a) **Heterotrophic Nutrition**: The mode of nutrition in which an organism cannot make its own food (absence of chlorophyll) and depends on other organism for food is called Heterotrophic Nutrition. Heterotrophic plants are of the following types:

1. **Parasitic plants**: A Parasitic plants is one that partially or completely depends on another plants (called host) for nutrition. Parasitic plants develop special roots, which penetrate into the tissues of the host plant. The prepared food is generally absorbed from the root examples-Cuscuta, dodder, and mistletoe. The parasite deprives its host of valuable nutrients. Its leaves are reduced to tiny brown scales. Since it has no chlorophyll, it obtains all of its food from the green plant it grows on. Its stems twines around the host, producing suckers, called haustoria, that invade the host and steal its food. Once the parasitic plant gets attached to the host plant, it loses its root system. **Mistletoe** is another parasite that steals water and minerals from the host tree. However, it also has green leaves. It produces its own food through photosynthesis, using water absorbed from the host tree. So, it is called a **partial parasite**.

2. **Saprophytic plants**: A saprophytic plants is one that which obtains its nutrients from dead and decaying plant and animals. They are usually white but can have brightly-coloured flowers. Example: Indian pipe and coral root. The root of saprophytic plants contain organisms called fungi. The fungi convert the dead and decaying water into nutrients that can be used as food. Saprophytic plants feed on dead and rotting materials. They grow in places with lots of rotting leaves, often in the deep shade in the tropical forests. These plants have no green leaves, generally they do not have leaves.

Saprophytes cannot manufacture their food by photosynthesis, derive their food from dead and decaying plant or animal matter. Mushrooms, moulds, some types of fungi and bacteria are the most common saprophytes. These non-green plants first release digestive juices which act on the dead and decaying matter, converting it into simple sugars which are absorbed by saprophytes.

3. **Symbiotic plants:** Certain plants live in association with other organism, share food and other resources. Both the types mutually gain from each other. Such plants are called symbiotic. This kind of mutual relationship is called symbiosis or mutualism. Example: lichens & pea plant. Pea plants contain bacteria called Rhizobium which converts atmospheric nitrogen into plant usable from & plants provide nutrients to the bacteria for growth. Lichen is a combination an alga and a fungus (a saprophyte). The fungus provides water and minerals to the alga whereas the algal part which has chlorophyll, supplies synthesized food to the fungus.

A rhizobium bacteria lives in the root nodules of certain leguminous plants such as peas and beans. It converts atmospheric nitrogen into usable form, e.g., ammonia for the plant. The plant in return provides food and shelter to the bacteria.

4. **Insectivorous plants or Carnivorous plants:** There are the plants that derive some or most of their nutrients by trapping and consuming animals mainly insects. These plants grow where soil is deficient in some nutrients. Example: Pitcher plant. These are actually green plants which can make their own food. But, they gain some of their nutrition from insects, trapped by the plants themselves. These plants mostly grow in the soil which is poor in nitrogen. So, they trap insects to get

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nitrogenous compounds without manufacturing them. The examples are venus fly trap, sundew, bladderworf and pitcher plant.

Venus flytrap: Insects are lured by the nectar into the jaw-like leaf trap of the Venus flytrap plant. Once the insect sits on the leaves, the jaws clampshut and the insect is trapped in it. The plant immediately secretes digestive juices that first drown and then dissolve the insect.

Sundew: Its leaves are covered with hair-like structures (tentacles) that ooze a sticky dew like substance that glitters in the sunlight. When an insect lands on the sticky tentacles of a sundew plant, it struggles to free itself, but this struggling stimulates the tentacles tighten their grip. The tentacles then produce a digestive juice that dissolves the victim.

Pitcher plant: The leaves of the pitcher plants extend into tendrils and then swell like balloons. Pitchers have a lid that acts as a landing platform for insects. It also helps to prevent rainwater from diluting the digestive juices inside the pitcher. The inside of the pitcher is lined with downward pointing hair, which do not allow any insect to climb back and escape. Insects are attracted to the pitcher by its scent or colour. When they enter inside, the lid closes. They slide down the walls and drown into the digestive juices at the bottom, which dissolve the insect.

Bladderwort: The stem and slender leaves of bladderworts bear a large number of very small, pear-shaped bladders. The bladders have small membrane covers that act as doors. Their oval shapes create a vacuum that sucks in tiny insects within one-thousandth of a second, when they trigger the hair that are located around the doors. Digestive juices are then released inside the bladders to digest the prey.

Nutrient Replenishment in Soil: There are two types of nutrition in plants. Green plants are autotrophs which prepare their own food. They take raw materials from the soil and air and sun's energy to synthesise food. The balance of carbon dioxide and oxygen is steadily maintained by plants and animals on the earth. Plants release oxygen gas during photosynthesis and they utilize carbon dioxide gas released by animals. But, do you know that plants continuously utilize nutrients from the soil absorbed with water. Due to this continuous utilization, the soil gets depleted of vital nutrients. Therefore, the soil needs addition of these nutrients from time to time to maintain its fertility.

Addition of Manures: Manures are decomposed matter of animal and plant wastes. They are rich in essential nutrients and humus. Manures are added to enrich the soil with vital nutrients that plants require. Cattle dung is mostly used by farmers as manure.

Addition of Fertilizers: Farmers and gardeners add chemical fertilisers to their fields and gardens. Chemical fertiliser are rich in particular nutrients like nitrogen, phosphorus and potassium. The benefit of adding chemical fertiliser is that the soil deficient of any nutrient gets replenished with that nutrient. Examples of some chemical fertilizers are urea, superphosphate and potassium sulphate.

Addition of Compost: We know that making of compost and its benefits. Compost can be made by utilizing biodegradable waste generated in our homes. It is cheap, safe and enriches the soil with valuable nutrients.

Growing Leguminous Crops for Soil Enrichment: Plants require nitrogen to make proteins. After harvesting, the soil becomes nitrogen deficient. Although plenty of

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nitrogen gas is available in air, plants cannot utilise it directly. They can absorb nitrogen only in the soluble form. Symbiotic association of rhizobium and leguminous plants like peas, grains, beans, etc., is a natural way of replenishing the soil with nitrogen. So, sometimes farmers grow these plants alternatively with other crops. This restores the nitrogen content of the soil which was used up by the earlier crop.

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