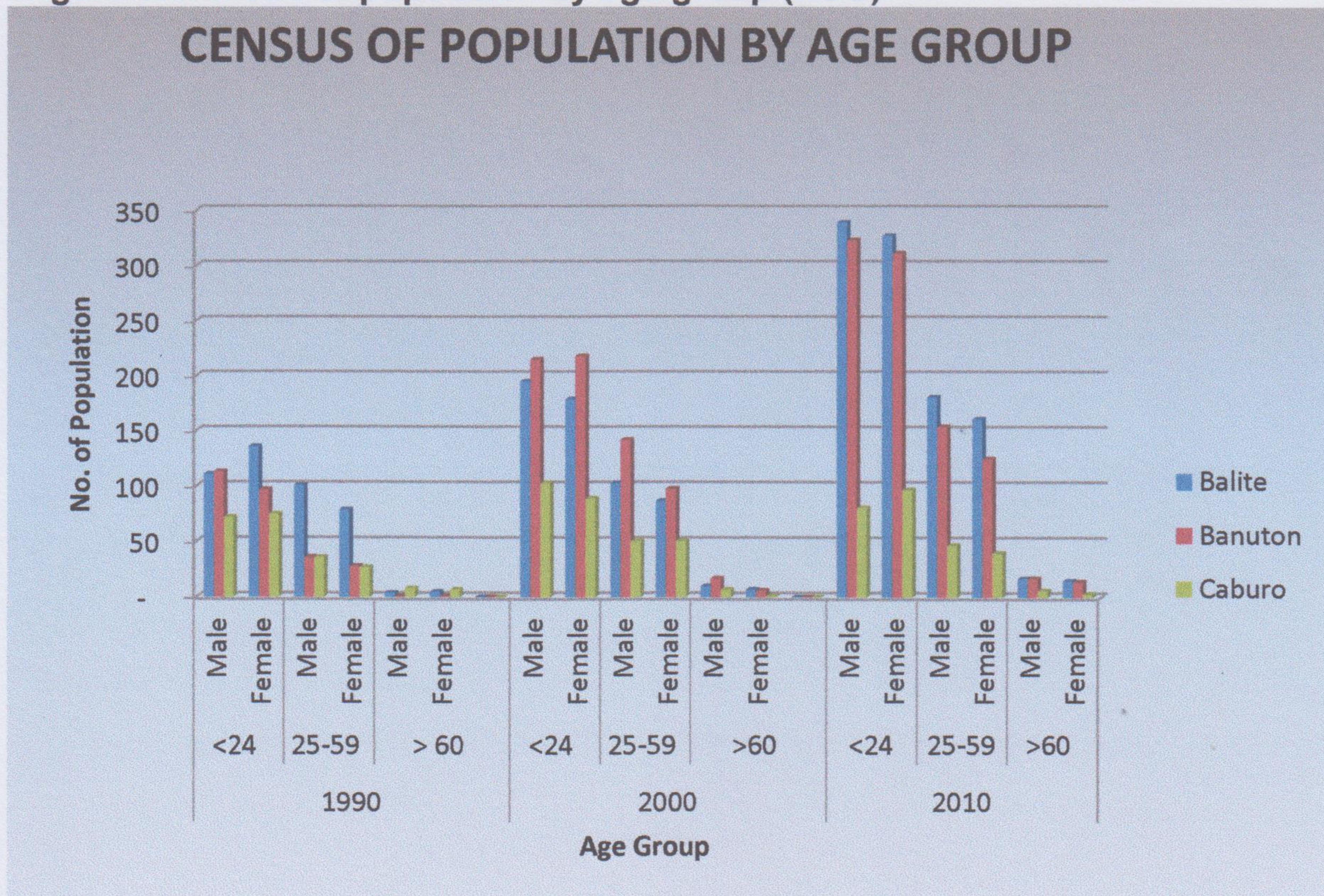
Figure 8: Census of population by sex (NSO)



d. Growth rate

Recorded growth rate in the area is 1.07 Percent (Naujan Socio-economic Profile).

Figure 9: Census of population by age group (NSO).





### **e. Employment Pattern**

Since then that Naujan is an agricultural producing town, farming become the major source of their livelihood. Some other sources of income of these people came from services sector.

## **2. Behaviour, Political and Cultural Pattern**

People in Naujan are composed of IP's and migrants from other provinces and regions such as from Ilocandia, Bicol and Batangas. But as they go along, inter marriages occurred, cultural tradition become modified and shifted to a new cultural paradigm. Dialects commonly spoken in the area is Tagalog. Major religious group in the area are Roman Catholic, Iglesia ni Cristo, protestant and Born Again Christian.

## **3. Support Services**

### **a. Education**

All barangays in Naujan has an elementary school while there are only secondary schools strategically located in eight district of Naujan. This gives the residents of Naujan an equal access and opportunity in education. There is one tertiary school in Naujan, the Naujan Technical College. Having these schools facilities put Naujan literacy at 92 Percent (NSO, 2007).

Females had attained higher levels of education as majority of those with academic degrees were females (NSO, 2007).

### **b. Health**

Medical services are provided by Municipal Hospital with two sub-office located at Santiago and Barcenaga.



Barangay Health in every barangay in Naujan is available. Barangay Health Workers assisted the residents in extending basic health services in the locality.

### c. Social Services

Municipal Social welfare and Development Office is the leading unit of Naujan local government in providing basic social services to the community. This unit of the local government give care, protection and empowered the socially, economically and physically disadvantage sectors in the municipality

## II. DEVELOPMENT PLAN OF THE PROJECT AREA

### A. SURVEY AND MAPPING

There are four sites surveyed to be used as the area for plantation establishment in compliance with the conditions stipulated under ECC No. ECC-R4B-1381-0007 issued to Catuiran Hydropower Corporation.

These sites are enumerated as follows:

1. Balite-	11 hectares
2. Banuton-	30 hectares
3. Caburo-	30 hectares
4. Campsite-	1 hectare

Total area = 72 hectares

### B. CONSTRUCTION OF NURSERY

One nursery shall be located in the area near the water source. It is expected to accommodate the planting requirements of the site to be planted as well as the seedlings to be distributed to the IP's in the area.

### C. NURSERY OPERATIONS



## 1. CHOICE OF SPECIES

The species to be used for this plantation are enumerated as follows:

- a. **Fruit Trees – Lanzones, rambutan, Pili, Marang and Mabolo**
- b. **Forest Trees – Mixed species**

## 2. SEEDLINGS PRODUCTION

The total number of seedlings to be produced shall be based on the requirements of the planting area as well as the request of the IP's.

## D. PLANTATION ESTABLISHMENT

### 1. PLANTING DESIGN

For fruit tree component of this private plantation, a spacing of 5 meters by 4 meters distance shall be used while for Mahogany and Gmelina, spacing of 2 meters by 3 meters shall be employed or observed.

### 2. SITE PREPARATION

The following steps shall be used as the methods to be employed in this private plantation development.

