

The Organic Farmer

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Photo: TOF

Anna Mutunga from Jimbo village, Kwale County, shows the animal manure from chickens and goats which she uses as fertilizer to grow maize in her 3-acre farm. The government plans to ban the use of animal manure according to a bill drafted by the Ministry of Agriculture Livestock, Fisheries and Irrigation. The move has raised an uproar from farmers across the country most of whom rely on farmyard manure to grow various crops

Dear farmer,

The Ministry of Agriculture Livestock and Fisheries has come up with new laws and regulations that have baffled farmers in the last two months. First was the Kenya Dairy Board (KDB) regulations banning the sale of raw milk in the country (85 percent of milk produced in Kenya is sold in the informal market as raw milk at a higher price than what the processing companies pay). An outcry by farmers and stakeholders in the informal sector forced the Kenya Dairy Board to suspend the new regulations.

Just before the dust raised by the KDB regulations had settled, the Agriculture and Food Authority (AFA) came up with the Food Crops regulations 2018, a draft bill that is aimed at banning among others, the use of Farm Yard Manure (FYM) in crop production. The draft bill also seeks to tighten regulations governing food production, processing, marketing, imports and exports.

The proposed regulations have left many Kenyans asking a lot of questions about the Kenya Government's intentions. Despite playing a very important role in the Kenya's economy (it contributes about 25 per cent of the Gross Domestic Product), the agricultural sector receives only 6 per cent budgetary allocation from the government.

Due to the high cost of chemical fertilizers and their soil-depleting side effects, almost every small-scale farmer in the country relies on animal manure to maintain soil fertility in their farms (*see article on value of manure on this page*).

Increased information dissemination on the benefits of farmyard manure and its use in making high quality compost has made thousands of Kenyan farmers (both conventional and organic) to turn to compost as their main source of fertilizer. It is therefore futile to tell them not to use Farm Yard Manure as an ingredient in compost making. Besides, the government did explain how it would enforce such a ban.

The agricultural sector is facing a lot of problems such as very little support to farmers to get inputs, employ more extension officers, new diseases and invasive pests. The entire sector requires a major transformation to enable it produce adequate food for the growing population and even raw materials that can be used to support the manufacturing sector to create jobs for the youth.

This can only be achieved by progressive policies that support farmers to produce food but not to stifle them through piecemeal regulations that only serve the short term interest of a few people at the expense of the majority.

Animal manure is critical in crop production

Peter Kamau | Soils in Kenya, as in many other countries in Africa are heavily depleted of essential nutrients due to many generations of cultivation. In Kenya, maize yields have reduced from up to 30 bags in 1970s to an average of 7 to 10 bags an acre at

the moment.

To increase their crop yields, farmers have turned to chemical fertilizers such as Diammonium Phosphates (DAP), Monoammonium Phosphate (MAP), Calcium Ammonium Nitrate (CAN) and even the soil-acidifying urea. However, these options have not solved the problem because chemical fertilizers increase soil acidity making the soil unsuitable for production of maize, beans, potatoes, vegetables, fruits among other crops.

A key source of nutrients for small-scale farmers in Kenya is animal manure. Farmyard Manure (FYM) increases and also maintains soil fertility because manure contains Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Calcium (Ca), Magnesium (mg) and Sodium (Na), including trace elements such as Iron (Fe), Manganese (Mn), Copper (C) and Zinc (Zn).

Animal manure also reduces acidity in soils and regulates high alkaline soils (calcareous soils). It increases soil organic matter and enhances the soil's ability to influence soil structure, nutrient availability, and the soil's reaction

to fertilizers and other soil conditioners.

Animal manure increases water infiltration, the ability to hold water and the soil's ability to slow down soil erosion. The organic matter in the soil plays a very important role in the soil. Without it, the soil cannot support living microorganisms such as beneficial viruses, bacteria, fungi, algae, protozoa, mites, beneficial nematodes, worms, ants, maggots and other even larger animals such as moles that burrow and aerate the soil. These microorganisms play a very vital role in releasing nutrients and making them available to plants, breaking down organic and also improving the soil physical structure.

A soil without these microorganisms is a dead soil and cannot support crop production and other life-supporting habitats such as trees, water sources, clean air that make up a healthy ecosystem or environment. Therefore, attempts to ban the use of farmyard manure will have disastrous consequences because animal manure plays a very important role in improving soil fertility and productivity.

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Take advantage of the rains to harvest water

Due to a shortage of rains this year, farmers should take advantage of any amount of rain to harvest the water. This will ensure that any runoff water is properly used to grow crops and even do small-scale irrigation to grow food crops or for use by livestock.

Amina Day Ojijo | It is always a farmer's desire to have healthy livestock, green crops, and robust fruit trees all year round.

With the threat of climate change hanging above us like a cloud, this dream remains elusive for many small-scale farmers.

In these times of unpredictable rain patterns, runoff water harvesting systems can mean the difference between a bumper harvest and biting hunger.

