

Make money from tree tomatoes



Tree tomatoes are becoming popular with farmers due to stable prices in the market.

Photo: TOF
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Dear farmers

Apart from inputs such as seeds and fertilizer, soil fertility is an important component that affects crop production. Unfortunately, many farmers in Kenya and in most parts of East Africa still associate chemical fertilizers such as DAP, CAN and urea with good crop yields.

But the situation is now changing; farmers have come to discover that even after using more fertilizers, the crop yields keep going down. Researchers have established that the use of chemical fertilizers for many years especially in Kenya's maize producing areas such as Uasin Gishu and Trans-Nzoia is to blame for increased soil acidity and declining crop yields.

Many crops, including maize cannot do well in acidic soils. Indeed, the low maize yields recorded last year in our grain basket areas has been partly attributed to increased chemical fertilizer use.

Organic farming discourages the use of chemical fertilizers because of the harm they cause to the soils. Apart from creating acidity, they induce leaching of essential minerals in the soil, making them unavailable to plants. The use of such fertilizers is therefore not sustainable.

Instead of chemical fertilizers, organic farming promotes the recycling of organic waste such as farmyard manure and crop residue; use of compost, combined with other sustainable farming practices such as green manures and crop rotation, also maintain soil fertility and nutrient balance. Chemical fertilizers cost more and damage the soil.

Our water bodies will also be safe from harmful weeds which are promoted by the chemical fertilizers washed down rivers through erosion.

As we begin the year, we advise more farmers to try these sustainable methods of farming in order to restore soil fertility and improve their crop yields.

Prepare early for planting season

TOF - The new year is always a challenging time for farmers. They need to plan their farming activities for the year and ensure they have adequate resources to undertake all the activities. The month of January is a particularly important period as it is also the time farmers have to prepare their land for the next crop. How the land is prepared will determine the quantity and

quality of crop yield at the end of the season.

To get a good harvest, farmers need to prepare their land early. After harvest, a lot of crop residue remains on the farm. Most farmers do not know the value of crop residue such as maize stalks and bean residue. To clear the land for ploughing, they burn the crop residue taking it as useless farm waste. Crop residue is valuable material that contains organic matter relevant to maintaining good soil structure and fertility.

Organic manure contains various nutrients that the next crop to be planted will require

to grow well. Therefore a wise farmer should not burn any organic material on the farm. Instead, all crop residue should be ploughed back into the soil where it breaks down, releasing nutrients into the soil. Organic waste also supports a lot of microorganisms in the soil such as earthworms and bacteria, which feed on it, releasing more nutrients into the soil for use by the next crop.

Early land preparation helps to loosen the soil, making it easy for plant roots to penetrate. It also helps the circulation of air in the soil, which is essential for proper germination and growth.

New bag reduces post harvest losses

After every harvest, the biggest problem that farmers face is protecting their harvest from damage by pests. Research shows that farmers in Kenya and most countries in Sub-Saharan Africa lose close to 50 per cent of their harvest due to pests such as weevils, moths and even



the Larger Grain Borer (LGB) or *Osama*. Previously, we have featured safe methods that farmers can use to protect their maize, beans and other cereals after harvest. These include the use of diatomite powder and metal silos. In this issue, we feature a new storage bag developed by the Purdue University, which is being tested by *icipe* among farmers in Kenya. *Page 6*

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Know about quails before rearing them

Many farmers have rushed into quail rearing due to the high prices of the birds' meat and eggs. It is critical that farmers learn more about quails before going into the enterprise.

Peter Kamau | Kenyan farmers are an enterprising lot and quickly embrace new agribusiness ideas. This is especially evident in the way they have adopted commercial quail rearing. Many of them had given up on poultry farming after failing to make good returns due to increasing feed costs. Quail farming has now become the most popular alternative to chicken rearing especially among farmers in peri-urban and some in rural areas.

The quail is a small, wild bird whose eggs are highly valued because they are a good source of vitamins A, B1, B2, B6, B12 and vitamin D, iron, magnesium, zinc, copper, phosphorus and other essential micro-nutri-



Quail farming requires training on breeding and management

ents, minerals and amino acids. The price of one fertile egg for hatching has increased rapidly from Ksh 10 in 2012 to over Ksh 80 this year. In some places a hen for breeding is now going for Ksh 300 in major towns.

It therefore makes good business sense for farmers to go into quail farming to take advantage of the good prices. Farmers, however, have to be extremely careful before committing their money into the venture. As we have always advised, it is important to have thorough knowledge of any new farming activity before going into full production.

This will protect farmers from incurring much losses due to lack of management skills. Currently, very few farmers know how to manage quails. Those with little knowledge and experience in the business are likely

to be disappointed if they do not get quick profits or incur losses. Farmers need to know the following before attempting large-scale production of quails:

Breed selection: Breed selection in quail rearing is very important for the farmer. At the moment most farmers buy quails from their neighbours or any other source because the population of quail in the country is very small and tends to originate from the same sources. This is likely to cause inbreeding where, for example, a female quail is served by the male quail. Eggs from related birds are poor in terms of fertility and their chicks are usually stunted in growth, deformed and prone to diseases. Indeed, the high mortality of quails in farms is due to the problem of inbreeding.

