

Kiwi Fruit Farming

Comprehensive Guide For Kenya: From
Planting to Marketing

Udongo Ni Mali



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Edition

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The Writers Forward

This guide is written to help farmers learn how to grow Kiwifruits for domestic and commercial purposes. It can also be used to help improve production for those who have been established orchards already.

It is a simple, easy to follow guide that provides step by step directions right from land preparation to post harvest operations. Details provided in this guide are purely based on research.

This guide, despite providing information in modern intensive farming, has a bias on organic farming. It is the practice of Richfarm Kenya and the belief of the author that organic farming is not only sustainable but the ultimate solution to food security and environmental conservation.

Constant revision of the information and practices provided here will be done in subsequent publications to provide updated information. Your input, questions and suggestions will help us improve the content of this book. You can channel them through to Evans by phone on +254724698357 or email, enthiga@gmail.com. Further reading and research by the farmer is advised.

Regards,

Evans Nthiga.

Kiwi Fruits Farming Guide

Introduction

As much as kiwi fruits are currently popular in Kenya, they are relatively new in the market. The quick uptake of this fruit is mainly attributed to its great taste and a growing awareness of its health benefits.

Kiwi fruits come from a large, woody, deciduous vine that originated from China. There are various varieties of kiwi fruits distributed from Siberia to Southeast Asia through China and Japan. Seeds from China were taken to New Zealand and planted in 1906 but commercial planting began in California in the late 1960s.



This fruit was originally called Chinese gooseberry. It was renamed Kiwifruit by a United States importer in order to promote its sale in the country. The name is coined from the fact that the fruit has a brownish colour and hairy appearance resembling the flightless kiwi bird from New Zealand. In 1974 the name kiwifruit became the internationally accepted.

In Kenya, commercial cultivation of Kiwi fruits is yet to take shape. Only a few farmers have taken interest in its cultivation in the recent past.

There are very few markets where demand exceeds supply and one such market is that of Kiwi fruits in Kenya. Despite being a relatively new idea in Kenya, has taken the market by storm. Most of the Kiwi fruits sold in this country are imported yet the country has the best of climate for the cultivation of the fruit.

This presents a huge opportunity in Kiwi fruit farming in Kenya. One fruit is currently selling at Ksh.100. The plant can grow well in central Kenya, the western highlands, many parts of the Rift Valley and all other areas with well drained soils, especially those that are slightly acidic.

The Kiwi plant is a woody vine that is relatively hardy making it easy to maintain and suitable even for small scale farmers. A suitable site is one that is protected from strong winds and is exposed to enough sunlight.

Varieties of Kiwi fruits

The kiwifruit is in the genus *Actinidia*, which contains over 50 species. However, there are only three species that are popular among farmers for commercial fruit production. We shall discuss them here as the three broad categories.

1. Cold Hardy Kiwifruit

Hardy kiwi plants are very vigorous and produce a good quality, highly aromatic fruit. Fruits are smooth skinned (skin can be eaten), generally green in colour, and much smaller than the fuzzy types. *Actinidia arguta* (A. Arguta) species has fruit size in the range of 5 to 18 grams. The flavour is excellent, but it varies by cultivar. Vitamin C content is very good at 10 to 70 mg per 100 grams of fresh fruit.

Hardy kiwifruit are well suited to the home garden. However, *A. arguta* is grown commercially in the United States, Canada, New Zealand, Chile, and parts of Europe. Oregon, with an estimated 100 acres of the cultivar Ananasnaya in production by the year 2000, is the world's largest production region.



Cold Hardy Kiwi fruits perform well in partial shade and may actually prefer cold places that are cloudy most of the time. They can tolerate temperatures as low as -3°C. They could perform very well in the cold central and Rift valley highlands of Kenya.

Commercial cultivation of cold-hardy Kiwi fruits has been limited mainly by marketing factors, such as the slow development of fresh markets for this relatively unusual fruit, the range in fruit size, and the

relatively short storage and shelf life compared to fuzzy kiwifruit. However, the continued development of processed markets will likely strengthen this industry. As markets are developed, you will see and hear more about these types, as they do have good quality, attractive fruit.

Fruit of hardy kiwi are best when ripened on the vine to maximize development of aroma and flavour; however, shelf life then is shortened.