The government including Non-Governmental organisations have developed various rain water harvesting technologies while others have been developed by farmers to fit their own unique needs. Mr Nzamba Nkuu a farmer in Mua hills is the proud local initiator of one such system with his unique way of harvesting road runoff water for use in his farm. For more than 20 years Mr. Nkuu



Farmers can dig dams on road sides where the runoff water from the roads can be channeled and stored for use during the dry season mainly for irrigation and also for livestock. Fence and plant trees around the dam to avoid pollution

has collected runoff water from a road culvert and directed it to his farm for use in irrigation. The runoff water flow is guided by earth furrows and ditches.

The runoff water easily spreads out across his fields, sinking into the thirsty soil that nourishes his crops. He also harvests runoff water from the upper side of his farm and leads it directly to his fruit trees.

"In our area, we don't get enough rain thus every drop is precious to us," says Mr. Nkuu. Such a system remains largely unknown to farmers in many farming communities. The farmer from the dry and rugged zone of Eastern Kenya is making productive use of road runoff

with obvious benefits.

Uses harvested water to grow fruit crops

According to Mr. Nkuu harvesting road runoff water protects the environment. "If this water had not been captured and led through a furrow to my farm, it would have rushed to the river and be completely lost. On its way it causes soil erosion, carrying the top fertile soil to the sea, leaving the remaining soil with no nutrients at all," observes the innovative farmer. His success in harvesting runoff water is evidenced by his robust and healthy mangoes, bananas, pawpaws and avocados.

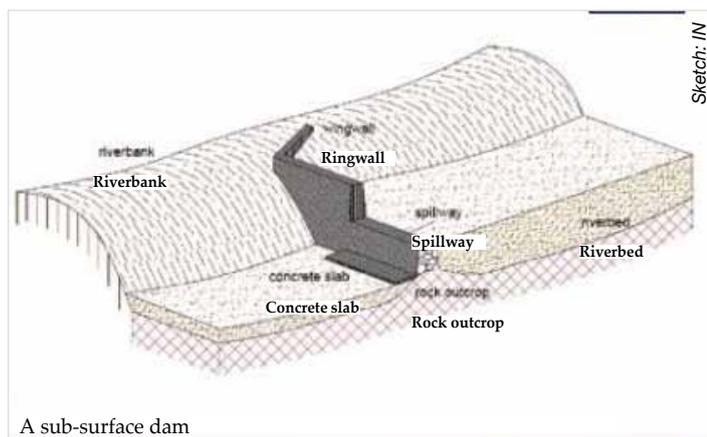
Mr. Samuel Maingi a farmer from Nzambani, Kitui, has also developed his own particular system of water harvesting. While his part of Lower Eastern has more rainfall compared to Mr. Nzamba Nkuu's area, drought is nevertheless a persistent problem. Like other creative farmers, Samuel saw the opportunity provided by miles of ready-made catchments that crisscross hills and valleys. "Before I did it, I saw there was a lot of water near my farm which was wasted because it flowed to the river. So I was interested to harvest that water", he says. Here, road runoff is channeled directly

into the farms. It passes through a series of simple filters and dirt traps. He then collects it in a pond. The water is then pumped to his fruits and vegetables bringing in the much-needed income, road runoff water harvesting makes food production systems more resilient and allows crop diversification.

Runoff water is underutilised

Despite its obvious potential, water harvesting remains largely underutilised. The systems can be designed in a way that makes use of road culverts and those that collect smaller quantities from the road itself. A third option is to simply spread or store it in a pond. Whatever the system, all add extra water to land where it can be used productively instead of being wasted. Run-off water harvesting can be done on any sloping land by channeling it into ponds, water pans, earth dams or even directly into crops. In an age of rapidly changing environment, it is time for farmers to take up these man-made catchments to harness water for use in crop production, which will lead to improved yields and income.

For more information on Rainwater harvesting <https://www.infonet-biovision.org/EnvironmentalHealth/Rainwater-Harvesting>



A sub-surface dam

The Organic Farmer is an independent magazine produced monthly for the East African farming community. It promotes organic farming and supports discussions on all aspects of sustainable development.



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Feed and protect your crops from pests and diseases

As the planting season starts, farmers will face a serious problem of pests and diseases. Adopting the following cultural practices can go a long way in reducing these problems. Natural methods of pest and disease control reduce the costs for the farmer while increasing yields and income.

Beritah Mutune | Cultural methods are agriculture practices used to enhance crop and livestock health and prevent weed, pest or disease problems without the use of chemicals. They are practised before, during, and after field cultivation and planting. Some examples of cultural practices that farmers can adopt include:

Organic plant nutrition

Proper nutrition and water are the foundation of crop health and therefore its pest and disease status. The first rule of sustainable and organic agriculture is to grow a healthy crop with proper nutrition. If there are shortages of particular nutrients, or the soil pH (acidity/alkalinity) is wrong, the crop may not be able to grow well. An excess of nutrients can also have unwanted effects including stimulating weed growth. Heavy rainfall or overhead irrigation can have negative effects in encouraging fungal and some bacterial diseases. In organic farming, chemical or inorganic fertilizers are not allowed.

