

# Sample research paper on avocados in tropical cropping system

[Environment](#), [Plants](#)



## **Introduction**

Avocados are perennial crops, which have a single seed. They originated from Mexico and Central America. Essentially, they are flowering plants, and belong to the family ' Lauraceae'. Avocados are commercially valuable crops cultivated in tropical and Mediterranean climates. The fruit is spherical in shape. According to FAO estimates, avocado production in the year 2010 was 37. 3 million metric tons and Mexico is the leading producer of avocado with 1. 1 million metric tons (Whiley 9). It has been established that the best avocados grow in tropical regions such as Africa. It is vital to study the farming system used in the growth of avocados in tropical regions.

## **Farming Systems in Tropical Regions**

Intercropping farming system is practiced where avocados are intercropped with other crops such as bananas and cover crops such as grass or sweet potato vines. Cover crops help in the control of soil erosion soil and are a very important biophysical factor which aid in the supply of nutrients to the plants for growth. PH Requirement for avocados is about 6. 2 for higher yields (White 12). The advantage of intercropping system is that it ensures maximum utilization of land. This system facilitates an increase in soil organic matter through the decomposition of foliage and leaves falling from the plants. It is important to consider soil because it provides plants with necessary nutrients required for the production process. To determine chemical minerals present in the soil, a chemical analysis is carried out. The composition and percentage of the minerals in the soil sample are determined in order to gain knowledge on how various elements should be

replenished. Reddish brown, red, and dark brown soils are considered to be the best because of their excellent drainage ability. As a result, there is a reduction of water logging, which is a key factor in rooting of avocados. Black soils have a high clay content which leads to a reduction in production. Moreover, soils with a clay percentage of 20-40% are the best because of their ability to retain more water as compared to other soils. This assists in the reduction of water stress. High percentages of clay should be avoided due to water logging problems.

## **Ecological Requirements**

For optimum production of avocados, several ecological requirements have to be considered. Such factors include temperature, rainfall and air movement. Avocados are best suited to cool subtropical conditions with daily temperature of 20-25 degrees centigrade. Avocados are able to tolerate frost conditions, but not at flowering and fruit setting stage. During the flowering, stage the lowest temperature should be 18 degrees centigrade (Scaffer 16). However, new cultivation practices have emerged that enable avocados to grow at low temperatures ranging from 13-18 degrees centigrade. An example of such a variety is the Fuertes variety.

Rainfall is also one of the ecological requirements. Avocados are sensitive to water stress; hence, require 1000 mm of well-distributed rainfall per annum. The reliability of rainfall is important in the production of avocados as they are unable to tolerate long dry spells. Humidity is also an ecological factor that should be put into an account. Notably, high humidity is required during the fruit setting and flowering as it assists in the reduction of water stress.

Air movement is also an Eco physiological factor that greatly affects avocado production. It causes blemishes on fruits, which leads to a downgrading of fruits. The trees have tender branches that are easily damaged by strong winds.

## **Avocados Principle Systems**

Spacing is an important factor to consider when planting avocados. A spacing of 7.5 meters is chosen for light soils, while in deep, fertile soils spacing of 9.1 to 10.1 meters is adopted because the plants are able to maximize growth; hence, the need for a wider spacing. A relatively smaller spacing is avoided because branches may intertwine causing death of branches. Planting holes are dug at a depth of 0.6 meters by 0.6 meters wide, and enriched soil is added so as to add nutrients to the soil. Mulching is carried out after planting, and this helps the planted tree in conserving moisture and eliminating weeds that compete for nutrients. Furthermore, watering is done on the plants until the roots become well established. Propping is also carried out on the avocado branches to avoid breakage due to the heavy weight of the branches from the fruits.

Another important principle of farming systems is application of fertilizer. Essentially, this is a crucial practice that is carried out four times a year. For older trees, nitrogenous fertilizers are used. Fertilizer application is carried out at intervals of two months, and nitrogenous fertilizers are mostly used because they facilitate vegetative growth leading to synthesis of energy used in food fruit production. Mineral deficiency on leaves can be identified by chlorosis on the leaves, and is corrected by foliar spraying of the fertilizer

which is deficient.

Irrigation is a vital aspect of the farming systems of avocados in the tropical regions. In many countries, it is usually carried out during the midwinter dry spells. Before carrying out irrigation, a test on the moisture content of the soil is carried out by digging a hole in the soil, and a test is carried out on the soil by squeezing the soil. If it is determined that the soil is too moistly, there is no need for irrigation. Notably, addition of more water to the soil will cause waterlogging, which may lead to root rot (Kennedy 17).

It is worthwhile to note that ripening of avocados does not take place in the field; thus, fruits are picked on attainment of maturity and stimulated to ripen. Ripening of avocado fruits involves the edible part acquiring a smooth and buttery texture. Fruits picked when immature sometimes fail to ripen properly. Notably, mature fruits take a duration of one to two weeks to ripen. Harvesting of the fruits is carried out manually with the help of clippers in order to cut the stems (Smith 25). This strategy is mainly used for small varieties of avocado. However, for taller varieties, a pole with a sharp v on the metal rim is used for down the stem, and a cloth bag to catch the fruits is used. However, there are some precautions carried out during harvesting in order to ensure fruit quality. Such precautions include transportation of fruits in canvas bags so as to avoid generation of heat that usually leads to spoilage of fruits. It is recommended for harvesting to be carried out by cutting the stem of the fruit and not by pulling. This is because pulling creates a wound on the fruit, which acts as an avenue for the entry of postharvest pathogens. The pathogen damage the fruit leading to losses (Ploets et al 27). Workers should be provided with cotton gloves to avoid

damaging the fruit with nails, which lowers the grade of the fruits.