In selective breeding, related

birds are reared and mated separately, which reduces inbreeding and produces quails that lay more eggs, have good fertility traits, are healthy and productive. There are two types of quail; the Japanese quail is good for egg production while the Bobwhite is good for meat.

Disease control: Most farmers assume quails do not require vaccination since they are wild birds that have been domesticated but this is not the case. Although quails are resistant to most diseases associated with chickens and other domesticated birds, they need vaccination to protect them against dangerous diseases such as coccidiosis, gumboro and Newcastle which can wipe out an entire flock.

Housing: The best way to house quails is to put them in special cages. These should have adequate space that is free from wind. One quail requires 1 square foot of space in a cage. Cages built 2 or 3 feet off the ground allow for easier cleaning and prevent foul smell due to dampness. The floor should be made of porous material or wire to allow droppings to fall through to the ground. Alternatively a pan can be placed under the cage for the droppings. A dust pan filled with sand should also be placed in one corner of the cage as the birds like bathing in a dirt bath of sand or soil. Quails kept in dirty and wet conditions such as lying on their droppings can develop diseases such as aspergillosis- a fungal disease. They are also prone to mites and lice that reduces their productivity.

Feeding: To be productive, egg laying quails require high protein feed (with at least 26 to 27 per cent protein content). Young quails of 1 to 6 weeks need feed with 18 to 20 per cent protein content. Although farmers with the right raw materials can make their own feeds, quails eat very little compared to chickens. Farmers can therefore buy the feeds from repu-



Quail eggs are nutritious and fetch more money in the market

Comparing quail and chickens rearing

- A fertile quail egg costs Ksh 80 to 120 while that of a hen costs Ksh 30 to Ksh 50.
- A quail takes 6 1/2 to 7 weeks while chickens take 16-18 weeks to start laying eggs.
- Quail eggs have a higher nutritional value and health benefits to consumers compared to chicken eggs.
- Quails are more resistant to diseases than chickens.
- Quails eat very little feed compared to chickens, farmers can therefore earn more from quail rearing while cutting the cost of feeds significantly.
- Quail meat and eggs are considered tastier than that of chicken
- Quails have a high feed conversion ratio of 1:1 compared to chickens of 3:1.

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The Organic Farmer is an independent magazine for the East African farming community. It promotes organic farming and supports discussions on all aspects of sustainable development. It is published monthly by **icipe**. The reports in the *The Organic Farmer* do not necessarily reflect the views of **icipe**.

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Earn more from tree tomato production

There are very few farmers who grow tree tomatoes for the market. But unlike other fruits tree tomatoes are easy to grow, resistant to diseases and in great demand.

Peter Kamau | Tree tomato is a small, half woody plant with shallow roots. It grows to an average height of 3.5 - 5.0 m depending on the variety. It produces an egg-shaped oval fruit. The fruit tree prefers well-drained soils and grows best in climates with long hours of sunlight. In hot and dry climates, the trees may require shade to maintain adequate moisture in the soil.

The tree tomato does not tolerate tightly compacted soil since it needs well-aerated soil. The soil must be fertile and light in texture and rich in organic matter. Good drainage is necessary since water logged soils can kill the plants. Tree tomatoes cannot survive in areas with prolonged drought. They must have ample water during the dry season.

The best way to retain moisture in a tree tomato plantation is to apply mulch, which also reduces weed growth. At fruit bearing stage, tree tomatoes need support to prevent branches from breaking off when laden with fruits. The trees can easily be blown over by the wind as they are shallow rooted.

Propagation: Tree tomatoes can be grown from seeds or cut-



Photo: TOF

tings. Seeds produce trees with more branches that are erect tree and ideal for sheltered locations. Cuttings develop into shorter bushy plants with low-lying branches, suitable for growing in areas prone to wind or areas without protection from wind. Transplanting can be done at 6 weeks.

Planting: Dig holes measuring 2½ by 2½ feet, put the topsoil on one side and the subsoil on the other. The distance from one plant to the next should be 4 feet and space between one row and the next should be 5 feet. Mix one and a half wheelbarrow of well-prepared compost (chickens and pig manure are preferred) with two spadefuls of topsoil to plant the seedlings. Leave a shallow depression in every plant for placing the mulching material - only 1 feet of the tree tomato seedling should be buried while planting just enough to cover the root hairs. Selection of planting site is very important; tree tomatoes

do well when planted on land that has not had any crop for two or three seasons. An acre can accommodate about 1200 trees.

Fertilization: To maintain a healthy growth, tree tomatoes require continuous fertilization. Mix farmyard manure with water and apply as slurry and apply in the shallow depression around the plant once every two months.