#### a. **Clear brushing**

The entire grasses found along the area shall be removed. Brushing shall be employed to avoid the competitors to develop in the early stage of seedling development. The portion where the seedling will be planted shall be widening enough for the initial stage of the seedling growth. Cut grasses in the intended hole shall be allowed to decay in the base of the seedlings. Decayed organic matters are good sources of plant nutrients.



**b. Staking**

To provide guide in a more uniform plantation, staking shall immediately follow after the brushing. For an easy identification and location of the hole at least a meter long stake is needed.

**c. Hole digging**

Hole digging should be the next step after the staking of the site. Hole should be wide and deep enough to allow the root to hang vertically. Soils that will be removed from the hole shall be put adjacent to the opening for purposes of using this again to cover the base of the seedling to be planted.

**d. Transport of the seedlings**

Common mishandling of seedlings along the transportation period had been experienced in previous plantation development. To avoid this scenario, a more rigid and demonstration on how to properly handle the seedlings should be given to the hauler of the seedlings to the plantation to avoid additional stress to the plants. These scenario if not avoided will contribute to the mortality of the seedlings. After the hauling, these seedlings should be immediately planted to the intended hole especially if continuous rain occurred. Too much water in the hole might contributed to the death or poor performance of the seedlings.

**3. PLANTING**

Having good rainfall in the area is an advantage for this private plantation, enough soil moisture is available thus after two to four weeks of the onset of the rainy season planting can be started.



Choice of the quality of good planting materials shall be employed to avoid using overgrown seedlings that are most of the times contributed to the higher mortality and incurring additional cost to the plantation development.

Replanting should only be done once or in the second year after the plantation establishment. The seedlings may become stunted and overshadowed by the early trees planted ahead.

#### **4. PRUNING**

There shall be regular pruning to improve the tree growth and produce a good lumber.

#### **5. THINNING**

Thinning shall be made five years after the plantation was established to improve the health conditions of the tree.

#### **6. INTERCROPPING**

Intercropping will be encouraged in order to maximize the utilization of the land area. These crops are not limited to cassava, camote and vegetables.

### **E. Maintenance and Protection**

These methods shall be used in maintaining this plantation.

#### **1. Weeding and Cultivation**

Removal of weeds surrounding the base of the seedling should be one meter wide. This activity should be done twice a year, the first is one month after the onset of the rainy season and the second is one month before the end of the rainy season.



## **2. Fertilizer Application**

Fertilizer should be applied once a year. This is one month after the start of the rainy season immediately after the weeding.

## **3. Stray Animal Monitoring**

There should be a regular monitoring of the plantation to check if there are stray animals that may potentially harm the planted species in the area.

## **4. Pest and Control Monitoring**

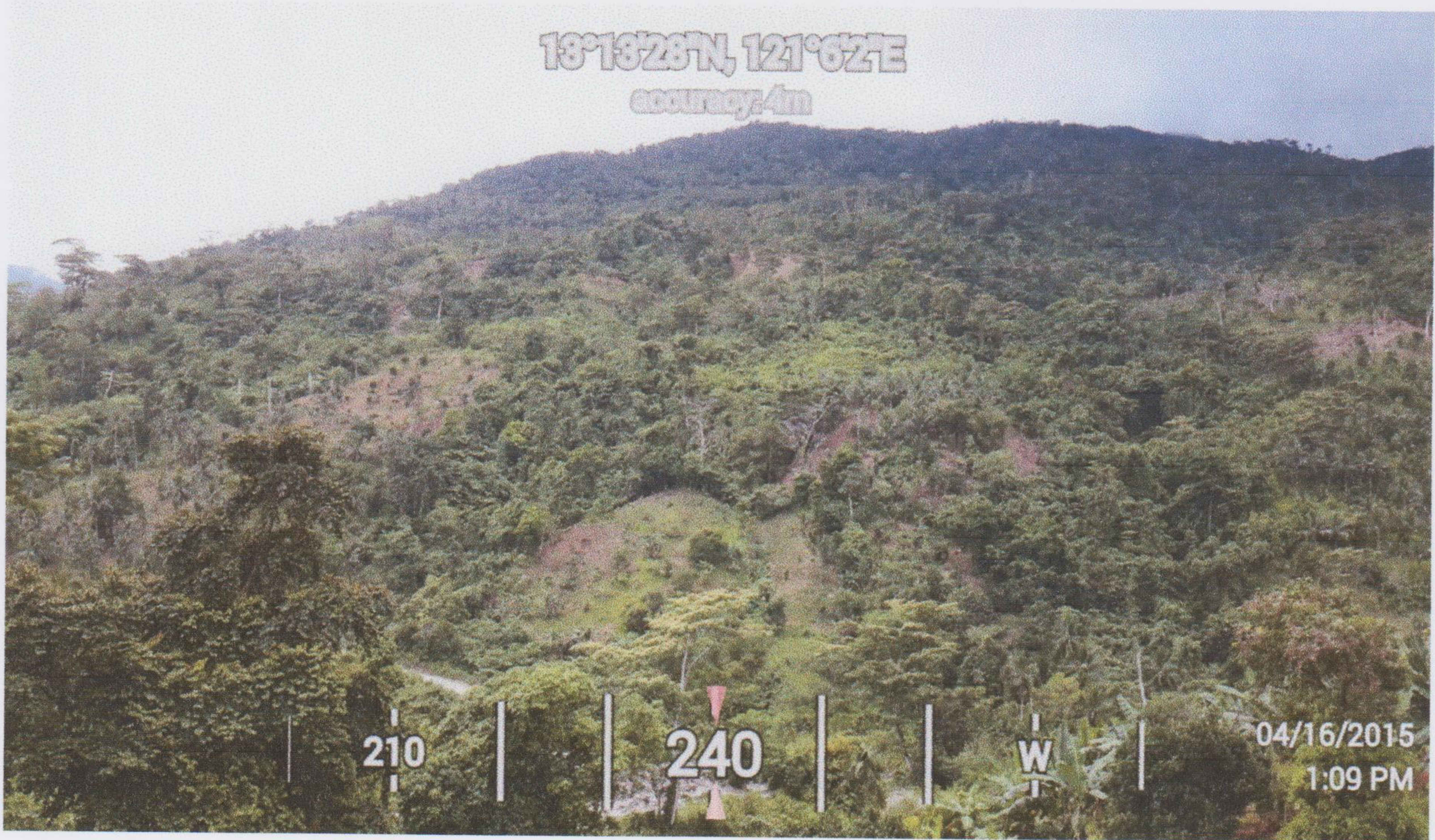
Regular monitoring should be done after the plantation establishment to prevent occurrence and incidence of pests and diseases. Monoculture should be avoided to prevent the pest from developing the host plants as their permanent habitat.