Compost

Farmers are advised to use compost as an organic fertilizer which can be added to the

soil. Using compost manure maintains the soil structure and adds nutrients to the soil. A good soil structure ensures improved circulation of water, air and nutrients. It is good for soil life and plant growth. Compost can be used in all soils with low fertility. It is especially good in areas that have low rainfall, where artificial fertilizers cannot be used effectively because of lack of moisture. It is also useful in sandy soils which have poor water-holding capacity. Compost improves the structure and drainage of all soils.

Field sanitation

Field sanitation is an important and highly effective farm practice which keeps most diseases and pests under control. It involves removal and/or destruction of sources of diseases such as volunteer crops, pest infested plants and weeds from the field.

Pests and diseases may survive on volunteer plants (crops which grow on their own after the main crop has been harvested) which should be destroyed. The same applies to some weeds which are also hosts to pests and diseases. If an old diseased or pest infested crop remains nearby when a new one is planted, it is likely that the pests or diseases will move over to the new crop.

Green manure and cover crops

Cover crops such as legumes play a major role in conservation agriculture and improve farm productivity. They are fast growing, hence accumulate high biomass within a short period. They can increase plant nutrient supply in the soil especially nitrogen through biological nitrogen fixation and improve crop yields.



A farmer in bondo at her Push Pull Plot

Photo: TOF

Green manures and cover crops are deep rooted and thus lead to improved soil structure and recycling of nutrients. They provide good ground cover, which minimizes soil erosion through reduction of raindrop impact and runoff and improves soil physical properties. Desmodium, a legume that kills weeds such as *Striga hermonitica* is an important source of human food and livestock feed.

Crop rotation

Farmers need to do crop rotation in their fields as it helps in reducing soil erosion and increases soil fertility and crop yields. Crop rotation reduces pest infestation because different pests feed on different crops.

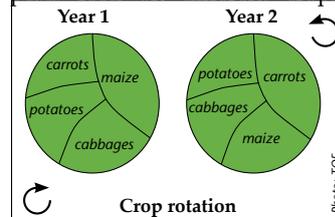


Photo: TOF

Through crop rotation the host crops is removed and replaced by another that does not host particular pests and diseases, therefore reducing both diseases and pests.

Intercropping and Push-Pull

Many farmers practise intercropping with a goal to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop. An example of an effective intercropping strategy is the Push-Pull technology.

Push-Pull is simple cropping strategy, whereby farmers use Napier grass or Brachiaria

grass and desmodium legume (silverleaf or greenleaf desmodium) as intercrops in maize. The desmodium repels stalkborer and the fall armyworm pests while the Napier grass and Brachiaria attract the pests and kill their larvae.

Mulching

Mulching is a common cultural practice among many farmers in Kenya, which helps protect the soil from erosion and evaporation. It helps retain moisture in the soil and nourishes soil life while increasing soil organic matter content and providing nutrients to the crop.

Conservation tillage systems

Conservation tillage embraces a principle of conservation agriculture that includes practices that keep the disturbance of the soil and loss of organic matter to a minimum, reducing soil and water losses. Mostly, the soil is not turned using ploughs. The practice reduces cultivation costs while increasing crop yields because nutrient in the field is preserved and used by a crop.

Weed management

Farmers are advised to control weeds early enough. If this is not done, weeds tend to outcompete vegetable crops for these valuable resources such as water nutrients and sunlight, which weakens the growing crops. Management practices depend on which type of weed is predominant in the field either annual or perennial weeds.

For more information on Cultural pest control practices https://www.infonet-biovision.org/cultural_practices

A selection of green manure and cover crops



Calliandra



Leucaena



Mucuna



Sesbania

Photos: IN

Plant trees to reduce effects of climate change

Trees act as carbon sinks, taking excess carbon from the environment and using it to make food for their growth. Trees help increase rain through evapo-transpiration and also create a beautiful landscape.

Natasha Atieno | Deforestation, especially in water catchment areas is a huge contributor to climate change, which is responsible for less and unpredictable rains, high temperatures, flooding and prolonged droughts.

Forests are an essential part of our planet. Despite increased awareness of the key role played by forests in our ecosystems, the rate of deforestation remains alarmingly high. The destruction of forests mainly contributes to climate change. Trees help trap excess carbon and use it to make their food. Through the process of photosynthesis, the carbon in the air combines with solar energy captured by trees to form the trunks, leaves, branches and roots.

Trees reduce greenhouse gases

Trees are essential reservoirs of carbon as they release oxygen into the air; this is why it is important to plant trees. If they don't exist, this carbon would remain in the atmosphere in the form of carbon dioxide, a very dangerous greenhouse gas that contributes to global warming.

