The various abiotic factors acting on plant

**Abiotic factors** are non-living elements found within an ecosystem. There are six **abiotic factors** that **affect plant growth**: air, water, space, temperature, light and soil (nutrients). These are the basic requirements that **plants** need to grow.

The abiotic factors that affect plant growth and development include topography, soil, and climatic factors. They are the nonliving components of the **environment** which, along with the **biotic** or living factors, determine the extent in which the **genetic factor** is expressed in the plant.

Topography

Topography is a nonliving factor that refers to the “lay of the land.” It includes the physical features of the earth such as the land elevation, slope, terrain (flat, rolling, hilly, etc.), mountain ranges and bodies of water.

The slope or inclination of a land is the percentage change in its elevation over a certain distance. It is measured by dividing the vertical distance from the foot to the top of the land by the horizontal distance between those points, multiplied by 100. A 45-degree angle of elevation is equivalent to 100% slope.

The steepness of a slope affects plant growth through differential incidence of solar radiation, wind velocity and soil type. A steep slope is susceptible of rapid surface runoff and soil erosion which cause soil degradation.

The altitude or elevation of the land with respect to the level of the sea surface influences plant growth and development primarily through temperature effect. The relationship of this abiotic factor to temperature is like that of distance from the equator to the arctic poles. According to Stiling (1999), temperature decreases by 1 C for every 100 m increase in altitude in dry air.

This abiotic factor is an important consideration in [crop or site selection](http://www.cropsreview.com/starting-a-farm.html) for more productive crop farming. Coconut prefers an elevation not exceeding 600 meters above sea level (masl) (PCARRD 1982); for better quality, tea is best grown above 1000 masl while rubber requires not more than 500 masl because at higher elevation latex flow is restricted (Abellanosa and Pava 1987); the seasonality of ripening of various fruit crops, e.g. [durian](http://www.cropsreview.com/durian.html) , is modified when they are planted in different elevations.

The effect of land elevation on plant growth and development is apparent when exploring a high-rise mountain. Dominance of certain plant types varies with elevation. With change in height from sea level to 16,000 feet (4,876.8 meters) from the foot to the top of a mountain in the Peruvian Andes or New Guinea, temperatures change from tropical to subtropical, temperate, and subarctic to arctic.

Likewise, the influence of this abiotic factor on plant growth and distribution is noticeable. There is a change from tropical vegetation at the coastal base to the oak forest, then conifers, and finally a tundra-like scene with hardy grasses, mosses and dwarf shrubs. At the arctic top, only occasional lichens are found on exposed rocks.

In the tropics, the timber line above which no more tree grows may be found between 13,000 to 14,000 feet above sea level or 3,962-4,267 masl (Went and The Editors of Life 1963).

Soil

Soil is the outermost layer of the surface of the earth in which plants grow. It is composed of eroded rock, mineral nutrients, decaying plant and animal matter, water and air. This abiotic factor is likewise important in crop farming and is treated under the heading Soil and Climatic Adaptation or Requirement of crops.

Most plants are terrestrial in that they are anchored to the soil through their roots, with which they absorb water and nutrients. But *epiphytes* and floating *hydrophytes* do not need soil to live. Variation in the physical, chemical, and biological properties of the soil have distinct effects on plant growth and development, depending on [natural adaptation.](http://www.cropsreview.com/plant-classification.html)

There are two properties of the soil having pronounced direct effects on plant growth and crop production: **physical** and **chemical** properties. There are also biological factors or living organisms in the soil such as the earthworms, insects, nematodes and microorganisms like bacteria, fungi, actinomycetes, algae, and protozoa. These organisms help in improving soil structure, tilth, aeration, water permeability and soil nutrient availability.

The physical and chemical properties of the soil are referred to as edaphic factors of the plant environment. The **physical properties** include the soil texture, soil structure, and bulk density which affect the capacity of the soil to retain and supply water while the **chemical properties** consist of the soil pH and cation exchange capacity (CEC) which determine its capacity to supply nutrients.

It is now known that this abiotic factor (soil) is not essential to plant growth. Rather, it is the [nutrient elements](http://www.cropsreview.com/essential-elements.html) that are present in the soil that make plants grow and enable them to complete their life cycle.