# ANNEXES

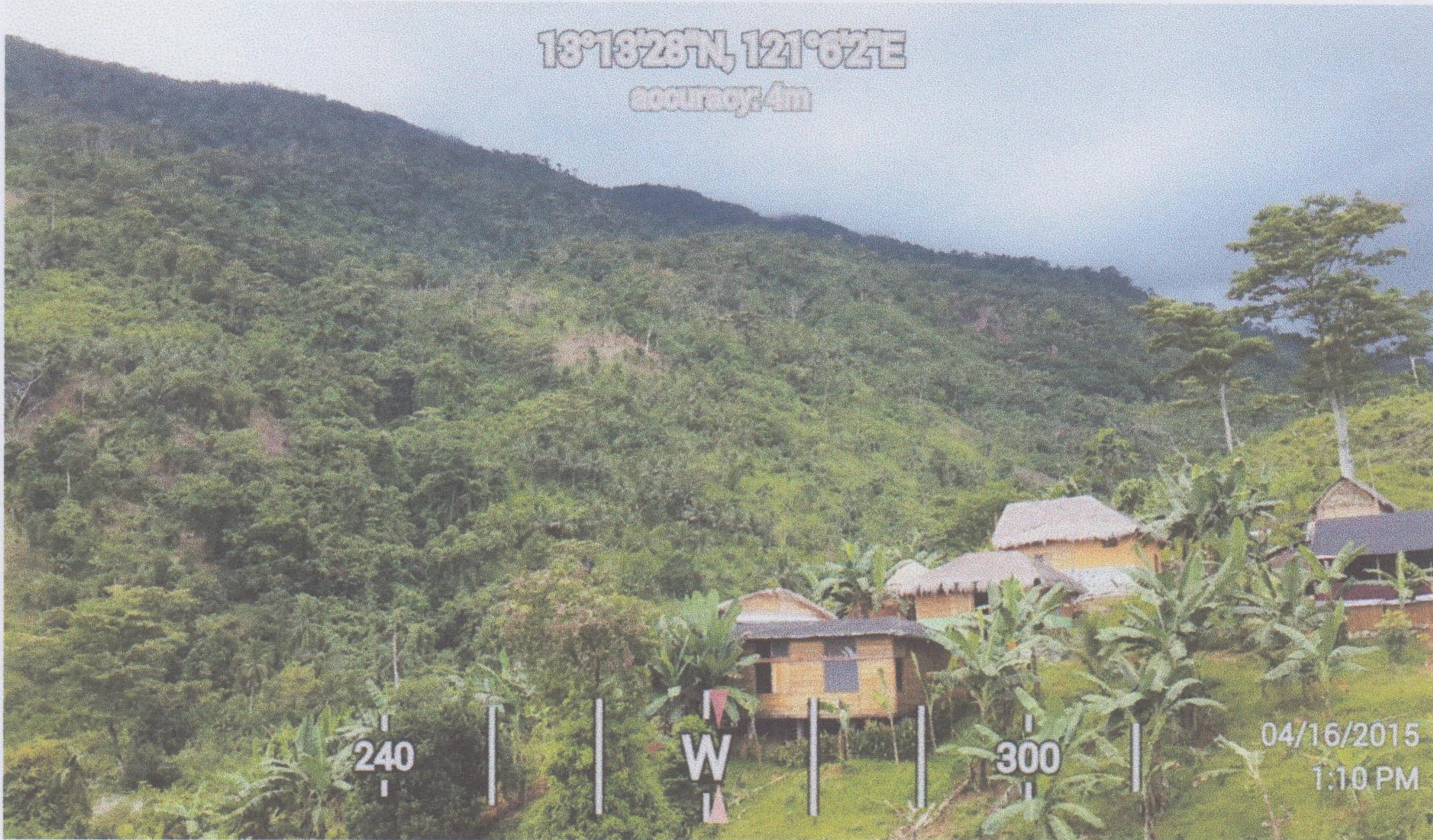


Annex 1: BARANGAY BALITE, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY BALITE, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE



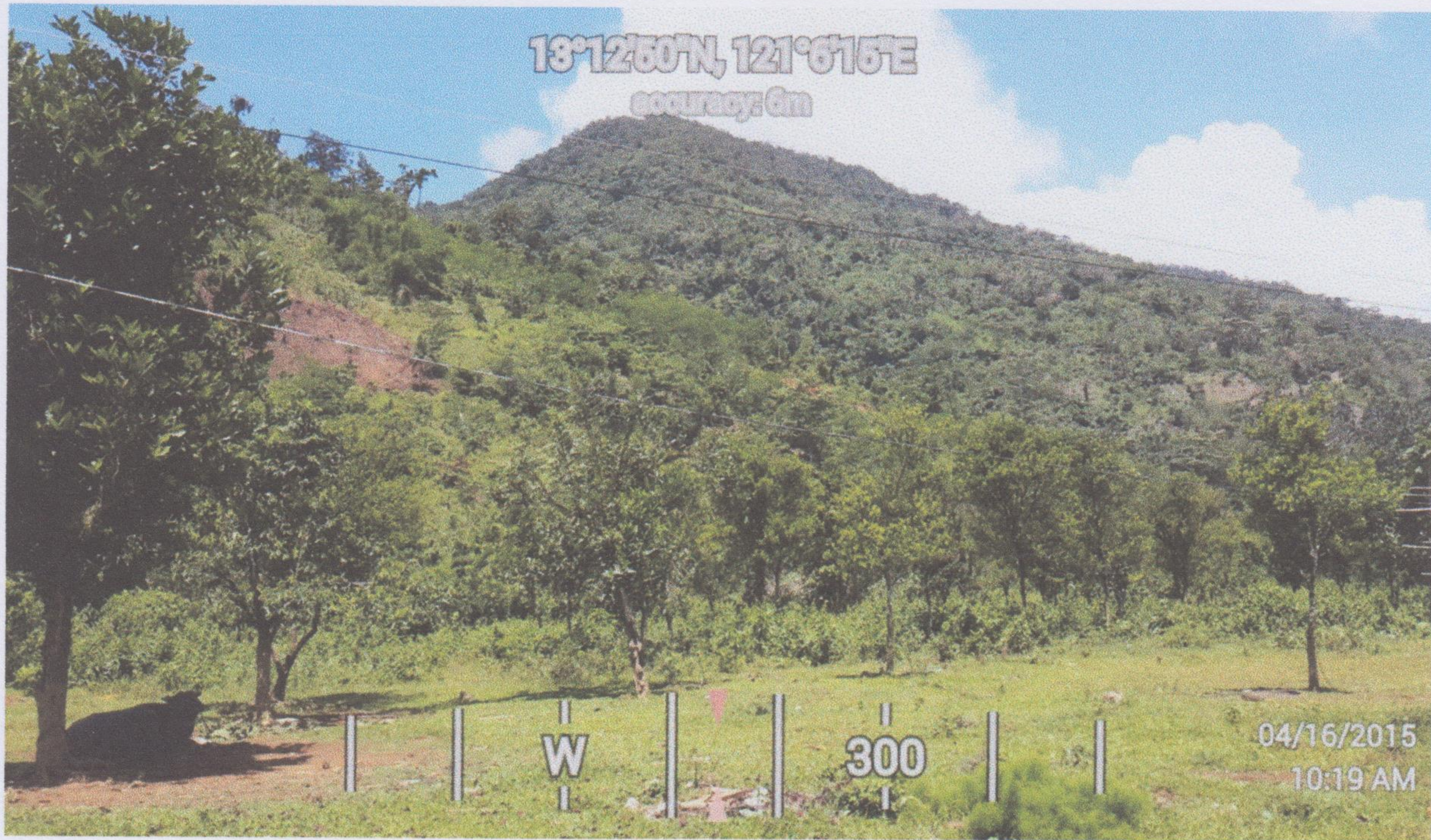


Annex 2: BARANGAY BANUTON, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY BANUTON, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE



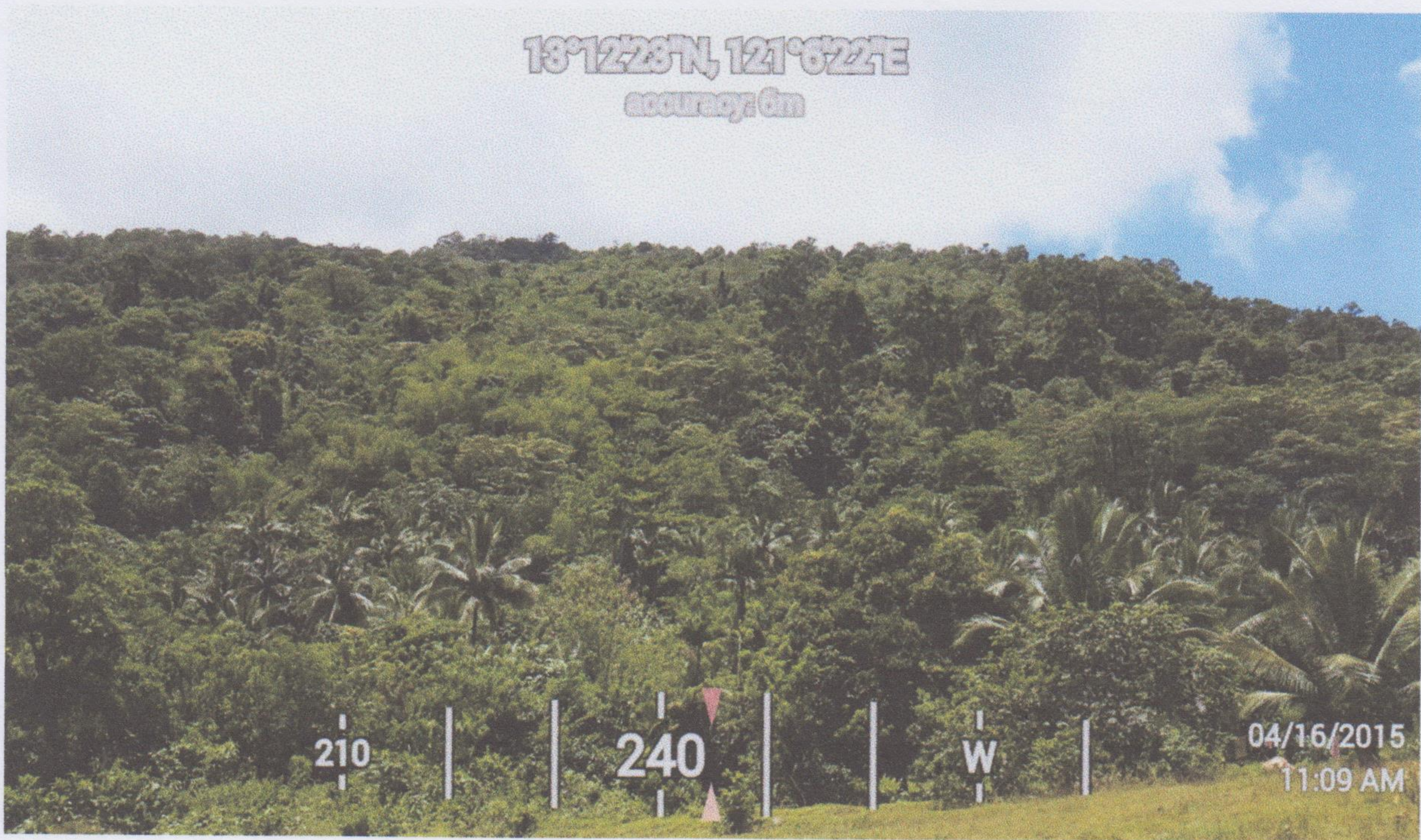


BARANGAY BANUTON, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY BANUTON, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY BANUTON, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