Trees increase soil fertility

When we plant trees, some of the carbon is absorbed while the rest enters the soil through decomposition of leaves and branches that are naturally shed by the trees. These decomposed materials contribute to the fertility of the soil. Currently, about a quarter of the carbon dioxide that the people add to the atmosphere is soaked up by trees and plants. Studies have shown that forests offsets between 10-20 percent of the world's greenhouse emissions each year. If we do not add trees soon, this human-induced carbon dioxide emission will accelerate the global warming that has already begun.

Trees 'attract' rain

Trees protect against climatic impacts like floods. They also help to attract rain through moisture evaporation and formation of rain. They reduce erosion and create more permeable soils. In coastal communities, mangrove trees are helpful because they protect them from severe flooding and cyclones by absorbing excess water and slow down the water strength as it surges on land.

Trees protect crops

Trees are also beneficial to cash crops like tea and coffee which are sensitive to microclimate fluctuations. Shade trees control temperature and humidity fluctuations and can also provide protection from wind and storm occurrences in plantation areas. Through the provision of shade, they help in retaining the soil moisture thus increasing crop production.

Plant trees on farm

The livelihoods and food security of many of the world's rural poor population depends on vibrant forests and tree products for their coping and adaptation means; for example burning charcoal for income generation and firewood to provide basic energy services like cooking. To reduce this high rate of deforestation for their basic needs, farmers should



Trees play a very important role in protection of water sources in catchment areas and help increase rainfall therefore mitigating climate change

be encouraged to practice agroforestry to support sustainable agriculture, stabilize soils, regulate water flow and restore habitats for pollinators and other fauna and flora (animals and plants).

Trees important in urban areas

Trees play a significant role in urban adaptation to climate change. Urban areas can be up to 12°C warmer than rural surroundings due to heat given off from buildings, industrial activities, traffic as well as reduced evaporative cooling, commonly referred to as 'urban heat island'.

An urban heat island not only increases the temperature in the area, but can also increase the intensity and frequency of rainstorms, leading to flooding in cities. Urban forests are important because they provide shade, evaporative cooling and rain interception; this lowers the urban heat effect and air conditioning needs thus reducing energy bills. Lower energy consumption means fewer carbon dioxide emissions. This largely assists in the adaptation to climate change in urban areas.

A University of Manchester

study has calculated that with just a 10% increase in the amount of green spaces in built-up centres would reduce urban surface temperatures by as much as 4°C.

Trees provide livestock fodder

As already mentioned, climate change has led to erratic rainfall and more extreme wet spells; which causes more floods and droughts. There is already increasing amount of evidence pointing towards the prolonged drought affecting the country.

From this, farmers in every part of the country should take action by planting more trees. They should plant more drought resistant crops such as sorghum, millet, sweet potatoes, cassava and even drought tolerant trees. We should also incorporate water harvesting techniques, make silage for our livestock. When one cuts one tree, it is wise to replace it with three or more. These planted trees will help lower temperatures over land and therefore mitigate rainfall extremes while reducing the negative effects of climate change.

For more information on Agroforestry <https://www.infonet-biovision.org/EnvironmentalHealth/Agroforestry>



Trees in a nursery

Water and its health benefits to the human body

Water is life. Without it, living things on earth cannot survive. Human beings and even animals require clean water to remain healthy. People should ensure they use clean water for drinking, cooking and even for their animals and crops.

Mary Mutisya | It has become a common habit to see people walking around with water bottles. Apart from the weather being hot, just out of curiosity have you ever stopped for a second and asked yourself what the benefits of water to the human body are? Well, water constitutes between 50-75% of your body weight, water is the cornerstone of human existence and survival and for this reason it has come to be called the source of life.

Typically, a normal healthy person can go for up to 3 weeks without food but only 3 to 4 days maximum without water. Because the body does not store water and is continuously losing the one that is in its cells through digestion, breathing and sweating, it is important to keep rehydrating it.

For human consumption, water is available in two forms: Free and bound water. Bound water is found in the foods that we consume while free water is the naturally occurring form which we often take.

Water content in common foods

Although it is highly recommended that one takes free water, 20% of our daily water intake comes from solid foods that we eat, and in case one does not feel motivated to take free water, they can spice it by squeezing a lemon into it or work



Photo: IN

People, animals and all other living things require adequate and clean water to remain healthy. All water sources should be protected from pollution

smart and instead choose to “eat their water” by consuming foods that contain high percentages of water. Top in this list of foods are cucumbers which contain about 96.7% water, tomatoes (94.5%), green pepper (93.9%), cauliflower (92.1%), water melon (91.5%), spinach (91.4%), strawberries (91.0%), broccoli (90.78) and baby carrots at 90%.