Disease and pest control: Tree tomato is fairly resistant to most diseases and pests. However, the tree is prone to powdery mildew, which causes the leaves to fall off. Application of copper oxychloride (allowed in organic farming) can control the disease. Neem extracts can also be used to control the disease. The main pests that attack the tree include the aphids, thrips whiteflies and nematodes. Pests can be prevented by continuous application of plant extracts (chilies, African marigold, garlic, neem) at least three times

a week. Good field sanitation also controls pests and diseases.

Seedlings are pruned back the first year after planting to a height of 3 to 4 feet (0.9- 1.2m) to encourage branching. In plantations, tree tomatoes reach a height of not more than 1.50m. Annual pruning thereafter is advisable to eliminate branches that are no longer fruiting. New shoots close to the main branches should be allowed to grow so that the tree does not develop a broad top with fruits on the outer edges, which are prone to wind damage.

Varieties: The main varieties grown in Kenya are the Goldmine, Inca red, Rothamer, Solid gold and Ruby red. New varieties being introduced into the country give better yields and a shorter growing period (see box).

Yield: New varieties can produce up to 800 fruits per tree every year under good management. The current price for one fruit is Ksh.10.

Farmer makes a fortune from tree tomato farming

George Wambugu, a farmer Githuru village in Nyeri town discovered tree tomatoes almost by chance three years ago. He had gone to Tanzania in the year 2010 where he set up a small pharmaceutical business in Iringa and Kilombero regions. While there, he noticed a tree tomato variety known as the Red Oratia, which was not available in Kenya. From its colour and size, Wambugu realized that the tree tomato variety was different from the types found in Kenya.

"I had noticed that this variety had big fruits and more fruits per tree than the varieties I had seen in Kenya. I have a passion for farming, so when I saw the fruit, I immediately decided to start commercial tree tomato



Photo: TOF

Wambugu shows off his tree tomatoes

farming back in Kenya," he says.

He bought some fruits and came back home where he prepared and put them in a nursery. From this lot, he managed to get 87 tree tomato seedlings, which he planted in a ¼ acre plot around his homestead. To his surprise, most of the trees survived with only a few dying. The trees grew very fast and within 8 months the fruits were ready for the market. Wambugu sold the fruits at Ksh 10 a piece at farm gate price. He made Ksh 200,000 from tree tomato sales.

Encouraged by the good returns, Wambugu decided to set up a tree nursery and expanded his tomato orchard. Soon, word spread to other farmers in the larger Nyeri region. Farmers from Nyahururu, Nakuru, Kisii

and even Mombasa prefer the tree tomato variety and buy from Wambugu the fruits and seedlings to sell or start their own orchards.

"Currently I cannot meet the demand for seedlings and even fruits because I am getting enquiries from all over the country. Agricultural institutions, schools and even farmers groups visit me daily for training," he adds. He plans to plant an additional 3000 trees next year to meet the demand.

Wambugu sells one seedling for Ksh 50. The seedlings are certified by the Kenya Horticultural Crops Development Authority (HCDA) to ensure they are disease-free. *Farmers interested in seedlings can contact Wambugu on 0725 440 904.*

Urea can soften dry fodder for animals

Most farmers rely on maize stalks and other crop residue to feed their dairy cows during the dry season. It can be made easier to chew by adding urea to soften it. But farmers have to use the right quantity of urea as excess amounts can cause sudden death.

The Organic Farmer | A lot of crop residue on the farm that is fed to livestock especially during the dry season is often wasted. One reason for this wastage is that the animals find it unpalatable (hard to chew). Some farmers in an attempt to make the fodder soft often immerse it in water. The best solution is to apply urea (the same one that farmers use as fertilizer). When combined with molasses, urea softens fodder, making it easy for the animals to chew. It also makes it easy for the cows to digest it and adds nitrogen in the crop residue used as fodder - maize stalks, rice, wheat or sorghum. Below are various methods farmers can use to improve the quality of their fodder using urea:

How to use urea in animal fodder

- Chop up dry old maize stalks or other low quality straw over mature grass-cellulose material.
- Dig a pit and line it with plastic or use the silage bags and fill in the chopped material. The recommended ratio for treating the residue is 60 grams of urea

Urea technology in fodder works

Julius Kang'ee is a farmer in Sagana, Kirinyaga. We give his experience on urea use in fodder preparation, which has been mentioned in past issues of TOF. Urea can assist farmers during times of drought. Dairy cows can survive the drought and continue producing milk while maintaining their body condition.

Kang'ee has used urea since the year 2000 to date without poisoning of animals. He lives in an area where the dry spells are longer than the wet ones. In this region, fodder does not grow well without irrigation. He uses maize stalks and rice straws to feed his Holstein-Friesian cows and Kenyan Alpine dairy goats. Both species are



Photo: TOF

Instead of burning maize stalks, they can be collected, chopped and softened using urea to feed livestock

for every 1 kg of dry fodder. The water should be in the same ratio as the fodder being treated. For example if you have 400 kg of maize stalks, use 400 litres of water and add 24 kg of urea (see the illustration on how to do it).