Annex 3: BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE





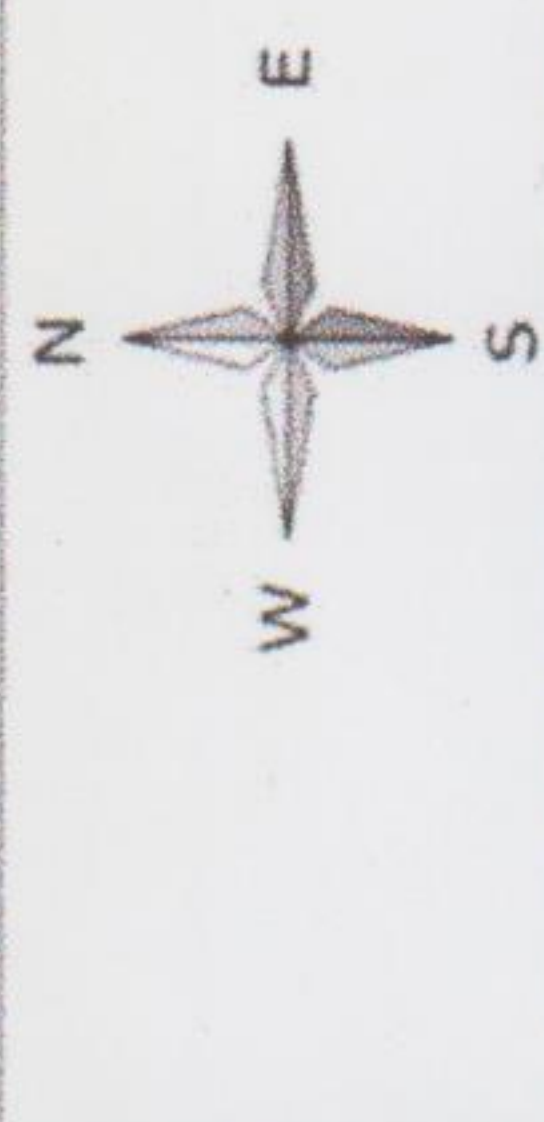
BARANGAY CABURO, NAUJAN, ORIENTAL MINDORO PROPOSED PLANTATION SITE



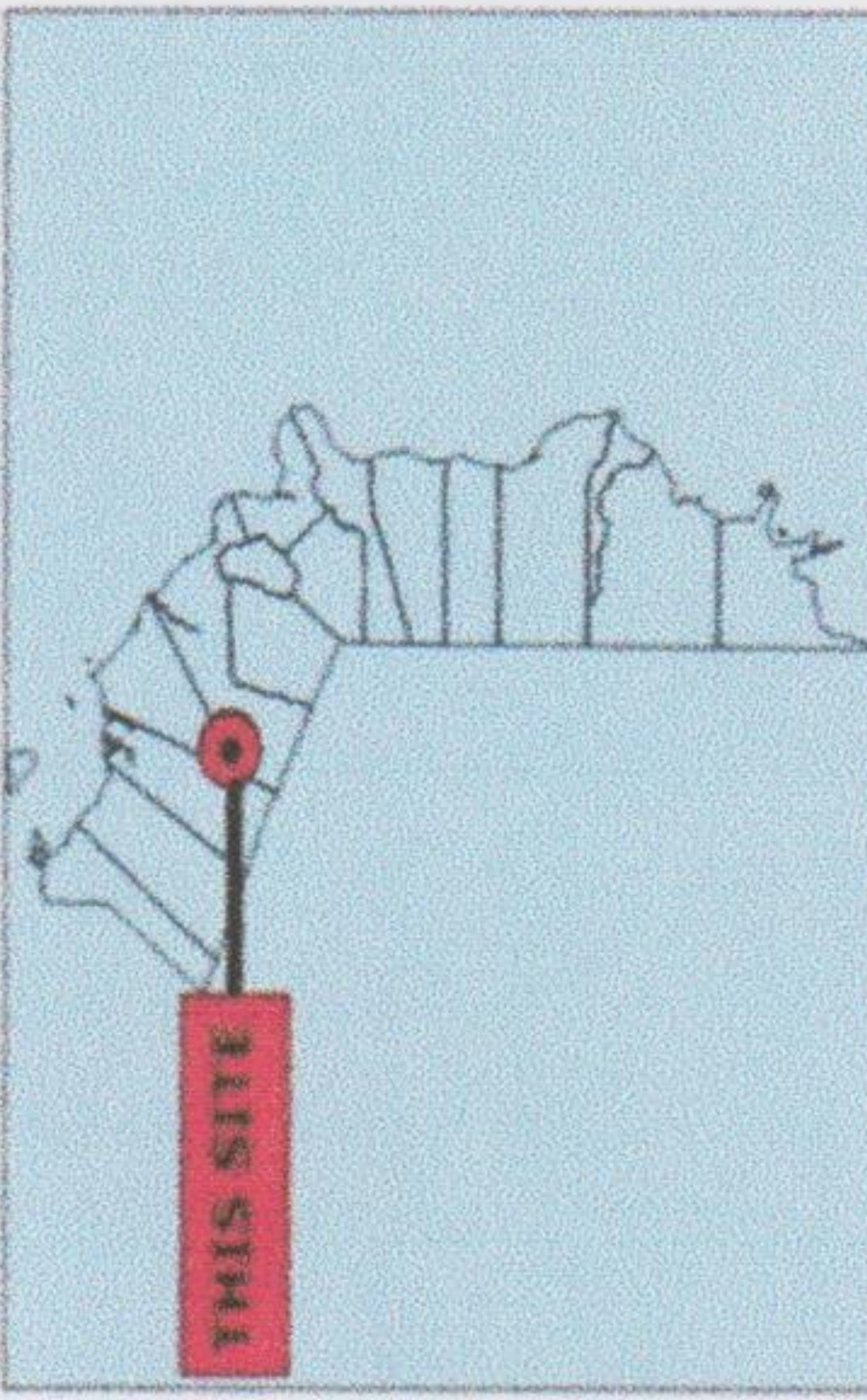


# MAPS





**LOCATION MAP**



**LOCATED AT:**  
 Malvar, Naujan, Oriental Mindoro  
 SCALE : 1:4000  
**AREA :**  
 1 hectare  
 SCALE (Metric) : 1 cm : 40.00 m

**Surveyed and Inspected by:**  
 I hereby certify that the above information is true and correct.

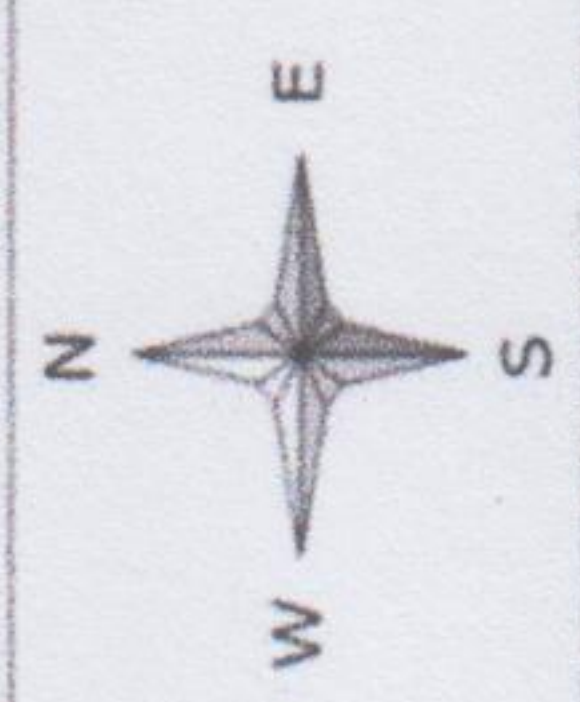
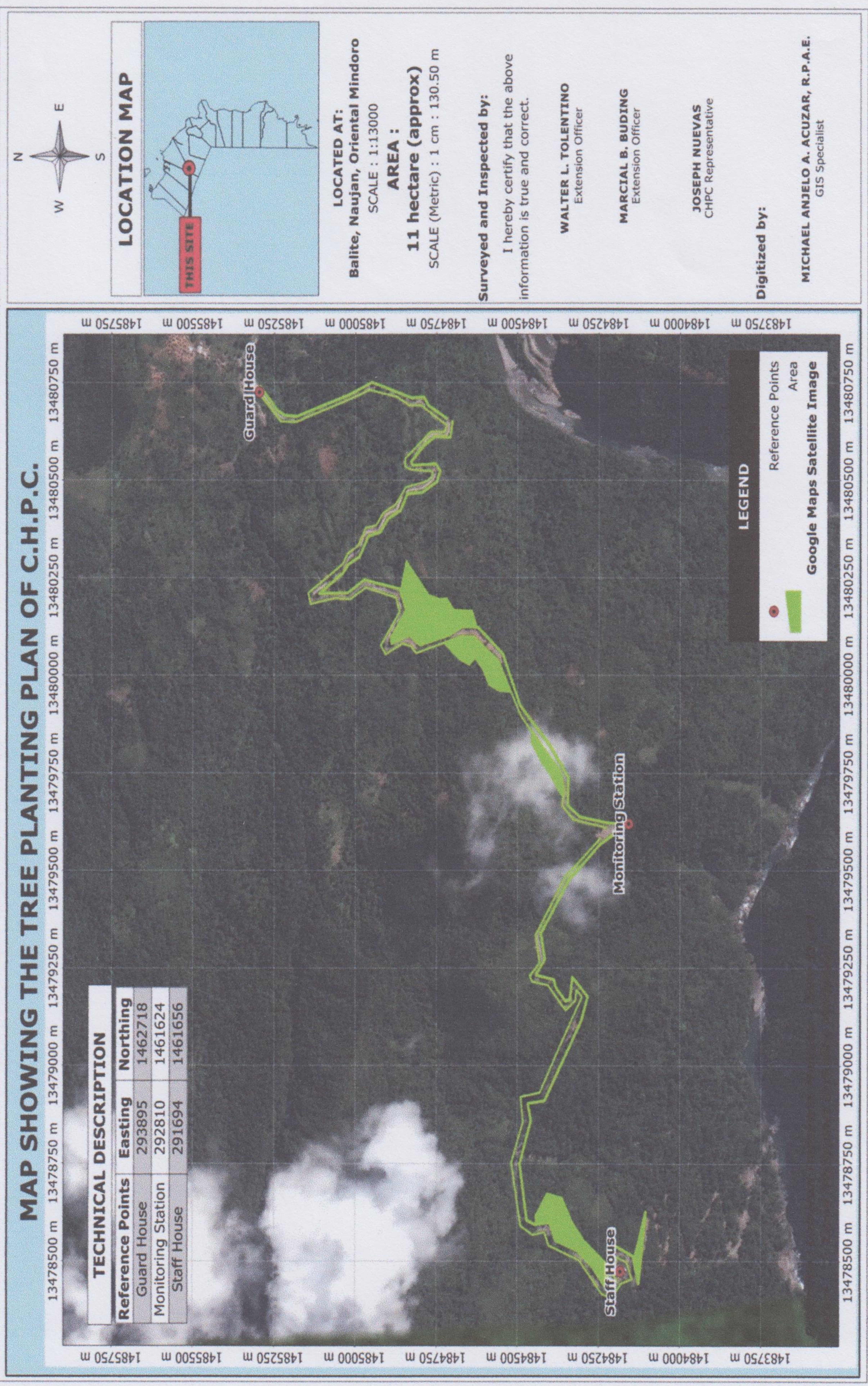
**WALTER L. TOLENTINO**  
 Extension Officer