Water requirements for different age-groups

Word on the street is that people should consume at least 8 glasses of water which is equivalent to 2l of water daily, but the level of water consumption are depended on various factors such as age, gender and general body wellness. At optimum health, the recommended daily water intake for different age groups is as listed below (see table bottom left)

When to take more water

People leading a sedentary lifestyle (in towns, slums and other settlements), those living in cold environments and those consuming foods with a lot of

water may consume less water. People with the following conditions will require higher water intake in a day:

- People on a high protein diet.
- Those who are physically active.
- Those exposed to warm/hot conditions.
- Pregnant/breast feeding mothers (fluid requirement is 750-1000ml daily above basic needs).
- Those vomiting or with diarrhoea.
- Those on a high-fibre diet as it helps prevent constipation.

Health benefits of water

The health benefits of water to the body are many and they include the following:

- Regulation of body temperatures; as water that is stored between body and skin layers comes to the skin surface, it carries with it heat from the body and in the process helps in cooling it.
- Cushions tissues, spinal cord and joints; water is involved in the production of hormones and neurotransmitters without which the functioning of the brain and its structure can be affected.
- Helps in waste excretion; water is needed in sweating, urine and faeces removal all of which are part of the excretion processes.
- Helps in nutrient absorption; water helps in the absorption of nutrients and minerals found in food making it possible for them to reach different parts of the body.
- Helps in weight loss; water can help in weight loss

when consumed instead of sweetened juices and sodas. Another strategy in which water helps in loss of weight is that of “Preloading” the digestive system with water before meals. This helps prevent overeating by creating a sense of fullness and in the process reduce weight gain.

- Helps prevent constipation; when the body is well hydrated, chances of constipation become low as there is enough water to facilitate the ease of expulsion of faeces from the colon.
- Helps in saliva creation; saliva helps us digest our food and keeps the mouth, nose, and eyes moist. This prevents friction and damage. Drinking water also keeps the mouth clean. Consumed instead of sweetened beverages, it can also reduce tooth decay.
- Water improves oxygen circulation in the body; water is composed of hydrogen and oxygen and its abundance in the body helps in circulation of oxygen through the blood which is 90 percent water.
- Water helps in the transportation of nutrients throughout the human body.
- Important in fighting illnesses; water oxygenates your blood and flushes out harmful toxins from your immune system. It also helps organs like the eyes and the mouth remain moist and repel contaminants that could cause infections.
- It helps improve physical performance; dehydration can cause fatigue, reduced motivation, and mood swings. Therefore, consumption of ample amounts of water by the body is very important to improve the energy levels while exercising and improving the overall physical performance of your body.
- Water prevents kidney damage; the kidneys regulate fluid in the body. Insufficient water can lead to kidney stones and other problems.
- Aids in digestion; for proper functioning, the bowel needs water. This component is key in the mixing and transportation of food along the digestive tract and without it the chances of constipation, heart burn and stomach ulcers increase.

		Total water adequate intake (Foods and fluids)	
Infants	0-6 months	680 mL/d (THROUGH MILK)	
	6-12 months	800-1000 mL/d	
Children	1-2 years	1100-1200 mL/d	
	2-3 years	1300 mL/d	
	4-8 years	1600 mL/d	
	9-13 years	Boys	2100 mL/d
		Girls	1900 mL/d
> 14 years	Cf adults		
Adults	Men	2500 mL/d	
	Women	2000 mL/d	
Pregnant women		+ 300 mL/d vs adults	
Lactating women		+ 600-700 mL/d vs adults	
Elderly		Same as adults	

Growing avocados is good for food and market

Currently, demand for avocados is growing very fast, with consumers in Europe and the US preferring avocados from Africa due to destruction of forests in traditional supplier countries such as Brazil and other South American countries.

Lilian Moraa | The avocado is a highly nutritious fruit as it is consumed all over the world. As of 2017, Kenya produced 5.9 million tonnes and was the world's eighth largest exporter of avocados.

Demand for avocados from Africa has increased in the last three years following a boycott of avocados from South America where farmers are cutting down trees to grow avocados.

Ecological requirements

When growing avocados, ecological conditions such as rainfall and soil type should be considered. Avocados are moderately drought tolerant. An annual rainfall of between 1000mm to 1200mm is sufficient, with a minimum of 750mm being enough for reasonable crop development. Deep, fertile, well-aerated, particularly sandy or alluvial soils with neutral or slightly acid pH values of 5 to 7 are preferable.

Seed selection and propagation

When collecting the seed, the characteristics of the mother tree and the fruit should be evaluated. Seeds must be collected only from healthy and vigorous mother trees and from fruits which are mature and healthy. The bigger the seeds, the more vigorous the seedlings. This is attributed to the fact that cotyledons (first leaves of growing seedling) of average to large-sized seeds have large food reserves for the growing plants. Seeds from decayed fruits or those that have dropped to the ground should not be used as they have higher risk of *Phytophthora* infection (a soil borne fungal disease also found in crop residue).

Disease control during propagation

Seeds to be planted should be treated in hot water of 49°C- 50°C for half an hour and then coated or dipped in a broad spectrum fungicides to prevent infection with *Phytophthora cinnamoni*. They are then planted either in nursery beds or directly into

perforated black polythene bags, about 20 cm in diameter and 30 cm deep.