- After 3 weeks the chopped and treated material will be much more palatable to cows, goats, and all other animals. In milking cows, it has been proved to boost milk production.

- There is no danger of poisoning in this method, as the urea will have been absorbed by the cellulose and converted to a form that provides energy to the animal as well.

Use urea on other feeds

- Urea can also be mixed with other animal feeds. But these should be done carefully so as not to overdose the animal - do not mix too much urea with the feed. Urea should not be given in excess of 30% of digestible

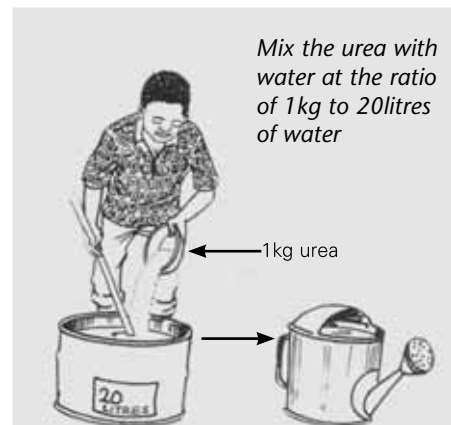
crude protein.

- For an average cow of 500 kg bodyweight, 290g of DCP (digestible crude protein) is recommended. 30% of 290 g = 87g. Now if you check the other attachment of nutrient contents of livestock feeds, you will see that urea contains 281% DCP, meaning 1 kg urea equals 2.81kg crude protein. This means that in order to supply your 87g/day in the form of urea, you will only need $87/2.81 = 31$ g per cow.

Give the correct amount

It is easy to overdose an animal with a small amount of urea. 1 tablespoon contains about 15g, so 2 tablespoons is needed for every cow. Mix with grains supplemented by molasses to keep the rumen pH below 6. Cows can gradually get used to slightly higher proportion of protein being fed in the form of urea, but farmers have to protect their cows from getting poisoned. In case of urea poisoning, give the animal vinegar. For sheep 0.5 litre and for cows 3.0 to 5.0 litres of table vinegar.

NOTE: Farmers should know that urea wrongly used can actually kill a cow. Be careful when using it. ■



Mix the urea with water at the ratio of 1kg to 20litres of water



Pour 1 bag of chopped stalks into a lined pit.

Pour an equal urea mixture onto the chopped stalks. Repeat these steps until the pit is full or all the stalks has been treated.



Cover the pit with polythene sheet. You can use the fodder after 3 weeks.

Source: More forage, more milk. Technical Handbook No. 33, World Agroforestry Centre, Nairobi 2005

Do a soil test before using any fertilizer

Continuous application of fertilizer has led to depletion of soils, soil acidity and reduced crop yields. Farmers should never use any fertilizer without first doing a soil test to know what is missing in their soils.

Peter Kamau | The problem of soil fertility is widespread in all farming areas in the country. Small-scale farmers are experiencing declining yields year after year. Many do not understand why the crop yields especially those of maize have steadily reduced despite adequate fertilizer application. Research carried out last year by Kenya Agricultural Research Institute and Moi University show that crop yields among small-scale farmers in the Western Kenya and the maize growing areas of Uasin Gishu and North Rift have been going down with some



Photo: TOF

Nutrient deficient maize

farmers getting as little as 2 to 5 bags per acre. The main cause of the crop yield decline is the consistent use of chemical fertilizers that have led to increased soil acidity.

What is soil acidity?

Soil that has too much acid is said to be acidic. Any fertilizer that has nitrogen in it can cause acidity but this depends on the amount of nitrogen applied and how it is made. Too much acid causes the available nutrients in the soil to dissolve fast, making it difficult for plants to take up the nutrients. Too little acid may cause nutrients in the soil not to dissolve at all, meaning that the soil 'locks' up important nutrients, making them unavailable to the plants.

The amount of acidity in the soil is measured in a mathematical scale called pH, which is measured on a scale of 1 to 14. The most acidic soil has a pH of 1 while the extreme alkaline soil has a pH of 14. At pH of 7, the soil is said to be neutral. Most healthy soils range between a pH of 5.5 and 7.5, and this is the level at which most nutrients in the soil are taken up by plants.

How can farmers measure acidity in their soils?

In Kenya and much of East Africa, acidity is the main problem affecting farmers. Alkalinity also affects farmers in other parts of the world. Soils in moist areas tend to be acidic while those in



Photo: TOF

Know what nutrients are missing in the soil before planting any crop

dry climatic zones are alkaline.

The level of acidity in the soil can only be determined in a laboratory or using a pH meter, which are not easily available to many farmers in Kenya and East Africa. We recommend that farmers should take their soil samples for analysis every 1 to 2 years to know the pH levels, including the nutrients needed, before buying any fertilizer for use in their farms.