**MARCIAL B. BUDING**  
 Extension Officer

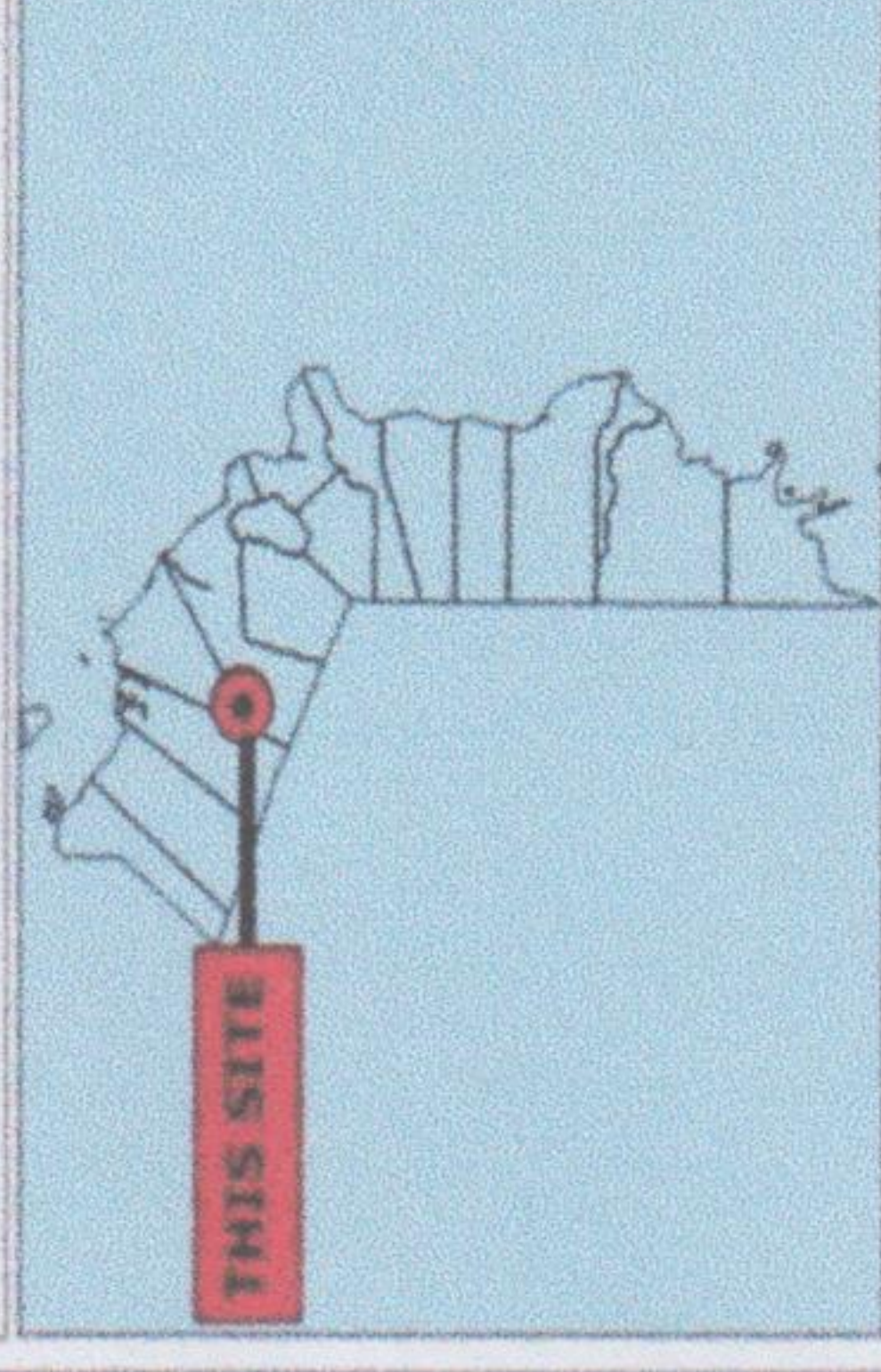
**JOSEPH NUEVAS**  
 CHPC Representative