Temperature and moisture are important influences on plant production (primary productivity) and the amount of [organic](https://www.boundless.com/biology/definition/organic/) matter available as food (net primary productivity). Primary production is the synthesis of organic compounds from atmospheric or aqueous carbon dioxide. It principally occurs through the process of photosynthesis, which uses light as its [source](https://www.boundless.com/biology/definition/source/) of [energy](https://www.boundless.com/biology/definition/energy/), but it also occurs through chemosynthesis, which uses the [oxidation](https://www.boundless.com/biology/definition/oxidation/) or [reduction](https://www.boundless.com/biology/definition/reduction/) of chemical compounds as its source of energy. Almost all life on earth is directly or indirectly reliant on primary production. The organisms responsible for primary production, known as [primary producers](https://www.boundless.com/biology/definition/primary-producer/) or [autotrophs](https://www.boundless.com/biology/definition/autotroph/), form the base of the [food chain](https://www.boundless.com/biology/definition/food-chain/). In terrestrial [eco-regions](https://www.boundless.com/biology/definition/eco-region/), these are mainly plants, while in aquatic eco-regions, they are mainly algae.

***Abiotic or Nonliving* things** have a vital role in maintaining the balance of the ecosystem. The factors of Abiotic have varied components and aspect in the physical environment on how they affect biotic factors. Below are some of the observations that will help you to learn further about Abiotic factors.

1. Bamboo can stand on strong winds while banana plant cannot for it don’t have hard trunk and doesn’t sway with the blowing wind.
2. Cogon thrives well in abundant sunlight while ferns are much on shades that is why they are shade-loving plants.
3. Coconut grows well in warm climates while Pine trees in cold climates
4. Cacti can withstand arid places like deserts while mosses can’t for they are moisture-loving plants.

The descriptions and examples above are some of the effects of climate on the growth and thriving abilities of plants, more specifically light, temperature, moisture and wind. The soil is another aspect of the physical environment that we should also consider for the characteristics of a soil determines what type of organism/living things can live. Below are some of the things that must be considered.

1. *The nutrients in the soil*
2. *Acidity level of the soil*
3. *Moisture content of the soil*

The amount of water that the soil can hold and the amount of minerals that can drain away is affected by the acidity of soil and the size of particles on it. Topography is also one of the aspects of the physical environment. Below are some of the observations that can make these things clear out, in the aspect of topography, and the effects on the distribution and growth of an organism/living things.

Most of the mossy forests are found at elevation above 1520 meters and not in the lowlandsCloud rats are found in high mountains unlike the lowland field rats.

**2.** Plants which need large amount of water are found in lowlands or along gentle slopes while plants which can tolerate little moisture grow along steep slopes.

**3**. It was also observed that mountains slopes which are oriented facing the sun generally have thicker plant growth than those on the shaded side.

These are some observations that illustrate the effect of topography of the land on plant and animal life, more specifically altitude or elevation angle of slope and orientation of the slope.

| **Climate (Factors)** | **Soil (Factors)** | **Topography (Factors)** |
| --- | --- | --- |
| Light | Nutrients in the soil  | Altitude or elevation |
| Temperature | Acidity of the soil | Angle of the slope |
| Moisture | Moisture content | Orientation of the slope |
| Air/wind | Of the soil |  |

**Four Main Abiotic Factors**

Abiotic or non-living things contribute to the physical components of the environment such as water, soil, air, heat and light. They are continually subjected in different situations in the physical environment such as erosion, typhoons, volcanic events, ocean current and etc. It can cause extinction any type of organism as a threat and may cause alteration to form new species and hybrid as well.

**1. Water -** it is an essential part in the environment where organism can find their food, shelter, a way to escape from predator, and a place for marine life. Bodies of water act as "heat sink" to slow down the large temperature changes creating a more stable environment. The bodies of living things are almost made up of water, likewise, the earth is 70% water and 30% land. Helps in the process of photosynthesis and other cycles in nature…
**2. Air** - is a mixture of several gases; it is the second key abiotic factors that contribute to ecosystem, where birds can fly and seeds can be disperse. Air composes of different gases: 78% nitrogen, 21% oxygen and the remaining 1%contains mostly of hydrogen, carbon diode, water, helium, argon and krypton. They endlessly circulate where all life depends.

**3. Soil -** is the third major abiotic key for physical environment. Basic medium for land base ecosystem where plants grow in and some organism lives on it. Soil is a natural reservoir for the inorganic mineral elements such as iron, zinc, calcium and phosphorus. It also contains humus which is certainly come from human and decayed plants. Soil which contains more humus is support more plant and animal life. It affects countless organisms.
**4. Heat -** is the fourth abiotic major factors that affects physical environment. Most heat energy here on earth surface originates and come from the sun. The effect of heat are very obvious, tropical environment support different organism than cold environment. Temperature affects what kind of organism can live in a certain place.