The problem in the country is that farmers have become used to the common fertilizers in the market such as DAP, CAN, urea and NPK for production of maize and other crops even when it is not needed. At the beginning of every planting season, farmers flood agrovet shops or the National Cereals and Produce Board (NCPB) to

buy these fertilizers without knowing what nutrients are lacking in their soils. It is wrong to apply any fertilizer without knowing what your soil requires. A soil test costs only Ksh 1000 in KARI laboratories and this can save farmers a lot of money used to buy chemical fertilizers, which their soils may not require in the first place.

How to reduce soil acidity

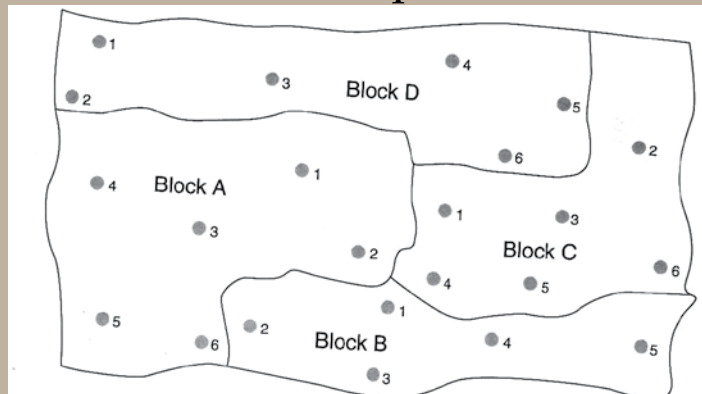
One method farmers can use to reduce soil acidity is by adding agricultural lime. It is, however, not easy for many farmers to get lime. Some do not know what lime is and very few agrovet shops stock it due to low demand. But even if it was available, very few farmers may be able to use it correctly as alkalinity caused by too much lime destroys micro-nutrients in the soil that promote plant growth.

Organic matter reduces soil acidity

Organic farming is a simpler way farmers can use to bring down acid levels in the soil. Continuous use of organic material in the farm balances the pH levels while maintaining the soil structure and fertility. To start with farmers should stop burning crop residue after harvest or when they are about to plough the land. All crop residue should be ploughed back into the soil. Other methods farmers can use to reduce soil acidity is to practise crop rotation. Farmyard manure and crop residue can be used to make compost, which should be worked into the soil every year in order to build soil fertility while neutralising soil acidity (see TOF N0s. 38,44,45,53 and 56).

How to take a soil sample

- Mark different parts of your shamba using sticks; ensure every part of your farm has been marked.
- Dig a hole in each part of the farm that you have marked and take a sample in both the topsoil and the subsoil (top at 20cm depth and subsoil at 50cm depth)
- Mix the soil samples collected, break crumbs to make sure the soil is fine in texture.
- Dry the soil on a clean plastic sheet.
- Put about 1kg of the soil sample into a clean plastic bag.
- Label the soil sample clearly with your name and address. If you have taken soil from different blocks of land in your farm, this should be clearly shown in



Take soil samples from every part of your farm as shown above

the label.

- Indicate the type of crop you intend to grow to get advice on what nutrients are needed for the crop.

Farmers should take soil samples

to any KARI station near their region. You will be advised on how to make payments. Results are usually ready within two weeks. Also send samples to KARI-NARL, Nairobi Tel. 020 267 2 975, Email: soilabs@yahoo.com

table companies (Fast Grow® or Turkey Starter® are recommended as they meet the protein requirement for quails). Give 29g of feed to each quail between 1 week and 6½ weeks. This should be increased towards the 6th and 7th week, but do not exceed 50g. Each egg-laying quail requires 145g to 150g of feed per day. Like chickens, quails require water at all times.

Fertility: Farmers buying quail eggs for hatching purposes should know that quail hens that have laid for 30 weeks can no longer hatch fertile egg. The hatchability of such eggs reduces by more than 50 per cent because at this age, the mother hen produces a hormone that interferes with the ability of the quail cock's sperm to fertilize the eggs.

In the same way cocks that have attained the age of 30 weeks should be replaced with young cocks as their ability to fertilize eggs is weak - this is called **spiking**. Many farmers are buying low fertility eggs because they cannot easily determine their quality. It is therefore important for farmers to buy eggs and breeding quails from well-known or reputable hatcheries.

Training on quail rearing is offered at Nyeri Hatcheries. Farmers can book for training by getting in touch with the company on 0735 768 580, 0722 768 580 (ask for Charles Gitata).

Farmer discovers the value of compost

Using compost and other organic farming practices, Mr Wakaba has managed to increase crop yields and income within a short period.

Pamela Mumbi | Joseph Wakaba is a small-scale farmer in Kinamba area, Njabini Division, Nyandarua County. He is one of the 22 members of Kinangop Apple Growers Self Help Group. It all started in August 2012 when he joined Mazingira Bora C.B.O and learnt about organic farming. He is among 13 members who have adopted and performed well in organic farming practices.