There are a good number of varieties available under this broad category. Probably the most popular one is 'Ananasnaya,' which is commonly called 'Anna.'

2. Kolomikta Kiwi

These kiwi types, *A. kolomikta*, are also hardy to cold tolerating temperatures as low as 4°C. However, shoots are sensitive to frost damage. Available cultivars of this kiwi type differ greatly in fruit shape, size, colour, and flavour.

Fruits of *kolomikta* are smaller than those of *arguta* kiwivines. Plants are considered good ornamentals because of their variegated pink leaves, particularly in the male plants.



The fruits are small to medium size, but very sweet, with good aroma and flavour. Fruits are valued for their exceptionally high vitamin C content—700 to 1,000 mg/100 grams of fruit (10 times higher than Hayward and 20 times higher than citrus).

Fruit are best when ripened on the vine to maximize aroma and flavour development; however, shelf life then is shortened.

This species has not performed well in test plantings at the NWREC, Aurora, Oregon, or in British Columbia, Canada. *A. kolomikta* seems more sensitive than other species to wet soils or phytophthora root rot and does not grow well in full sun based on findings at the NWREC. It is therefore not suitable for our tropical climate here in Kenya.

A. kolomikta is not grown commercially. Nevertheless, some cultivars of this species may perform well in some parts of the world and certainly would make good ornamental fruit plants in the home garden.

3. Fuzzy Kiwifruit

The most commercially important species is *Actinidia deliciosa*, commonly known as the fuzzy kiwifruit. The fuzzy kiwifruit is a tropical and subtropical plant that will not tolerate low temperatures.

Generally, fuzzy kiwi fruits are large, with a green skin covered with brown fuzz. Vitamin C content ranges from 100 to 200 mg per 100 grams of fruit. The most common commercial cultivar is Hayward, which is found in supermarkets throughout the world.



Fuzzy Kiwi fruits require about 25 weeks from flowering ripening. Fruit typically range in size from 40 to 90 grams and can be picked before ripening kept in cool storage, and allowed to ripen naturally over time.

It's important to note that fuzzy kiwifruit will not ripen on the vine but will slowly ripen in a refrigerator in about 4 weeks. Fruit can be stored from 4 to 6 months at 0°C if protected from dehydration at 90 to 95 percent relative humidity.

The fruit will also ripen at room temperature when removed from cold storage. Ripening can be hastened by ethylene treatment. This can be accomplished at home by placing kiwifruit in a plastic bag with an apple for at least 2 or 3 days. Check the fruit periodically, and begin using them as they ripen.

The fuzzy Kiwi fruits are the most common and the most suitable for growing under the Kenyan tropical climate. For this reason, this farming guide will focus on the fuzzy kiwifruits even though the agronomic practices are very similar to those that would apply for the cold hardy kiwi fruits.

Site Selection and Planting

Site selection

Kiwifruit vines will grow on a wide range of soils, from a sandy loam to a clay loam, as long as the soils are well drained. Although vines grow in soil with pH between 6.0 and 8.0, they do best in a deep, well-drained silt loam with a neutral pH (about 7.0).

Plants will not tolerate heavy, poorly drained soils such as the black cotton soils – such soils can be improved by adding sand and humus. When grown in sandy soils, they are susceptible to root-knot nematodes – such soils can be improved by fumigation and addition of organic manure such as compost or well cultured animal manure.

Kiwifruit are susceptible to verticillium wilt. Avoid planting in soils with a history of strawberry, black raspberry, potatoes, or other crops in the Solanaceae family.

When selecting a site for planting kiwifruit vines, consider places with a free flow of air but not too strong winds. Long shoots are very susceptible to wind damage or breakage. Not only can wind cause fruit loss, but it also may reduce economic yields by causing the fruit to rub. When rubbed, fuzzy kiwi first lose their fuzz and then develop a callus, whereas the hardy types develop a callused or scabbed area.

Just like with other fruit crops, it is best to avoid low-lying areas that are prone to frost. Plants should particularly be protected from cold conditions when young, during their first year.



A soil test for nematodes should be done before planting. If nematodes or oak root fungus are present, use a pre-plant fumigant (contact your agro vet for advice on the available options). Young kiwifruit vines compete poorly with weeds, so eliminate as many perennial weeds as possible before planting. A permanent cover crop or a natural weed strip may be maintained between rows.

