

Mitahato Education and Development Fund



GRAIN AMARANTH FARMING MANUAL



Nurturing the roots of change in rural Kenya

Local names

- Terere (Kikuyu)
- muchicha (Kiswahili, Ngiriana)
- Lidodo, (Luyha)
- Alike(Luo).

These species are divided into four classes as follows:-

- Grain
- Vegetables
- Ornamental
- Weeds

Why grow Amaranthus crop:

- It requires less input to grow and can be grown by the rural poor
- It is easily harvested
- It is early maturing producing a lot of seed/grain
- Highly tolerant to drought
- Highly nutritive with high quality proteins (lysine and methionine) and high levels of vitamins and dietary fibers.
- The Grain is highly palatable and can be used raw, cooked, popped or milled to flour.
- White or golden colored grains are recommended for consumption.
- Other uses include green leaves as vegetables, Amaranth oil extract and animal feed.

Real opportunities in Amaranth farming

- Seed production – contract farmers to produce seed
- Livestock feed – growing of amaranth as forage and also manufacturing livestock feeds
- Industrial use – Squalene is a special component in amaranth oil which is used as an important in skin cosmetic preparation, pharmaceutical industries and as a lubricant in servicing computers
- Production of edible oil for domestic purposes

Ecological requirements

Soils

Amaranth can tolerate a wide range of soil conditions but does best in

- Loam or silty loam soils with good water holding capacity
- Soil Ph of 4.5 – 8.00.
- Water logging should be avoided.

Altitude

The crop can grow anywhere in Kenya i.e. 0-2400m above sea level

Temperature

- Optimal growth occurs at 22-30 degrees C
- Normally the hotter it is the better it grows
- For seed to germinate temperatures of at least 15- 17 degrees C is needed

Rainfall/ Water requirements

- It can do well both under rain fed and under irrigation. It is drought tolerant because it has deep roots that can go up to two meters in such of water.
- If grown under irrigation, watering should stop, 15-20 days before maturity

Recommended varieties

Grain Amaranth has 2 main varieties the short and tall varieties, recommended varieties low and high rainfall areas

- The short varieties are suited for low rainfall regions
- The tall varieties for high rainfall areas.

Source of Planting Materials

Certified seeds are available from the following:-

- Coast-KARI – MTWAPA
- Eastern, Central and Nairobi, R/Valley-Amaranth International
- Western-Amaranth Incas ,Farmers – Lugari
- Nyanza-African Amarantha Limited, Amaranth International, Amaranth Incas

Land Preparation

- Clear the land of all bushes, burn the bushes as ashes favors amaranths production.
- Break down soil to fine tilth to provide a layer of fine soil surface. It requires fine, loose soils which can provide the small seed with good soil contact

Propagation

- Amaranth is planted either by direct seeding or transplanting. The choice of planting method depends on availability of seed and labor and may also vary with the growing season.
- Average seed requirement is 2 kg / acre.

Planting seeds can be grouped into two:

- Pure seeds
- Seeds mixed with fine soil, fine wood ash or fine manure.

Direct sowing

- Direct sowing is appropriate when plenty of seed is available, labor is limited, and during the dry season when frequency of flooding is less.
- When using direct sowing, plants are grown in rows. Make furrows 0.5-1.0 cm deep. The spacing should be as below.
- Short varieties – 45cm by 10cm
- Tall varieties – 60cm by 20cm

Planting is done when the soils are soaked or wet. Spread manure along the furrows and mix well with soil to provide full utilization by the plants.

Planting methods include:

- pure seeds dropped or broadcast with two fingers including thumb
- Pure seeds dropped or broadcast using tins with very small holes at the bottom.
- Soil, wood ash or manure seed mixture using three fingers including thumb.
- Hold a few seeds between thumb and the fingers and drop to the furrows.
- The seeds require very little soil covering because if deep planted, germination is delayed or seeds may rot
- Ashes are used to scare away pests that carry the seeds away before the rains.
- Germination occurs in 3 – 6 days depending on soil moisture and planting method

Transplanting

- Transplanting is preferred when there is limited amount of seed, plenty of labor, and during the wet season when heavy rains and flooding are most likely to wash out seeds.
- To shorten the crop duration in the field and to secure a better and more uniform stand especially during the wet season, raising seedlings in a nursery followed by transplanting to the field is preferred to direct seeding.

There are two steps to transplanting:

Seedling production

Seedlings grown in a

- Nursery
- pulled
- Bare-root transplanted.
- Container-grown in divided trays, lifted with the root ball intact and transplanted.

- If seedlings are started in a raised nursery bed, the soil should be partially sterilized by burning a 3-5 cm thick layer of rice straw or other dry organic matter on the bed.
- This also adds minor amounts of P and K to the soil, which helps in the establishment of the seedlings.
- Broadcast the seeds lightly in a nursery bed and cover 1 cm deep. Cover the seedbeds with an insect-proof net to protect seedlings from pests.

Setting plants into the field

- Transplant in the late afternoon or on a cloudy day to minimize transplant shock.
- Dig holes 10 cm deep on the bed using recommended spacing for the chosen variety.
- Place each transplant in its hole and cover the roots with soil and lightly firm.
- Irrigate immediately after transplanting to establish good root-to-soil contact.

Field management

Fertilizer application

- Although amaranth is a low management crop and can grow in poor soils, applying organic fertilizer increases yield.
- Amaranth is a heavy feeder and a nitrogen lover.
- Use 50 kg DAP/acre or use manure at a rate of 6 tons/ acre.
- For infertile soils use 100kg DAP /acre.
- Organically grown amaranth is more preferred in the market.

