REPUBLIC OF KENYA

KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT

CLIMATE SMART AGRONOMIC PRACTICES FOR AVOCADO

INTRODUCTION

Avocado fruit has a great potential in contributing to food, economic and nutritional security in the country. Avocado fruit is a source of income for small holder farmers and foreign exchange for the country. It has important nutritional and medicinal properties due to their high oil (12-30%) and protein (1.5-2.5 %) content. It also contains carbohydrates, vitamins, and minerals thus can be regarded as health food. Currently avocados are grown on both large and small scale for commercial purposes for oils and pharmacological products while also providing employment to many skilled and semiskilled laborers working in the agro processing industries.

Common commecial avocado Varieties

Hass

Fuerte

Pinkerton

Climate requirements

Avocados prefer a climate without marked seasonal variations. In Kenya avocados can be grown at an altitude range of about 1500 to 2100 metres above sea level. The tree has very low frost resistance and as such it will not grow where frost is likely to occur.

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The Mexican race and its hybrid (viz Fuerte) do well under high elevations while the West Indian varieties and their hybrids (Tonnage, Simmonds, Booth 7, Booth 8 and Hass) are suitable in hot and humid coastal lowlands and require an optimum temperature of 25 –28°C.

Rainfall

Rainfall should preferably be not less than 1000 mm and be well distributed. A sufficiently high moisture content and light showers at the time of flowering and fruit setting will ensure good yields. The avocado tree has relatively shallow root system, consequently where supplementary water through irrigation is necessary, it should be applied as frequent and light applications no more than 50 litres weekly.

Site Selection and Orchard Establishment

Wind break

Farmers should plant a windbreak a year before planting the trees to protect the plants from the wind. The windbreak protects the plants from leaning over to one side and also from the wind damage such as shedding the leaves, fruit drop and bruising of fruits. This is important in hilly and windy areas.

Site Selection

The avocado grows successfully on many types of soils provided the soil is deep permeable and free-draining. The soil should be able to retain moisture and the pH be preferably in the region at 5.5 to 6.5. Avoid water-logged soils which favour the development of root-rot disease caused by the fungus *Phytophthora cinnamomi*. The tree also has very low salinity tolerance.

Land Preparation

When laying out the field, one should consider the type of soil and climatic conditions, tree type and size, irrigation, and farm machinery access. The initial cultivation should be deep to allow better and faster root proliferation. Aggressive perennial weeds such as Kikuyu grass should be eliminated before planting.

Spacing

Spacing of trees depends on the variety, types of soil and climatic conditions. Generally the recommended spacing for Fuerte varieties is 9 x 9 meters (123 trees per hectare). Varieties with upright growth habit such as Bacon may be spaced at 8 x 6 meters (208 trees per hectare). For Hass, a spacing of 7x7 meters (204 trees) is recommended.

Planting

Carefully remove the seedling from the pot with the soil intact and place it in the centre of the hole and cover firmly with the mixture of top soil and FYM. Make a basin around the seedling for holding water. Transplanting is more successful when carried out during the long rains either early morning or evening. Plant the seedlings at the same depth as it was in the nursery and water the plant immediately after planting. In hot areas, shade the seedlings after transplanting.

Pollination

The type of avocado cultivars planted in an orchard will contribute to the expected yield. There are two types of avocado that flower at different times of the year (type A and type B). Have some Fuerte trees in Hass orchard and vice visa so that type A pollinates type B. Hence cross pollination leads to higher yields than self-pollination. The presence of bee hives within the orchard is recommended as bees are the main pollinators of avocado.

Fertilization

Nitrogen is the controlling factor of avocado yields. At the onset of each long and each short rains remove mulch and scatter manure and fertilizer.

Soil analysis to determine the type and rate of fertilizer to be applied must be done before any fertilizer use recommendation is given.

Quantity of manure and fertilizer application is dependent on the fertility status of the soil and the age of the trees.

At the onset of each long and each short rains remove mulch and scatter manure and Fertilizer per tree as follows:-

Age in Years	CAN (g)	Triple Super Phosphate	Muriate of Potash	Manure (kg)
1-3	125	225	-	15
4-5	225	450	-	15
6-7	450	650	225	30
8-9	650	650	450	30
10-14	900	1000	635	
15+	1300	1200	650	

Note

Quantity of manure and fertilizer application is dependent on the fertility status of the soil and the age of trees. One should have this soil analyzed to determine how much fertilizer to apply.

Pruning

Formative pruning is needed in avocados to shape the tree. Growing tips of young plants should be pinched at top bud at height of 1 to 1.5m to promote a more compact tree. Use a clean pruning saw to avoid disease transmission. Lower branches should be removed if they interfere with irrigation or general field hygiene. Vegetative

and reproductive growth should be avoided from occurring at the same time. Avocado should be allowed to continue increasing in size to be more productive. However, internal branches and dead twigs should be removed. The tree is very susceptible to the sunburn and for this reason it is not advisable to prune too severely. Heavy pruning is only used to reduce the size of the tree after many years of growth.