Planting

Prepare the planting field by ploughing to loosen the soil and eradicate weeds. Prepare holes in rows that are 2 meters apart. The holes should be at least 3 meters from each other and 2 feet in diameter. Since the kiwifruit's root system is shallow, decrease the planting hole depth to keep the soil line at the same level as it was in the nursery.



Two to three weeks before planting, mix the top soil obtained during the preparation of the holes with peat moss or composted cow manure. You should also add lime or sulphur to regulate the soil pH depending on the findings of your soil test.

For home gardening, you would benefit from purchasing containerized plants. Protect newly planted kiwifruit vines from desiccation by wind or very hot sun by providing shade. Kiwifruit vines should be considered tender and drought-sensitive until they are well established.

Since kiwifruit is a dioecious plant (produces male and female flowers on separate vines), a male and a female vine are required for fruit production. Plants of both sexes are essential for fruit production, and they must flower at the same time to ensure pollination.

Female kiwi plants have flowers with long sticky stigmas radiating out from the centre of the bloom. The female flowers do not produce pollen. They have bright white, well defined ovaries at the base of the flower.

On the other hand, male kiwi flowers have a brilliantly coloured yellow centre due to its pollen bearing anthers. They are heavy producers of pollen that is attractive to pollinators which carry it off to nearby female kiwi vines. Because the male kiwi vines do not bear fruit, they put all of their energy into vine growth and are, thus, often more vigorous and larger than their female counterparts.



Male vines are usually spaced throughout the vineyard in a number of designs in which the male-female ratio varies from 1:6 to 1:10. In a commercial kiwifruit vineyard, one male vine is generally planted to serve as a pollenizer for eight female vines.

Kiwifruit are wind and insect pollinated. Commercial kiwifruit growers place three to five beehives per acre in their vineyards during flowering to ensure good fruit set.

Female kiwifruit flowers are not attractive to bees due to their lack of nectaries. Fortunately, however, in their search for pollen from the male flowers, the bees inadvertently enter and pollinate the female flowers.

The ultimate size of a fruit depends both on good growing conditions and on the number of seeds that have been fertilized.

Kiwifruit are very similar to grapevines in their general growth and fruiting habit as well as their training and trellising requirements. In our warm climate here in Kenya, Kiwi plants will take about 2 years from planting to start producing fruits.

Establishment and Nurturing

Irrigation

Kiwifruit vines require a great deal of water. Kenya has a hot tropical climate which makes the vines' large leaves transpire water rapidly. This is particularly so in hotter areas that experience almost 12 hours of bright sunshine. In such areas, newly planted vines in loamy soils should be watered deeply to ensure that the soil is moist enough every day to promote root growth. However, don't overwater since this can cause anaerobic conditions that promote root rots.

For this purpose, drip irrigation is the most suitable method. Drip systems economize on water use, but on lighter soils often supply water to only a narrow cone of soil. In such soils, deep watering using a pipe twice or thrice a week is recommended.

Frequent irrigations are necessary, particularly to young plants with small root systems. However, as the crown tends to stay drier, risk of crown rot (phytophthora) may be reduced.

At planting, one emitter is placed near each plant. The second year, two emitters are placed 12 to 18 inches from the trunk, and the one near the trunk is removed (to keep the trunk relatively dry). When the plant is 4 years old, two more emitters are added 3 feet away from the trunk.



When plants are mature, you will find it difficult to supply enough water with four emitters per vine, so you may need to add more emitters or switch to other deep irrigation methods or sprinklers.

Fertilization

Kiwi vines are woody plants and they will produce best if fed on well-decomposed manures. These plants are heavy feeders of nitrogen which is supplied in abundance if manure is applied during the first half of the growing season. Late season applications of nitrogen will enhance fruit size but are discouraged as the fruit then tends to have a shorter shelf life.

Therefore, as stated earlier, application of manure should be done before planting. Thereafter, it should also be done twice a year, each time adding about 3-5kg of well cultured compost or animal manure. It is best applied during the flowering of the plants and the amount should be increased gradually as the plants grow bigger.

If chemical fertilizers must be used, it is important to note that it is relatively easy to burn the roots of kiwivines, so apply fertilizer cautiously. The following are recommendations based on practical experiences.