Weeding

- Amaranth grows very slowly during the first two weeks after germination while weeds grow faster and overtake amaranth if not attended to.
- 1ST weeding should be done within the 2nd week after germination between the rows to reduce weed competition.
- 2nd weeding is best done as soon as weeds appear after hilling (2 – 3 weeks after the 1st weeding).
- Herbicides cannot be used since the crop is in the weed family.

Thinning

- This determines yields since Amaranth is a heavy feeder and hence thinning gives isolation distance to give it space to feed from.
- It's best done in the 3rd week.
- Remove plants from the Centre and leave only 3 plants to grow, set like a traditional firestones.
- In the 5th week thin to leave only 1 plant/hill.

Hilling

- This is done after thinning by earthling up the crop. This gives roots enough space to spread and avoid lodging and diseases.

Irrigation

- Water should be applied especially just after sowing or transplanting to ensure a good stand.
- Irrigate thoroughly to maintain vigorous plant growth.
- Avoid over-irrigation, which may enhance disease development and nutrient leaching.
- Drip irrigation or micro-sprinkler irrigation is recommended in areas with limited water supply

Pests and Diseases

Pests

They include

- Leaf miners
- Leaf rollers
- Cutworms
- Aphids
- flea beetles
- Mites.

Weevils

- The most common is the pigweed weevil (*Hypolixus haerens*).
- Adult weevils feed on leaves, but the larval stage is more damaging because they bore into roots and stems.

Symptoms

- The adult weevil lays its eggs in branch crotches, and the larvae bore through stems to the root collar, causing hollowing of stems making them more susceptible to wind breakage.
- Plants wither and lodge.
- Rotting of bored stems and roots predisposing the plant to diseases.
- Extensive tissue discoloration, decay and cankers in branches, stems, and root collars



Weevil larvae feeding in amaranth stem



Canker and hollowed amaranth stem due to feeding by weevil larvae

Control

- Uproot and destroy attacked plants to reduce number of weevils

Stink Bugs

Bugs can cause severe damage to flowering head and seeds especial during the critical seed fill stage.



Bugs feeding on amaranth flowering head

Control

- Spray with the correct pesticide

Diseases

Damping-off

The disease is favored

- High soil water content
- low soil temperatures
- Also dense planting without sufficient aeration enhances disease development.

Causal agent – *Pythiumaph anidermatum*, *Rhizoctonia solani*, *Aphanomyces sp.*

Symptoms

- Seeds may rot in the soil before emergence (pre-emergence damping-off)
- Seedlings may exhibit stem canker above the soil line and/or root necrosis.
- Affected seedlings eventually wilt (post-emergence damping-off).

Control

- Use disease-free seeds
- Avoid over watering
- Avoid dense planting

Choanephora blight

- Infection is predisposed by injuries
- The disease is spread by air currents and infected seeds. Warm, moist conditions favors disease development.

Causal agent – *Choanephora cucurbitarium* (a fungus).

Symptoms

- Wet rot of stems and leaves.
- Affected plant parts have hairy appearance (silk-like threads) consisting of fungal spores.
- Heavy defoliation during rainy season.

Control

- Use resistant varieties where available
- Plant certified disease-free seeds
- Avoid dense planting to allow sufficient aeration
- Practice good field sanitation

Harvesting & Marketing

Harvesting

Maturity

- Generally it takes 7 to 8 weeks to mature.
- Maturity occurs in 45 – 60 days for early maturing (short) varieties while late maturing (tall) varieties take 70- 120 days.

Maturity indicators

- The crop turns brown or pale green or even yellowish.

- The yellow flowers disappear and the seeds appear eligible in the chambers i.e. seeds are visible to the eye.
- Squeeze seeds between thumb and palm, If the seeds are hard and do not produce milk at all, then they are ready for harvesting (even if the plant has some green leaves at this stage).
- If the seeds produce some fluid give it at least one week to dry.

Deheading (actual harvesting)

- Cut the head slightly below the inflorescence or the end of the stem at a slanting angle using a knife or sharp panga.
- Bunch the heads together and carry them to a spread canvass or polythene paper or bags sewn like canvass.
- A delay in harvesting leads to sprouting especially if there are high temperatures and moisture. Dew should be avoided during harvesting as it leads to sprouting.

Threshing

- Beat the bunch heads hard using a stick.
- Since the seeds hang very loosely on husks when ready for harvesting they come off easily.

Winnowing & drying

- Winnow the seeds to clean them and spread them out under the sun to dry.
- Two or three days of good sunshine will completely reduce moisture levels to required standards (13% moisture content).

Yields

- The yield is 50g/plant giving approx. 1900 kg/acre.
- The average is 800 – 1200 kg / acre.

Storage

- The seeds can be stored in clean plastic paper bags in a cool room where rodents are completely avoided.
- Stored grains are usually infested by rats and cockroaches; however they are not infested by weevils due to their small size.

Marketing

Several companies are involved in grain amaranth promotion and marketing. The key ones include:-

- Amaranth International Ltd offers both local and export market.
- Incas Health International Ltd
- African Amarantha ltd
- Amaranth Grain ltd
- All Grain Company Kenya Ltd in Nairobi
- MAP international
- Local market range between 40 – 80/= per kg depending on the buyer for the grain (for consumption) and 200/= per Kg of seed (for planting)
- Most of these companies process and sell grain amaranth products

Value Addition

The grains can be utilized in several ways:

- cooked as a cereal
- ground into flour
- popped like pop corns
- sprouted, toasted
- cooked with other whole grains
- Added into stir fry or soups and stews as a nutrient dense thickening agent.

The flour can be used to prepare

- porridge
- pizza
- pasta
- Pancake
- flat bread
- Ugali

The flour has no gluten and therefore needs to be mixed with other flours at the ratio of 1 part: 3parts when preparing

- Chapattis
- Doughnuts
- Mandazi
- cakes
- Bread.



Amaranth cakes