During germination, shade cover is essential. It can be up to 80%. When the seedlings are approximately 20 cm high and have developed two pairs of leaves, they are uprooted, moved into containers. Shade may need to be manipulated at approximately 30 – 40% to avoid sun scorching.

The soil used in the planting container mix should be of medium texture, sterilized if possible and well-drained. A recommended mixture could be composed of five parts of topsoil, two parts of coconut fibre (Coir), two parts of compost and one part of gravel. Nurseries should not be near areas of pineapple cultivation as this is a source of *Phytophthora cinnamoni* infection.

Grafting

About six months after transplanting, the seedlings will be ready for grafting. Grafting is a horticultural technique whereby parts of different plants are joined together to form one plant. The upper part of the combined plant is called the scion while the lower part is called the rootstock. It improves the variety by increasing its resistance to diseases, improving yield and increasing its adaptability to different soils.

Scions are obtained from mature trees. In order to achieve uniformity, high standard and healthy mother trees should be chosen. A good scion consists of a mature terminal shoot, about 5 cm long, and with 2 – 3 fully developed buds. After cutting the scion from the tree, all its leaves must be removed immediately so as to prevent drying. Three to four months after grafting and at the end of their first growth cycle, the trees are ready to be transplanted into the field.

Tree establishment and management

The selected planting site should be free of perennial weeds, big stones, tree stumps and bushes. One deep ploughing (30 - 40cm) and 2 - 3 harrowings are recommended. Level or slightly sloping land is favourable, and early establishment of a windbreak hedge is advised in case strong winds are expected.

Spacing: Trees should be planted in straight lines in order to facilitate crop husbandry measures and harvesting. Planting distance depends on soil type, fertility, altitude, climatic influence and avocado variety.

Recommended tree spacings, depends on various conditions, but they vary from 6 m x 7 m to 8 m x 10 m. To make up for low returns in the starter years, you can intercrop with annual crops such as beans and maize. A minimum distance of 2m between the young seedlings needs to be observed.

Planting: Preparation of planting holes should begin during the dry season and end at the onset of the rainy season. Individual holes should be dug large and deep enough to fit the nursery trees. (About 70 cm deep and 60 square cm). Top soil is placed on one side of the hole and sub soil on the other. Hard pans are broken up to ensure sufficient aeration. The top soil is then mixed with compost manure.

Trees should be planted as soon as rain has penetrated the ground. Potted plants are removed from their plastic sleeves right at the planting hole. While placing them in the planting holes, care should be taken to ensure that the soil around roots is not interfered with.

Fill the hole with the top soil that was mixed with compost manure first, and then the sub-soil. Press the soil down as you fill the hole, but do not plant the tree deeper than the soil level it was in while in the sleeve. Use the leftover soil to build a basin around each tree so as to collect water from rain or irrigation.

Irrigation: Immediately after planting, irrigate the trees with enough water (15 – 20 litres) to settle the soil and to wet the roots thoroughly.

To ensure ample moisture, this watering may have to be continued - depending on the rainfall - until the first young shoots appear. In order to minimize moisture loss and sun-scorch, growers are advised to whitewash the stems of their young trees with a 10% solution of agriculture lime. Additionally, each tree must be mulched. The mulch should be kept at least 10 cm from the trunk to deprive pests of a hiding place.

Pruning: Formative pruning during the first years is important to encourage lateral growth and multiple framework branching. Sucker growth must be continuously stopped by removing all shoots originating from below the grafting joint. Training a tree means creating a strong central shoot from which to extend spaced side branches at the desired height and the creation of a bare main trunk about 50 – 70 cm in height.



In later years, pruning is undertaken to influence the quality, quantity and size of the fruit. It includes the removal of undesired shoots inside the canopy, the pruning of broken or diseased branches and the shortening of those touching the ground. Treat wounds created during pruning with a suitable sealing compound in order to prevent fungal infestation. Moreover, whitewash exposed trunks and branches to protect against sunburn.

Weed control: Timely weed control is important for the avocado trees to thrive. Pulling weeds by hand is the most preferable method as it protects shallow roots around newly planted trees. Intercropping and mulching are also recommended. Use of heavy machinery as a method of weed control is frowned upon as it can lead to damage of the shallow root system; increased risk of *Phytophthora* root rot infestation, injury to branches and fruits; harm to the soil structure and promotion of erosion.

Fertilization

Fertilization is important for plant development, health and productivity. About 5 – 30kg of manure is given per tree, per year depending on the stage of development.

Common avocado varieties grown in Kenya

1. **Hass and fuerte** – the two varieties have high oil content. They are used as scions.
2. **Puebla** – commonly used as rootstock as it has no fibre and is resistant to diseases.
3. **Singapore** – it is a new variety that is fast growing reaching maturity in 14 – 15 months.
4. **G5 and G6** – popular as they can do well in both highlands and lowlands.

