



Photo: TOF

Farmers planting maize in Njoro, Nakuru County: Farmers should plant early to get a good maize yield. Research has shown that farmers who plant late lose 2½ bags every week.

Dear farmers,

The soils in most farming areas in Kenya are in poor condition and no longer suitable for crop production. For years, our policy makers have glorified and promoted the use of chemical fertilizers for crop production at expense of more sustainable methods. The practice is so engrained in our farmers' minds that it is difficult for most farmers to imagine planting without a dose of DAP or other chemical fertilizer.

Many times in this publication, we have explained the harmful effects of repeated use of chemical fertilizers. But we have been a lone voice in this crusade because the government has continued to encourage their use in spite of the proven and documented harmful effects of their long-term use. For example, soil tests done in all maize growing areas have shown that the soils are too acidic and can no longer sustain maize production in those areas due to repeated and haphazard use of chemical fertilizers.

Although many institutions and individuals that support the use of chemical fertilizers have argued that small-scale farmers are not able to get enough organic matter to make compost and therefore need chemical fertilizers to grow maize and other crops, TOF has a different view. If you visit any small-scale farmer's backyard in most areas you will see a huge pile of farmyard manure, kitchen waste and a lot of crop residue lying around, some of which are often burnt to keep the compounds tidy, but are good soil fertility sources.

Farmers need to change their farming practices and mindsets if they are to improve their soils. Making compost is one of the easiest tasks that yield a lot of benefits in the long term. Farmers can make small piles of compost whenever they have any compost material in their yards. Compost making should be done continuously because organic manure is usually never enough in a farm. In this way, farmers can gradually reverse the poor state of their soils to a point where they do not need to use chemical fertilizers anymore. If they did this, they will not only cut their production costs, but also increase their crop yields and income. (See page 4 and 5)

Plant early to reduce the effect of MLN disease

TOF - The planting season is here with us again. Farmers across the country are preparing to plant by buying various inputs like seeds. A lot of farmers were affected by the Maize Lethal Necrosis (MLN) disease, which greatly reduced their yields. Last year, we advised farmers whose farms had been affected by the disease to practise crop rotation as one of the ways of reducing the infection rate and even the possibility of spreading the disease.



Poor quality of seed

TOF has established that the poor quality of seed in the country is contributing to the rapid spread of the disease in many parts of the country that were free of the disease two or three years ago. Scientific studies have established that even low levels of infection in seed have the potential to spread the disease (TOF No. 115, December 2014).

The Kenya Plant Health Inspection Service (KEPHIS) has been certifying maize seed with up to 10 per cent level of infection to be used as seed, a condition which has greatly facilitated the spread of the disease in the country.

However the inspection body has revised its inspection rules to control the disease. According to the new regulations, any maize seed that has any traces of the two viruses Maize Chlorotic Mottle Virus (MCMV) or Sugarcane Mosaic Virus (SCMV), which cause the MLN disease

will not be certified as seed. But farmers should know that all the seed in the market this year was certified at 10 percent level of infection, which means that most of the seed currently in the market still has the potential to spread the disease.

Plant early this season

Since it may always not be practical to ask farmers not to plant maize because it is our staple food, farmers should improve on the management of their crop to ensure the disease does not destroy the entire crop. One way to do this is to intensify pest control measures to ensure insects do not spread the disease.

Another control measure is to try and plant early when the pest population is low. Farmers who planted early in the last two years have managed to reduce the infection rate in their maize and even managed to get a good maize harvest. (Page 7).

You can download your own copy of this magazine for free from:
www.theorganicfarmer.org/folders
www.infonet-biovision.org



in this issue

Growing groundnuts 2 & 3



Integrated soil fertility 8

TOF on the web

 theorganicfarmer.org
 mikulimambunifu.org
 facebook.com/theorganicfarmer
 twitter.com/TOFMagazine

TOF partners on the web

 biovision.ch
 infonet-biovision.org
 icipe.org



TOF Radio
KBC Thursday 8.15 pm
Milele FM Tuesday 8.30 pm
Kass FM - Wed 7.15pm
Mbaitu FM - Fri 7.30pm

Farmers can diversify by growing groundnuts

Experienced farmers always know that planting the same crop on the same piece of land every season leads to decline in yields. In this article, we focus on groundnuts, which farmers can plant instead of overly relying on maize that has been devastated by disease in many parts of Kenya.