Fertilize young kiwifruit vines monthly with small amounts of nitrogen (N). Ammonium nitrate and urea are good sources of nitrogen for kiwifruit.

In the first year, apply no more than 11g of actual N per plant per month for 3 months during the rainy season. Spread the nitrogen in a circle 6 to 12 inches from the base of the trunk.

In the year after planting, apply 22g of N per plant per month in the same manner. Spread the fertilizer in a ring about 12 to 36 inches from the trunk.

Fertilize third and fourth-year plants with 50 to 80g of actual Nitrogen spread across 5 months of the most rain in your area. Apply the fertilizer as a broadcast band under the vine canopy.

You may liquid-feed nitrogen to young plants on a 2-week to monthly interval instead of using granular fertilizer.

Base your fertilizer application on nutrient needs/soil analysis. Kiwifruit vines tend to take up a considerable amount of phosphorus (P) and potassium (K). Test soil for P and K prior to planting, and incorporate the required nutrients prior to planting if necessary. DO NOT use fertilizer containing chloride (i.e., KCl), as kiwivines are very sensitive to chloride.

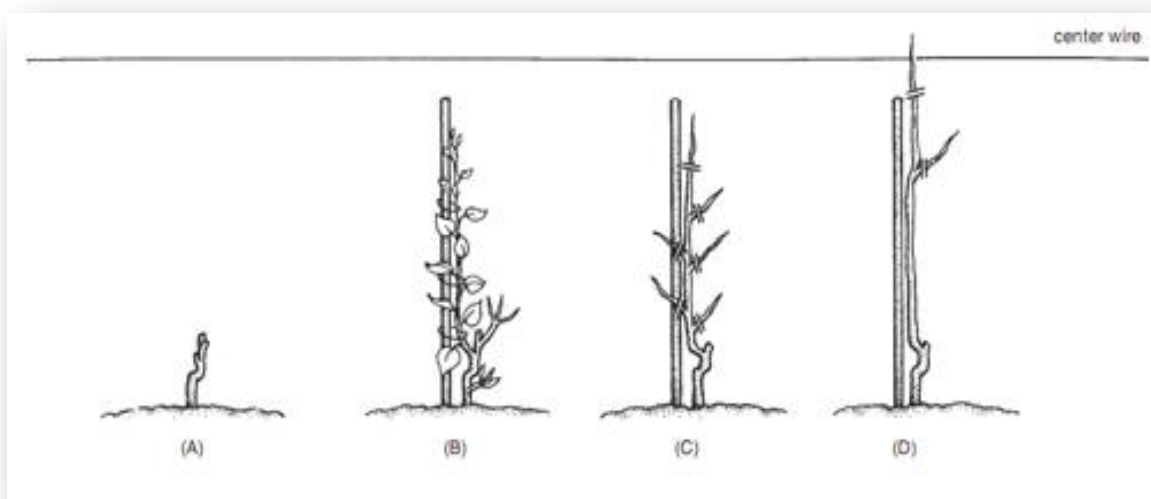
When using animal manure, mix it with the top soil and fill the planting hole 2 – 3 weeks before planting. Water these holes if there is no rain to ensure that the manure is well decomposed before planting your kiwi fruit seedling.

Trellis support

At the farm, a kiwifruit vine cannot support the weight of itself and its fruit. It must, therefore, be supplied with some form of structural support. Either a T-bar or hitching post trellis is recommended because each supplies a large fruiting area, provides easy access to the fruit and requires a minimum investment in materials.