A regular reader of TOF magazine and a TOFRadio listener, Mr. Wakaba had longed to know how to make compost. The opportunity came when the Biovision Outreach Programme in Kinangop area trained his group. After the training, Mr Wakaba made his first compost heap. Most farmers in his area then used chemical fertilizers such as DAP, CAN and urea to grow various crops. The farmers had not realised the dangers that come with prolonged use of inorganic fertilizers such as soil acidity and leaching of important minerals.

Mr Wakaba first planted broccoli on a ¼ acre using compost where he harvested 4,000kg. The vegetables fetched Ksh 60 per



Photos: P Mumbi

Wakaba's cabbage crop (left), tending his potatoes (right)

kg, earning him Ksh 240,000, part of which he used to buy a commercial plot of land.

Encouraged by the good earnings, he has diversified into cauliflower production. "I am expecting to earn more income as the demand for broccolis and cauliflowers is big in Nairobi," he says. He attributes his success to the use of compost, which has cut the cost of production for him. "As farmers, we do not appreciate the value of compost which many regard as *takataka* (rubbish). I have learnt that with knowledge, you can make your own fertilizer, which does not cost you anything. Compost can make your soil healthy and fertile, thus making you earn more money from increased crop yields," he adds.

Mr Wakaba is also involved in potato seed multiplication on another 5 acres of land using compost. He is multiplying a new potato variety called "sifa Kenya" which he sells to other farmers. One potato tuber from

this variety produces 10-18 potatoes. The main source of manure is his three dairy cows.

He has learnt a lot from TOF magazine. He has planted lucerne, calliandra, lupin, double beans and barley for his dairy cows. He makes his own dairy meal concentrates using these fodder crops. The three water ponds he has dug on the farm are his main source of water. The secret behind his success is irrigation; during the dry season he is able to grow vegetables that are in great demand in Nairobi and other towns. Mr. Wakaba has several tree nurseries, where he grows seedlings for cabbages, spinach, lucerne seedlings and even grafting of apples for sale to other farmers and members of his group.

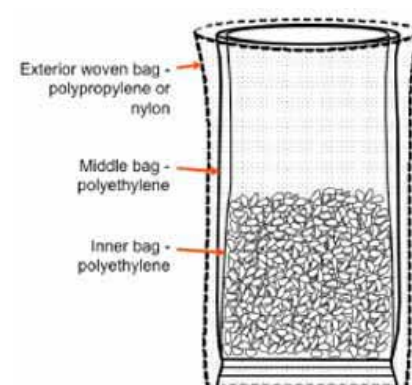
He encourages other farmers to practice farming as a business because, to him, it is the only way they can benefit from various farm enterprises. Farmers can contact Wakaba on 0722 251 223.

A new bag that protects grains from destructive pests

Like metal drum silos used for grain storage, the PICS bag is sealed tightly and pests in the grains cannot survive for long as they are deprived of oxygen.

TOF – After every harvest, farmers usually have problems storing maize, beans, rice, sorghum, millet and other cereals. The problem is worsened by the fact that most of the pests have developed resistance to the common chemical pesticides in the market. Research has shown that in Africa, farmers lose more than 40 per cent of their crop harvest every year due to pests and lack of proper and efficient storage.

A new storage bag developed by Purdue University, which is being tested by *icipe* may be a solution to storage problems faced by thousands of farmers.



The PICS bag kills pests by suffocating them



Photo: Purdue University

The Purdue Improved Crop Storage (PICS) bag has been used by millions of farmers and consumers to protect the harvested grains in West and Central Africa. The bag has also been effective for storage of grains like maize and beans in East Africa.

The PICS bag is made of three layers of plastic material that deprive pests in stored grain of

oxygen. It consists of two inner bags made of high density polyethylene material and an outer sack composed woven bag. The inner liners have walls of 80 microns thickness, which prevents air from moving across the wall of the bag. The outer woven bag enables easy handling.

The bag works in the same way as metal silos that are used

for grain storage - insects cannot survive without oxygen since they use it to digest food to get energy for growth, development and reproduction. When the bag is sealed, the insects in the grains use up all the oxygen in the container while raising the carbon dioxide level. When the oxygen level in the container goes down, the insects cannot feed, their growth, development and reproduction is stopped. They eventually stop growing and die. Insects at larvae and pupae stage are the first to die, leaving the stored grain free of any pests. PICS bags also help preserve the quality of grains. Even after several months of storage, the quality of grain is as good as when it was put in the bag. A PICS bag costs Ksh 200.

Interested farmers can purchase them through Bell Industries Ltd, P.O. Box 18603 -00500, Nairobi Tel 020 6535 828/9 23688 703, 0733 764 562.

Why vaccination is important in organic farming

I am a poultry farmer but I have a problem managing diseases in chickens. How can I vaccinate them in an organic system?

Organic farming promotes the rearing of all livestock without the use of external inputs such as vaccinations. While organic standards state that the adoption of good management practices is the preferred method to maintain livestock health in an organic system, they also recognize that sometimes, this alone cannot guard against diseases.