**Digitized by:**  
**MICHAEL ANJELO A. ACUZAR, R.P.A.E.**  
 GIS Specialist





**LOCATION MAP**



**LOCATED AT:**  
Balite, Naujan, Oriental Mindoro  
SCALE : 1:13000

**AREA :**  
**11 hectare (approx)**  
SCALE (Metric) : 1 cm : 130.50 m

**Surveyed and Inspected by:**  
I hereby certify that the above information is true and correct.

**WALTER L. TOLENTINO**  
Extension Officer

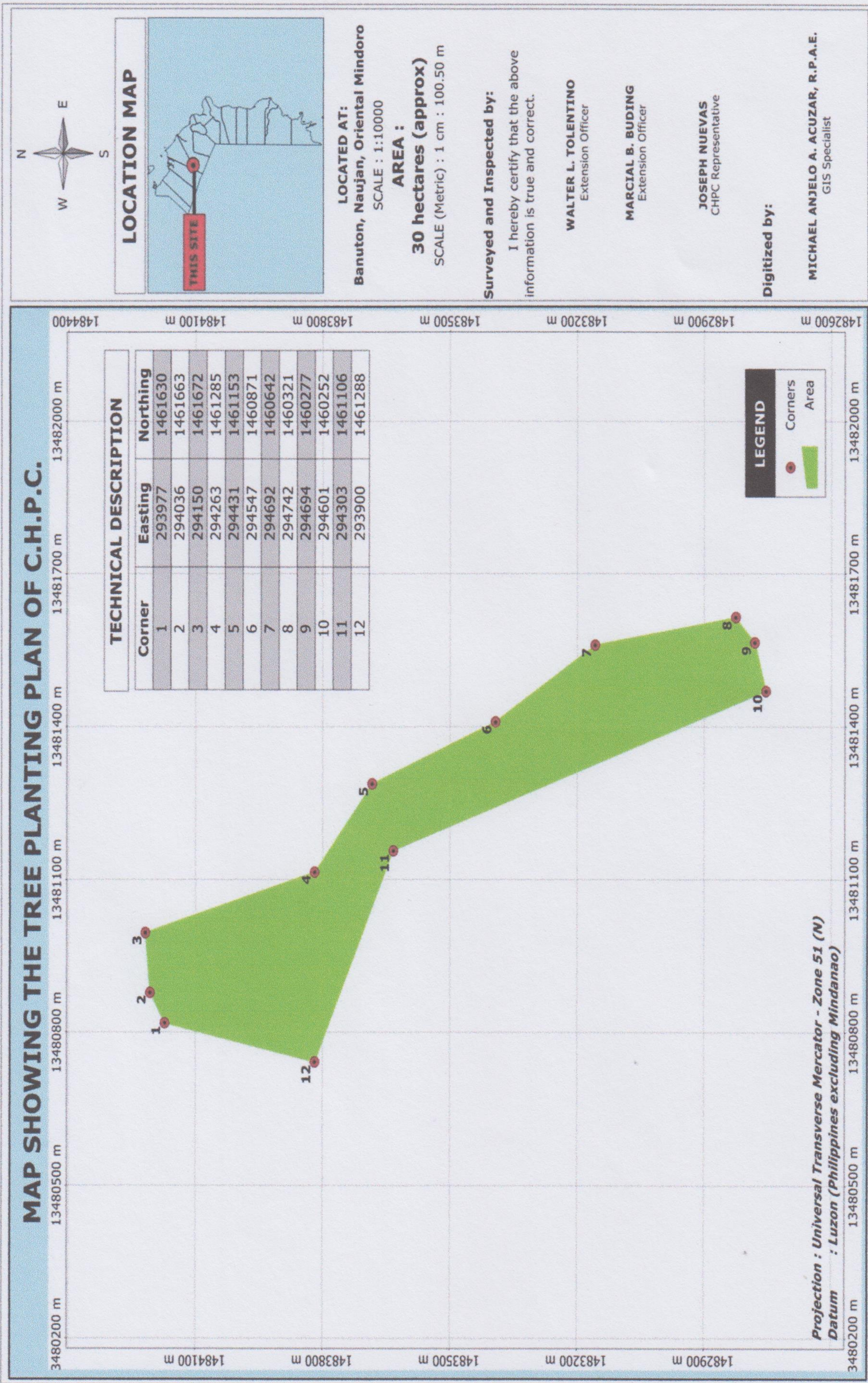
**MARCIAL B. BUDING**  
Extension Officer

**JOSEPH NUEVAS**  
CHPC Representative

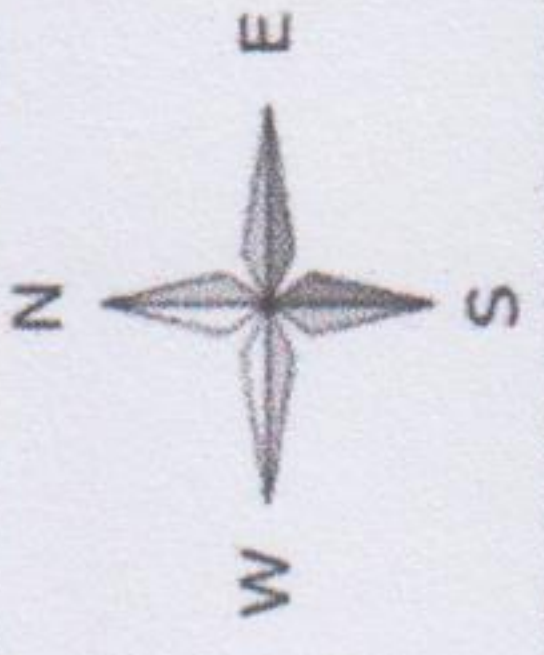
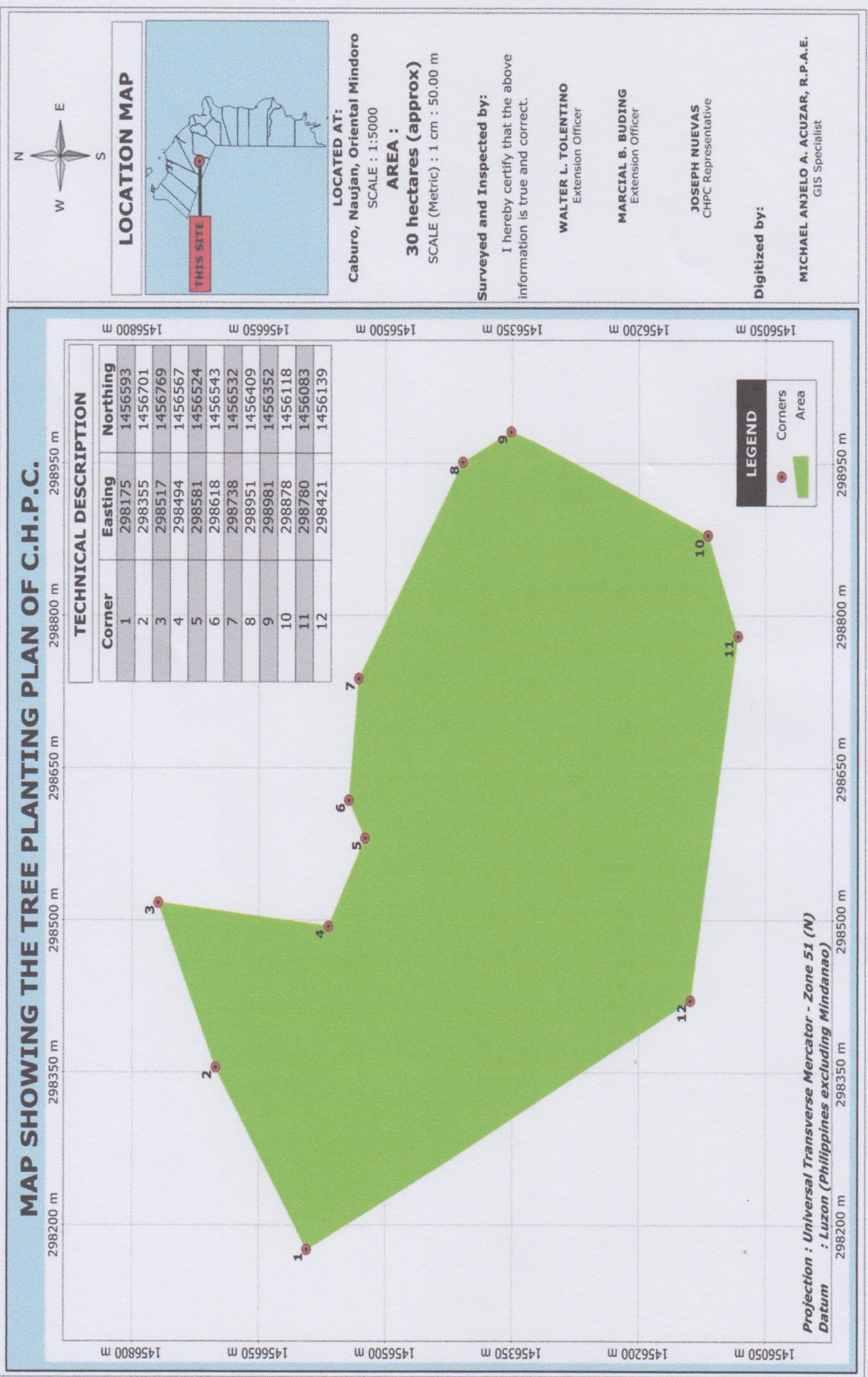
**Digitized by:**