After harvested fruits are packed in trays used in transportation, care should be taken to avoid damaging the fruits. In the transportation process, avocados should be placed under a shed or covered to avoid overheating from the sun, which causes uniformity of the ripening process. Besides, ventilation should be ensured. Grading is also carried on the fruits. This involves separating large fruits from small ones. Moreover, the spoiled ones and infected fruits are separated from the best fruits.

In addition, processing of Avocado fruit is done to produce a variety of products, which are mainly avocado oil and guacamole. In the year 2011, 57.5% of the avocado fruits were processed to yield oil, while 42% was used in guacamole production in South Africa. Avocado oil is obtained through a unique procedure, which involves the selection of different types of avocado fruits. In this procedure, ripe fruits are selected while the overripe ones are eliminated from the extraction process. The first step involves crushing the fruit and preheating followed by pumping into centrifuges where extraction of oil takes place. The extracted oil proceeds to the refining stage where it is deformed and bleached for oil intended for cooking. Deodorization and winterizing are also performed on the oil to prevent oil from solidifying under low temperatures. Extracts of avocado are also used for medicinal purposes. Moreover, skin of the fruit is used as an antibiotic for remedy of dysentery. Avocado leaves are have medicinal value and are used for a wide range of uses. For example, the juice contained in the leaves is applied on wounds to assist in healing. Furthermore, juice is also drunk as a remedy for diarrhea, sore throat, and hemorrhages. The juice is also believed to stimulate and

regulate menstruation. Other uses include wood products used in the construction of various farm structures.

There are three varieties of avocado that include Hass, Fuertes, Nabal, and Puebla (Duncann 12). Among the three varieties, the Hass variety performs best. It is worthwhile to note that all the three varieties of avocado encounter various problems in relation to the Eco physiological conditions of the places they are produced. For example, when Hass is produced in a warm climate, the fruit becomes smaller in size. Forte is also sensitive to microclimates and is affected in fruit setting; hence, leading to lower yields. Nevertheless, pollinators help in improving the production of avocados.

## **Morphological and Eco Physiological Factors**

There are various morphological and Eco physiological factors that affect avocado production in various ways. Pest and diseases affect avocado production by lowering yields. Pests such as rats, squirrels strip fruits from the plant leading to a decrease in crop yield. Leaf rolling caterpillars are also problematic causing losses to the farmer by destroying branches. Essentially, the branches bear leaves that generate nutrients for the plant, reducing the surface area upon which food is synthesized; thus, when they are destroyed, it translates to lower yields, which is a loss to the farmer. Mites are also destructive in the production and cause shedding of leaves on plants. This significantly affects production of avocados. Fungi and Viruses are also problematic because they cause significant damage as compared to pests. They include Dothiorella canker, which infects the trunk of the plant. Other avocado fruit pests include the Mediterranean fruit flies, which affects

avocado plant during the early maturity. Mealy bugs also affect avocado production by destroying the plant through sucking sap from the plant. In this way, they are able to spread diseases in different avocado plants.

There are various factors relating to the morphology and Eco physiology of the avocado that can be attributed to the low yield of the avocado. These factors can be grouped into various categories according to their effect. One of the factors is tree architecture and branching. Avocado plants are able to grow vigorously vegetative wise; thus, compete with other plants for the soil nutrients. This situation will lead to a lower flower set, which ends up translating to a lower fruit set because reproductive structures are few.

Rouse model states that in case of an indeterminate inflorescence flower set, retention is normally low which is exhibited when vegetative growth exceeds reproductive growth. This leads to low yields of avocados in the tropical regions. Evolution adaptive strategy is also a contributing factor to low production of avocados.

Avocados have very long history, but still bear some residual features preventing it from attaining production ranges of present day requirements. Features such as the large vegetative canopy that is antagonistic to productive growth still exist within the plant thereby reducing yield expected from the avocado plant. It also possesses a shallow root network that was previously used in absorbing nutrients from forest litter. The shallow network is a disadvantage in cultivated land because the roots have to grow deeper to obtain nutrients owing to its low produce. Previously, avocados were used in growing in soils without Phytophthora cinnamon, which has greatly stressed the plant owing to its low yield. Environmental factors have also



affected avocado production whereby environmental parameters have considerably affected the production of avocados. Furthermore, architecture and branching systems have led to low yield because the vigorous vegetative growth suppresses flower production, which leads to low yield.

## **Diagnosis and Improvement of Existing Farming Systems**

Scientists have come up with various approaches to improve the existing farming systems. Genetic improvement is one of the approaches used in diagnosing this problem. In solving this problem, breeding is used as a way of achieving higher yields. Through breeding, scientists aim at solving problems associated with clonal rootstocks, control of root rot in avocados, control of fruit and foliage fungal diseases, and control of avocado diseases (Ploets et al 31). Various methods and materials have been used in breeding so as to acquire an improvement in avocado production. These methods include the use of techniques such as embryogenic cultures and genetic transformation.

## **Conclusion**

The planting of avocados in the tropical regions is a complex practice. It is a flowering plant; hence, requires adequate attention for it to yield maximum yields. The main farming system used for avocado planting is intercropping system. This form of farming system involves growing avocados with other types of crops such as bananas and sweet potato vines. In order to get good yields, it is important to consider ecological requirements such as rainfall, temperature, and air movement. Some of the agronomic principles that should be considered include spacing, application of fertilizer, irrigation and

harvesting. Moreover, there are several morphological and Eco physiological factors that affect avocado production such as pests and viruses. In conclusion, improvement of the existing farming systems of planting avocado in the tropical regions will definitely lead to increased production and good yields.

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