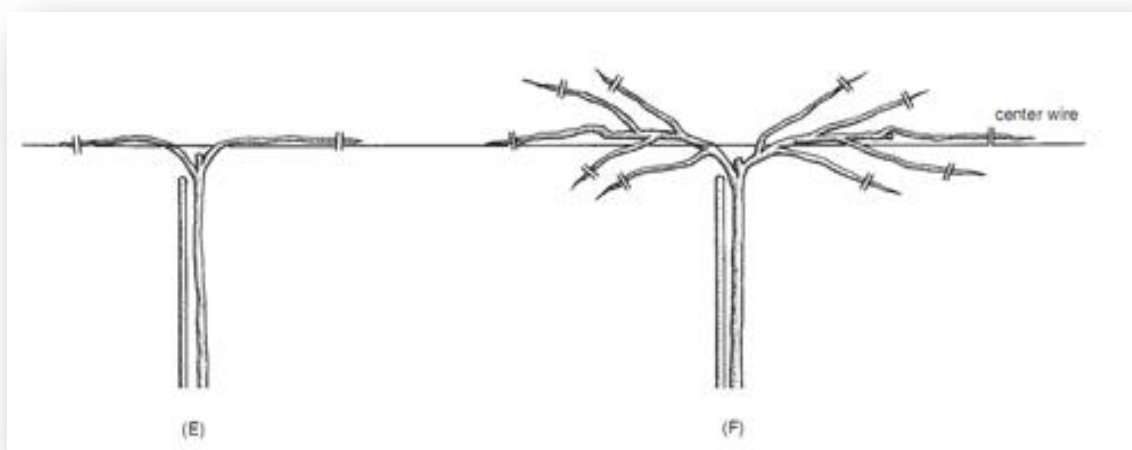
At planting time, place a temporary stake that is as high as the wire next to the vine as shown below. As the vine grows, tie it loosely to the stake, and check it often during the first year to see that it doesn't wind around the stake.



Pruning and Training

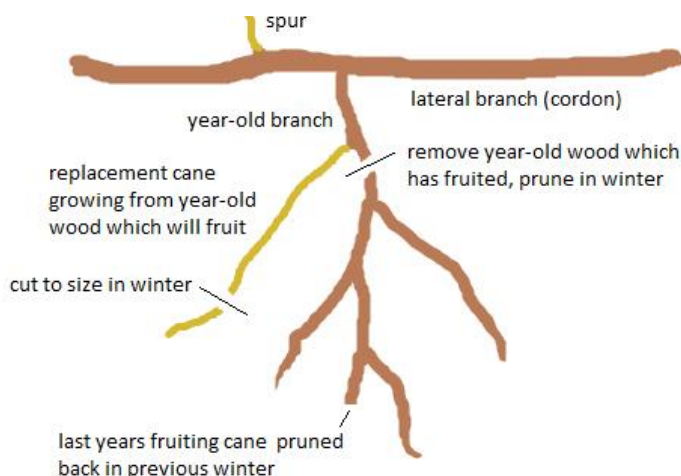
Pruning of kiwi fruits starts right at the planting stage. This is done in order to maintain a desired form, contain the size of the vine and most importantly maximize its fruit production.

During planting, cut the plant back to about 30cm (1 ft) from the ground. Once the plant starts to grow back, select a vigorous shoot to grow rapidly to the top of the support. Gently tie this shoot to the temporary as it grows, and later remove other less vigorous shoots. When the vine reaches the top of the support, tip it back, allow two buds near the top to grow; train them along the support wires or beams. Tie them loosely with heavy string or plastic tape. These cordons form the basic structure of your plant.



Prune back lateral vines that grow from the main trunk down to the trunk joint every two to three years. These are the main fruiting vines, so do not prune them all at once but on a rolling schedule, balancing cuts on both sides of the main trunk. Re-tie the vines as needed to stabilize.

Prune non-fruiting male vines immediately after flowering. Cut the flowering arms down to between 43 and 66cm in length so that mostly new green growth remains.



Conduct maintenance pruning with your secateurs to control shape and size, prevent tangling and allow for light and air penetration into the body of the plant. Make fresh tiebacks from the vine to the climbing structure as needed to support the cutback vines.

Insects and Diseases

Compared to other fruit types, kiwifruit has few insect pests. Red mites can build up in hot, dry areas. Scale insects and leaf rollers can also be pests but can easily be controlled by spraying pesticides.

Leaf diseases may affect plants some years, and fungicide sprays may be useful in eliminating them. Kiwifruit vines are susceptible to oak root fungus, crown gall, and crown and root rots (*Phytophthora* sp.). Although crown and root rots can be discouraged by careful watering (by allowing no standing water in vineyards), the best way to deal with oak root fungus is to not plant kiwifruit vines in infested soil. Root-knot nematode is a serious pest of kiwifruit; therefore, fumigate infested soils before planting.

Harvesting and post-harvesting operations

Fruit Maturation

Kiwifruit continue to increase in size until harvested, but the most rapid size increase occurs the first 100 days after bloom in Hayward and 60 days in Ananasnaya. Still, picking fruit too early in Ananasnaya can lead to a significant loss in fruit size and yield.