Vaccination is controlled

Organic standards outline specific requirements for the use of vaccines and other livestock treatments for disease control. The use of vaccines however is restricted. This means that routine use is discouraged and



All animals under treatment should be isolated from other stock

is only permitted when there is evidence given by the organic farmer that a specific disease is common in a region or their use is required by law or in proven cases where potential diseases cannot be controlled by other management practices.

Organic certifiers require that a written verification from a veterinary officer is obtained to confirm the presence of a threatening disease before they can authorize the use of vaccines.

The vaccine must not contain Genetically Modified Organ-

isms (GMOs).

Isolate sick animals

In organic farming, treated birds must be kept separately for a minimum of three weeks from non-treated ones. After that, they can be mixed with non-treated animals as long as they are marked and their records maintained to show they are under treatment. Meat and eggs from such stock or flock must not be sold as "certified organic".

Vaccinate against dangerous diseases

For chickens, vaccination against gumboro, New castle and coccidiosis is allowed to protect the farmers investments. But they have also to be isolated from the rest of the flock during the period of treatment as set out in organic standards for animals.

The value of coffee pulp in organic coffee production

How can I make compost using coffee pulp?

Coffee pulp is a fibrous material that has glue like fluid that is obtained when coffee cherry is processed to remove the outer cover or husk. Coffee pulp contains some amount of caffeine and tannins that are poisonous. However coffee pulp is rich in organic matter, which makes it very suitable as an ingredient of organic fertilizer. When coffee is processed a lot of coffee pulp is produced. The coffee pulp is often a problem because it contaminates rivers when released from the coffee factories. If coffee pulp is disposed in dumps, it decomposes, releasing methane gas, which is harmful to the environment.

Use EM1 to speed up composting

Organic farmers are being trained on how to make high quality organic fertilizers or compost from coffee using Effective Microorganisms (EM1), which is available in most agroveterinary shops in the country. Add 1 litre of EM and another 1 litre of molasses to 100 litres of water; mix the coffee pulp with other material such as farmyard manure (cow dung, chicken dropping, pig manure) make several layers of material. After every 4-inch layer of compost, sprinkle the solution of molasses, EM1 and water to make it moist (but not wet). Cover the compost with



Coffee pulp can be converted into rich fertilizer. Organic farms use earthworms to prepare compost that is later used to enrich the soil

a polyethylene sheet and turn after 21 days or three weeks.

Using earthworms to make coffee pulp compost

Farmers who have access to coffee pulp can use it to make very high quality compost or organic fertilizer. Coffee pulp from the coffee mill is treated with EM1, molasses and calcium. Once it has cooled down, it is transferred into a chamber full of earthworms, which eat and convert it into humus.

The earthworm castings or waste is rich in microorganisms, micronutrients and humic acids essential for soil health. If water is allowed to run through the compost, collected and sprayed on the coffee plantations, it provides a ready source of rich foliar feed that can be applied to coffee nurseries, used to hasten germination and transplanting of coffee seedlings and other crops.



Rock phosphate helps enrich compost

Why should I add rock phosphate in the compost?

A lot of organic material used in compost making does not contain adequate amounts of nutrients such as phosphorus and potassium. In order to ensure compost has enough and balanced nutrients, rock phosphate can be added as it is a rich source of phosphorus, calcium and other micronutrients. Since rock phosphate takes a lot of time to break down in the soil, humic acid in the compost helps the rock phosphate fertilizer break down faster and release nutrients to plants. Farmers making compost should also remember to add wood ash as it contains potash which helps increase the level of potassium in compost.

How long does the composting process take?

The normal composting process takes 21 days or three weeks but these mainly depend on the size of material used and the size of the compost. A compost heap of 1 cubic metre takes a shorter time especially where organic activators such as EM or even comfrey is used.

How do I keep pests out of my compost?

During the process of composting, the temperatures in the heap rise to a level where most of the harmful pests cannot survive. When the temperatures go down, the compost is again colonized by beneficial organisms that help break it down further such as earthworms, slugs, millipedes and ants- these help aerate the compost as they move about the heap. There is therefore no danger of them causing any harm to the crops grown using the compost.

Should I put my compost in the sun or shade?



Putting compost in the sun vapourizes the nitrogen, thus making the soil less rich in nutrients. Compost should therefore be covered at all times or be kept under shade to prevent the loss of nutrients. **TOF**

TOFRadio answers your questions

TOFRadio TOFRadio is broadcast on Milele FM at 8:30pm and KBC on Thursday at 8:15pm. 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 correspondences to the radio program. Send your questions and comments via SMS 0715 916 136.

Provide your cows with a balanced diet

"I have just started dairy farming. I need guidance on feeding dairy cows and making feeds at home."
Moses Kiplabat - Moiben, Uasin Gishu.