For more information on Avocado <https://www.infonet-biovision.org/PlantHealth/Crops/Avocados>

Which is the correct ratio of cocks to hens in chicken shed?

What is the correct ratio of cocks to hen?

The correct ratio of cocks to hens should be one cock to 8 or 10 hens but many farmers and experts insist on 8 hens to one cock.

Cock fights meant to establish the pecking order

How does one prevent cock fighting?

It is not easy to prevent cock from fighting but it is advisable to ensure you reduce the number of cocks to hens. Over time cocks establish their own pecking order and hence reduce competition over the hens. Our advice is for the farmer to ensure the correct ratio of cocks to hens is maintained. Fighting really is not a major problem and if it persists the farmers can separate the notorious ones and put them in different compartments, which solves the problem.

Where should the laying nests be located within the chicken shed?

You need to build a compartment for laying at the corner of the chicken shed in dark place. You can cover the laying nest compartment with old sacks to ensure the nests are dark on the inside where the hens can lay eggs without disturbance from other chickens. Chickens are cannibalistic and other chickens may peck and injure the laying hen in the oviduct (egg canal) while laying eggs if the nest is not protected.



The advantages of raised poultry sheds

What are the disadvantages raised houses?

There are more advantages than disadvantages to raised sheds in terms of hygiene and sanitation. Raised sheds allow chicken droppings to drop to the ground floor because they have slatted floors or wire mesh. Chicken droppings contain a lot of ammonia which can be inhaled by chickens sometimes causing more health problems because they are contaminated. Food



Overcrowding of chickens in shed can lead to stress and cannibalism. Farmers should always provide adequate space and perches for their chickens to allow them to express their normal behaviour

waste can also drop through slatted or raised floors therefore minimizing chances of chickens eating contaminated feed.

However, in organic systems of production, intensive rearing of chickens in storied and congested sheds is not encouraged. All chickens should have adequate space for movement. They should also be provided with sand baths where they can exercise, which is not possible in raised sheds. Organic chickens should be provided with open space where they can forage, scratch for insects and even play.

In conventional production system, the farmer should ensure that every bird should have at least 1 square feet of space. This allows for movement and feeding; the better if more space is available for the birds.

Feed analysis can be done in KALRO Research stations

Where can we have chicken feed analysed?

For farmers who make home-made feed, it is important that all such feed is analysed by a competent laboratory to establish if the feed meets the standard required to ensure it is balanced in nutrients for different categories of chickens feed such as chicks, layers, broilers.

In Kenya, feed can be analysed in laboratories in some of the Kenya Agricultural and Livestock Research organization (KALRO) Centres mainly in Thika (0722 504 127). It costs Ksh 1000 for analysis of one sample. The farmer can get results within 24 hours if they are online.

Why chickens eat eggs

What causes egg eating?

There are many reasons why chickens eat eggs. One of them is a habit they acquire especially when they come across a broken egg and eat it. This may be termed as accidental discovery, once the egg is broken the chickens may begin to eat the yolk and develop a taste for eggs. Therefore, even though the initial egg breaking was accidental, it may gradually become a habit for the chicken to eat eggs. Sometimes it just takes one chicken to develop the habit. Other chickens will learn the



habit and also start eating eggs.

Chickens also eat eggs as a result of inadequate and unbalanced diet especially the lack of enough calcium and protein. Calcium deficiency causes chickens to seek out a supplement diet of egg shell.

Overcrowding and boredom in the coop (chicken shed) can also cause chickens to eat eggs.

Farmers are advised to make sure that their chickens get a balanced diet with plenty of calcium and protein. Calcium helps form strong egg shells which are less likely to break, while protein make the chickens less inclined to break and eat eggs. Ensure that chickens have enough space and pasture to roam around. Additionally, eggs

should also be collected often enough; even several times a day to ensure there are no idle eggs lying around in the nests.

Nutrition is major cause of shell-less eggs

What makes chickens lay shell-less eggs?

At times these eggs may be termed as soft-shelled eggs. Age is one of the causes for chicken to lay shell-less eggs. While biological framework of younger chickens may still be undeveloped and needs a little more time to get used to laying eggs, older chickens reproductive systems may no longer be reliable leading to decreased number of eggs and more malfunctions in the egg laying process e.g. laying of shell-less eggs.

The lack of enough calcium and Vitamin D in the chickens diet may cause chickens to lay shell-less eggs as calcium is vital in forming egg shells. Stress may cause chickens to lay shell-less eggs. Chickens need adequate sleep for the eggs to set properly, if the chickens are under any kind of stress e.g. environmental, overcrowding, they may lay shell-less eggs. Some bacterial or viral infections may also be the cause behind chickens laying shell-less eggs.

Farmers are advised to ensure that they feed their chickens a balanced diet with sufficient calcium and Vitamin D to prevent their chickens from laying shell-less eggs. They should also ensure that the sheds have adequate space to avoid overcrowding that leads to stress and many other problems.