Fruit size within a vine is not related to fruit maturity. Also, most cultivars show little visual change in fruit appearance as they mature. Kiwis are ripe to harvest when they are just starting to soften. The true test is to try one and see how they taste. Hayward tends to have more uniform ripening of fruit within a vine than do the *arguta* cultivars (Ananasnaya, for example).

The fruits should not be allowed to ripen on the vines. Vine-ripened fruit become very soft, and the stem pulls from the fruit leaving a wound; these fruit cannot be stored.

Harvesting

Once the minimum maturity standards have been achieved, all of the fruit can be harvested in one picking. Harvest fruit by hand.

To harvest fuzzy kiwifruit, pickers should wear soft cotton gloves to prevent damage to the skin (fuzz) of the fruit. Fruit are easily damaged by rough handling even though they seem quite hard at this stage of maturity.

When *arguta* fruit are too ripe or soft when picked, fruit will tear at the stem end. Riper fruit are delicious, but their shelf life is very poor. Enjoy them immediately or keep separate from other fruits.



Pickers should use gloves or clip their nails short to avoid damaging the skin of hardy kiwifruit. Pick hardy kiwifruit without the stem. Break the stem at the fruit–stem juncture, by hand.

Keep fruit in the shade while awaiting transport, and cool them as quickly as possible to maximize storage life. Field heat must be removed quickly from fruit after harvest, because the fruit

can lose water quickly.

Fruit usually are sorted for size and quality before packing. If fruit are not packed immediately, you can store them in large plastic containers.

Storage

Store kiwifruit as near to 0°C as possible and at 90 to 95 percent relative humidity. Make sure oxygen is circulated to the cooler. Low oxygen levels lead to anaerobic respiration, making fruit nonmarketable due to an off flavour. Even when fruit are held at this temperature, about one-third to one-half of the remaining flesh firmness may be lost per month of storage (Hayward).

Fruit are sensitive to freezing injury; be careful that the temperature of the fruit does not drop below 0°C.

Hayward fruit can be stored 3 to 6 months under ideal storage conditions. Hardy kiwifruit, however, can be stored less than 2 months, because fruit are more perishable.

Although fuzzy kiwifruit are sold loose, unwrapped, hardy kiwifruit are best sold in clamshell packages that maintain a higher humidity (to prevent shriveling) and prevent fruit damage.



Marketing

There are very few markets where demand exceeds supply and the Kiwi fruits market is one. Despite being a relatively new fruit in Kenya, it has taken the market by storm. There are very few farmers who have gotten wind of its valued benefits hence the demand today far much outstrips the supply.

Marketing Kiwi fruits in Kenya is therefore no task at all and you can take advantage of this loophole to make a timely investment.

You can also get your products to the export markets through established exporters. Below is a list of exporters that you can successfully work with:

1. Selina Wamucii Fresh exporters, Serengeti Drive, Off Magadi Road, P.O. BOX 35037 – 00100 – Nairobi.
2. Sunripe LTD, P.O.Box: 41852 - 00100 Nairobi, Kenya. +254 722 822 151 / 733 600 212 info@sunripe.co.ke www.sunripe.co.ke
3. Homefresh Horticulture Export Ltd, P.O.Box 49804-00100 Nairobi, Kenya. Tel: +254 2 821074/76 Mobile: +254 723246133/ 724543549/ 704594749
4. Kenya Fresh Produce Exporters Limited, Adjacent to Mobil Plaza, Old North-Airport Road, Embakasi Nairobi, Kenya. Email: info@kenyafresh.co.ke Phone: +254 716 381 413

Important contacts:

1. Evans Nthiga, 0724698357 – Supplier of seedlings
2. Pius Rioba 0724076390 – Agronomist and consultant
3. Jane Lyomu 0735847672 – Agro-vet and plant protection specialist.

Other guides in this series

1. [The Guide to Grapes Production in Kenya](#)
2. [The Strawberry Production Guide For Kenya](#)
3. [Passion Fruit Production Guide For Kenya](#)
4. [The Ultimate Pawpaw Production Guide](#)
5. [Garlic farming guide for Kenya](#)
6. [Chia seeds farming guide](#)
7. [Chives farming guide](#)