Farmers can make different types of feeds on the farm using locally available materials like forage. These are mainly green grasses such as Napier, Kikuyu grass, Boma Rhodes, Brachiaria and star grass. Leguminous forage like lucerne, desmodium, dolichos as well as other crops like sweet potatoes vines can also be used to make feeds for dairy cows. It is important to grow forage in the farm to cut down on the cost of buying and transport.

Making fodder

Ensure that the forage is cut and left to wilt for a day before feeding them to your cows. This increases the dry matter content. It also reduces bloating in the animals and makes them drink more water. Chop all forage to about 2.5cm in length and feed to the animals on feeding troughs. This ensures that the feed remains clean for a long time and minimizes wastage.

A dairy cow needs 40-70kg



TOFRadio receives many queries on animal production, particularly chicken and dairy production. Radio airtime and this space on the magazine is not enough for us to respond to all your questions. We advise our listeners and readers to include their email or postal addresses whenever they send their questions so that more detailed answers and past articles covered by TOF magazine can be sent. **John Cheburet**



Photo: TOF

of high quality forage per day. Divide this amount and feed it two times a day, preferably in the morning and in the evening. Always feed your animals a mixture of grasses and legumes. Cut, bale and store forage for use during the dry season. A good dairy farmer should have feed to last his/her animals for at least 6 months.

Farm by-products: These include materials such as maize stalks, wheat straw, rice straw. These are low in nutrition content and should be fed in small quantities or enriched with molasses or urea. Dilute one litre of molasses in 3 litres of water and soak chopped straw overnight before feeding. The straw should be soaked and ensiled for at least 3 weeks. Urea can cause poisoning and so farmers are advised to consult an animal nutritionist or livestock officers before using it (page 4). The use of straw and stalks is usually for maintenance during the dry season. Its use should be minimal.

Concentrates: A high nutrient concentrate is provided to take care of nutrient deficiencies that are not provided by forage. This can be bought from agrovets or made on the farm, depending on availability of the components.

A simple way to measure rations prepared at home is to ensure that it has 70% energy

source, 30% protein source and required minerals. Dairy rations should have about 18% crude protein content. The high protein compensates for protein deficiencies in the feed. It is, however, important that farmers take their feed to the laboratory for testing.

Example of rations: (a) 35% wheat bran + 35% maize + 30% cotton seed cake + 1% minerals, (b) 37kg maize + 35kg cotton seed cake + 6kg fishmeal + 22kg wheat bran + 1kg mineral lick.

A cow can produce up to 7kg of milk per day from good forage without giving concentrates so long as the required minerals are present. Any production above this should be supplemented by giving 2kg of concentrates for each 3kg of milk produced above the first 7 kg.

Feeding time: Many farmers give their cows concentrates when milking. This is not advised as cows get used to the routine and when there is no concentrate, the cow cannot give milk. Therefore, it is best to feed your cow after milking. If you must give the cow concentrates, make sure you split the concentrate into two; to be fed in the morning and evening, depending on how many times the cows are milked per day.

In calf cows, give concentrates daily for 2 months (60 days) before calving. For heifers, give 2kg per day per during the first month and increase to 4kg per cow in the second month, especially for those that are still growing. Minerals: Give each cow at least 100g per day of high quality and balanced livestock mineral lick. The granular mineral salts can be mixed with feed while the block can be left for cows to lick as they feed or while resting.

Water: Water is essential for animals, yet many dairy farmers overlook this. Every kilogram of milk contains 870g of water. If a cow doesn't get enough water, then it will not produce enough milk. Water should be available to cows at all times.

It is your experience as a farmer that will enable you balance the economic costs of your feeds and practice what works for you.

 farmers forum

0717 551 129 / 0738 390 715

Sunflower grower wanted: I would like to make a contract with any farmer ready to grow 15 acres of sunflower and sell to me. SMS "sunflower" to 0722 878 635.

Hay wanted: I would like to buy 270 bales every week. Anyone able to supply can contact me on 0721 985 438.

Land for sale: 1½ acres of land, 3 kilometres from Kagumo town opposite Royal Academy with 360 coffee bushes, 380 grevillea trees, a zero-grazing unit with a capacity for 15 cows, a chicken house with a capacity for 1500 layers or 3000 broilers rabbit cages, 8 dairy goat cages, 6 bee hives, a borehole with electric motor, 6000 litre water tank, a 3 bedroom house. Call 0722 460 066

Cream separator for sale: Suryoday cream separator as new, in good working condition, complete with operation manual Ksh 46,000. Highest offer secures. Call 0734 913 049 from 8 - 5am.

Quail eggs for sale: We have fresh quail eggs for sale. Bulk orders of 10-40 trays per week call Nyaga on 0733 526 813.

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Tune into KBC Radio, Taifa Kiswahili every Friday @ 8.00pm to 9.00pm and every Wednesday, 6.30pm to 7.00pm for Animal Health, Animal production and range management training. Dial *285# for FREE iCow Updates on this and other events and programs!