Top working

Is the process of changing variety/cultivar of a mature tree due to:-

- Changing of cultivar according to the market demand.
- Susceptibility of a cultivar to diseases, poor yield, poor fruit colour and shape.
- Poor shelf-life, inadequate taste.
- Replacing of old varieties with superior ones.

Top working is very successful because of well-developed root system and the trees quickly come back into production.

When and How to top work

- Best time to prune is July/August.
- Trees are cut at a height of 1.25 and 1.5 m above the ground with a handsaw or power saw. Take care that branches do not tear or split. Cover the wounds with copper based fungicide.
- All the branches except for one vigorous branch are cut back.

- To top work, cuts are made in the bark and scions are inserted as shown
- The scions are then wrapped in polythene strap to exclude water from the graft union, as shown

- Remaining branch (sap drawer) must be left for normal metabolism
- As soon as the grafts on the top worked trees begin to grow strongly the sap drawer can be removed so that it does not hamper the flow of sap and nutrients to the new grafts**.**

Bearing

Bearing starts after 3-4 years from the time of planting but break-even point of the crop is attained in the sixth year onward.

Harvesting

It is not easy to tell when the fruits are ready for harvesting especially with varieties which do not change colour upon maturity such as Fuerte.

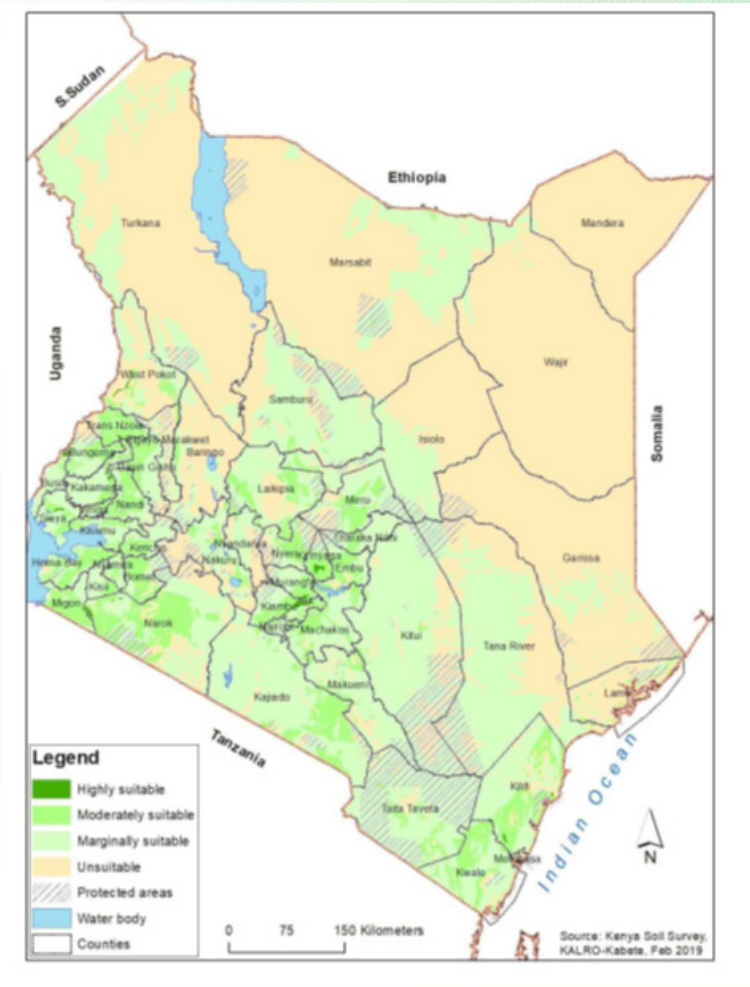
To determine whether the fruits are ready for picking, harvest a few fruits, and noting their stage at harvesting, then keep them at room temperature and observe everyday.

If the fruits soften within a week to ten days without shriveling, then the fruit of that age should be ready for harvesting.
The fruits should be picked firm and should soften upon ripening. Fruits should not be pulled from the stalk but rather they should be cut, leaving about 3 cm of stalk attached on the fruit.

Yields

Avocado bears after 3-5 years and yields **300-400** fruits per tree per year. From 5th year onwards, yields increase to 800-**1000** fruits per tree.

Major Avocado counties: Meru, Kirinyaga, Muranga & Nandi counties



Emerging Avocado producing counties

KALRO-Kandara (Horticulture Research Institute);

(http://www.plantwise.org/KnowledgeBank/CountryHome.aspx)

www.kalro.org

Reference: L(http://www.plantwise.org/KnowledgeBank/CountryHome.aspx)

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