TOF **Radio** answers your questions

TOFRadio is broadcast on KBC on Thursday at 7:30pm and Mbaitu FM on Friday at 8.30pm. Tune in and listen to farmer experiences and expert advice on agribusiness and eco-friendly farming methods. On this page, we respond to some of the issues raised by farmers in their correspondence to the radio program. Send your questions and comments via SMS 0715 422 460, email: admin@theorganicfarmer.org

School benefits from practising conservation agriculture

Charles Kimani | In 2018, the Government took over the school feeding programme and for schools with farms such as Kirwiro Primary School in Meru, Eastern Kenya, having additional food sources goes a long way in complementing the programme. The programme not only improves the nutrition of the pupils but it is one of the most dependable safety nets for school children. To get the best out of the school farm, the school has adopted conservation agriculture.

Adopting conservation agriculture

Working with partners such as Participatory Approaches For Integrated Development (PAFID) a Kenyan NGO, Kirwiro Primary school is reaping the benefits of Conservation Agriculture (CA).

According to Mr. Isaiah Marete, the Kirwiro Primary school head teacher, CA intervention in the school is not only expected to boost crop yields from their farms, but also to reduce the cost of labour and time spent on the school farm. In the end – the additional food produced by the school farm is expected to contribute to food security in



Pupils from Kirwiro Primary School show off their maize farm where they practice conservation agriculture

the school as well as keeping the pupils in school for a longer time.

Pupils practise CA at home

The pupils are also expected to practise the same farming methods in their farms at home, which improve household food security and income. The Conservation Agriculture intervention is also expected to reduce the cost of production by up to 60%, hence sparing the pupils, whose parents are single mothers and the elderly from the

agonizing long hours spent on the school farm in a bid to support the school feeding programme.

This intervention is expected - in the long run to break the unending vicious cycle of poverty in some of these households. Other parents/farmers acknowledged that management of CA plot was a lot easier while the crop-stand looks significantly better than the ones done under conventional farming.

The parts under CA have had some crops yield as much as

double cobs, furthermore the crop under CA did not show any signs of wilting even during the periods of prolonged dry spell while on the other hand, the crop under conventional farms was largely single cobs and occasionally wilted whenever there was prolonged dry spell.

Children have more food

With enough maize, Mr. Marete has committed to provide porridge as breakfast to the whole school – currently, only lower primary pupils take breakfast in school. The school management has committed to convert the whole of the school farm's 7 acres to CA in the coming season. This is because they did not see the relevance of ploughing the land.

Some of the school parents whom we have interacted with – have already committed to adopting the CA techniques in their farms in the coming seasons.

For more information on Conservation Agriculture <https://www.infonet-biovision.org/EnvironmentalHealth/Conservation-agriculture>

What is conservation agriculture?

For many small scale farmers, the hoe is the preferred farming tool. Conservation Agriculture involves minimum disturbance to the soil. Farmers only use a hoe to dig small planting holes in lines, at carefully measured distances, leaving the rest of the soil undisturbed. If the last planting season in previous year produced a hardpan, the holes must be deep enough to break through this hard layer. As mentioned one of the principles of conservation agriculture is crop rotation, farmers can intercrop maize and beans and plant cover crops between the holes to raise the soil fertility and improve water retention. It is important to note if one chooses to intercrop the beans and maize, one should plant the beans after the onset of rains. Farmers who

choose to use mechanized tools can replace their mould boards ploughs, disks, and harrows with rippers, subsoilers and direct drill planters. It is possible to use rippers and subsoilers that sow seeds and apply fertilizer at the same time, in this way saving time and the workload. Before planting the crop, the farmers can use a hoe or knife-roller to kill

weeds.

The delay in the onsets of long rains this year coupled with the drought that the country is currently experiencing make a strong case for adopting conservation agriculture. Conservation agriculture will help in preserving moisture and water in the soil and improve crop yields.



Beans planted under conservation agriculture technology

Radio Taifa frequencies for our TOFRadio programmes

TOWN	FM FREQUENCIES	MW (MEDIUM WAVE FREQUENCIES)
Nairobi	92.9 MHz	
Mombasa	100.8 MHz	
Kisumu	104.5 MHz	
Kakamega	104.5 MHz	
Bungoma	104.5 MHz	
Eldoret	88.6 MHz	
Nakuru	104.1 MHz	
Meru	90.4 MHz	
Nyeri	87.6 MHz	
Kisii	103.3 MHz	
Malindi	90.1 MHz	
Kapenguria	93.3 MHz	
Kitale 9	3.3 MHz	
Voi/Kibwezi	96.9 MHz	
Namanga	89.9 MHz	
Lodwar	88.6 MHz	
Lokichoggio	89.3 MHz	
Garsen	93.1 MHz	
Kajjado	92.9 MHz	
Kitui	92.9 MHz	
Lamu	96.3 MHz	
Maralal		1107 KHZ
Wajir		1152 KHZ
Marsabit		675 KHZ
Garissa		567 KHZ