**MICHAEL ANJELO A. ACUZAR, R.P.A.E.**  
GIS Specialist

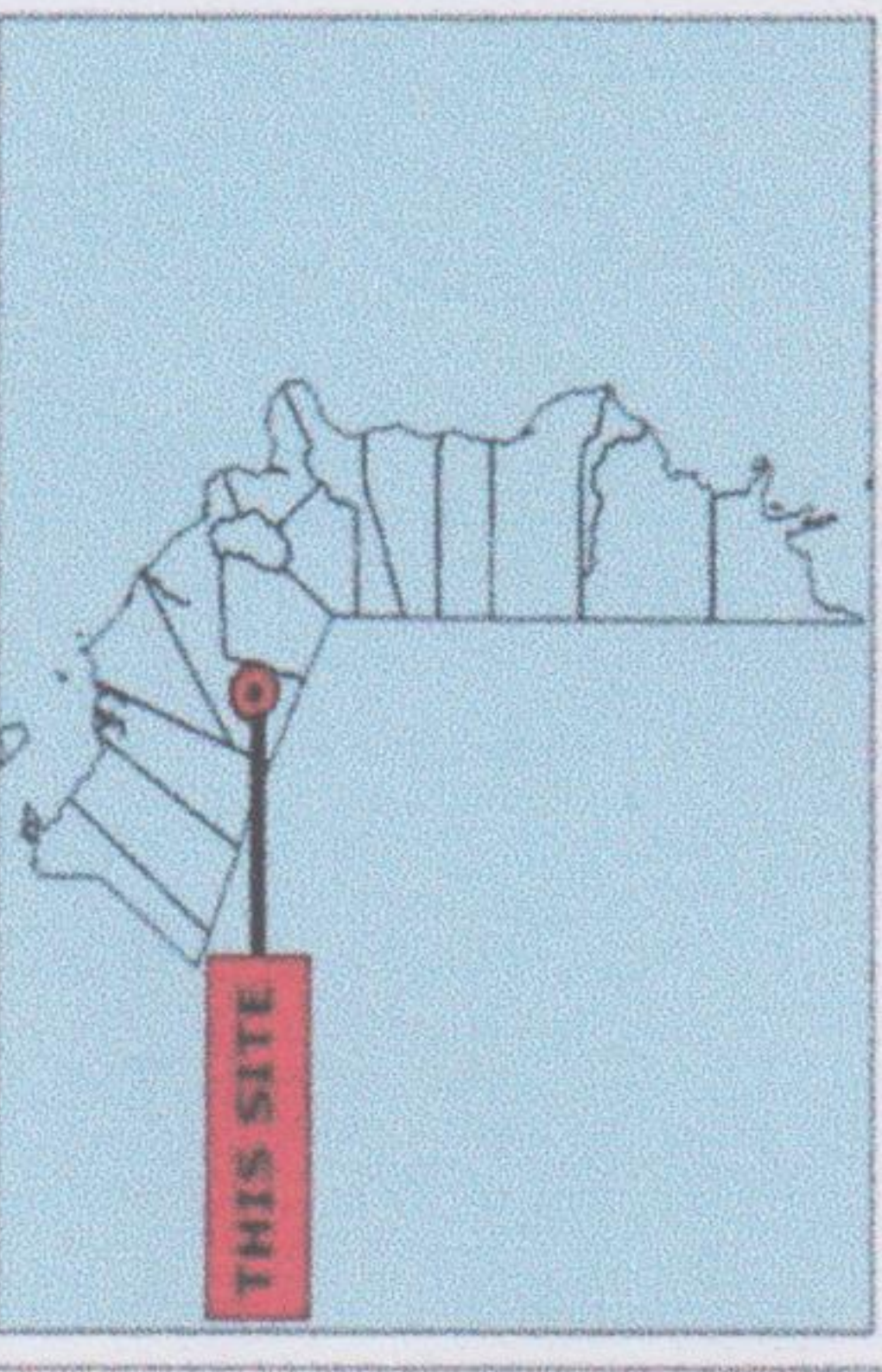








**LOCATION MAP**



**LOCATED AT:**  
 Caburo, Naujan, Oriental Mindoro  
 SCALE : 1:5000

**AREA :**  
**30 hectares (approx)**  
 SCALE (Metric) : 1 cm : 50.00 m

**Surveyed and Inspected by:**  
 I hereby certify that the above information is true and correct.

**WALTER L. TOLENTINO**  
 Extension Officer

**MARCIAL B. BUDING**  
 Extension Officer

**JOSEPH NUEVAS**  
 CHPC Representative

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**MICHAEL ANJELO A. ACUZAR, R.P.A.E.**  
 GIS Specialist