Caroline Nyakundi | Due to the outbreak of Maize Lethal Necrosis Disease (MLND) in most maize growing areas of the country, farmers have been encouraged to practise crop rotation or grow alternative crops in following seasons. This is to prevent spread of the MLND disease, which has led to huge financial losses for the farmers. Some farmers have even lost their whole harvest, leaving them with no food for the family and none to sell for income.

If you have been planting maize on your shamba for more than 3 years without rotating with a different crop, it is time to change. If your shamba was affected by MLND last season, you cannot plant maize this season. The alternative is to plant alternative crops like groundnuts, potatoes or African indigenous vegetables.

Like beans, the groundnut is a high value staple crop that fetches good prices in the Kenyan market. Currently,

a 100kg bag is going for an average of Ksh.12,500 in Nairobi and Ksh.10,400 in Kisumu. Compared to maize, this is a more profitable crop as it has a high demand for making oil, and for food. It is a good source of protein (23-25% content) and oil (45-52% content).

Popular groundnut varieties

Most of the groundnuts produced in Kenya are grown in Nyanza and Western regions (at least 89%). Mrs. Julia Kerubo, a farmer and trader in Kisii County, says that although she does not plant on a large piece of land, the yield and income for groundnuts is far much better than maize. "In an acre I can get two or three 100kg bags of groundnuts per acre. When I sell at wholesale price, I get Ksh 300 - 360 per 2kg tin, depending on the variety. If I sell a full bag that has 40 tins or 100kg, I get Ksh 10,000 - Ksh 12,000," she says.

Although there are many varieties of grounds (see table), she plants two varieties of groundnuts - Red Valencia and Manipinta. Manipinta is brown and big and is more popular in the market but takes longer to mature, about 4 months. "But the yield per acre is very high and they prefer more fertile soils. They also need to be harvested immediately they are ready, otherwise they get spoiled in the shamba if not harvested on time. They need more rain and care than the other types. Loam soil is preferable if you want good yield," she says.



A groundnut farm: A bag fetches twice the price of beans in the market.

Red Valencia is a more resilient variety. Its main advantage is that it matures faster, in about 3 months and grows even in poor soils and less rain. According to Ms. Julia, it is less preferred in her region.

The retired teacher confesses that although growing groundnuts has more work especially for the hybrid variety, it fetches more money. Her advice is that since groundnuts prefer low to medium altitudes and slightly high temperatures and no frost, one can get a good harvest as long as you have 60 to 90 days of rain.

"I prefer to plant groundnuts and even if we do not get plenty of rain and our soils are a little poor in fertility, I know I can harvest the crop and get good income. But for maize, yields can be terrible especially in areas with poor soils and rainfall low. One bag of groundnuts is equivalent in value to 5 bags of maize. But to harvest 5 bags (500kg) per acre these days you need very fertile soil and adequate rain. But the maize yields here in Kisii can be as low as 2 bags per acre and here the farmer is only assured of about Ksh 3,000 because of oversupply. But if I only get 3 bags of groundnuts, I am assured of a minimum of Ksh 30,000."

Julia has already planted this season's crop and is anticipating a better yield this time, because she was more serious and has

planted on a bigger piece of land. She hopes to take advantage of the huge demand in the market, which relies on imports from Uganda. She has planted two local varieties, which, she says, are preferred by her customers.

Varieties and Yields

There are two main types of groundnuts:

Bunch type such as Red Valencia that mature within 90 - 100 days
Runner type like Homa Bay, which mature in 120-150days

The present growers yield in Kenya is 450-700kg/ha can be doubled through improvement of husbandry practices.

Variety	Mean Kernel yield Kg/ha
Red Valencia	1500
manipinta	2450
Makulu Red	2750
Bukene	1530
Asyria Mwitunde	1300
Texas peanut	1360
Severe 116 (white)	1250
Atika	900
Homa Bay	770

Source: Agro-Environment Initiative

continued on page 3 ►►

Nutritious food
Groundnut seeds can be eaten raw, boiled or roasted. They can be used in soups or made into sauces for meat and rice dishes. They can also be packaged as snack foods. The vegetative residues from the crop are excellent feed for livestock and improve soil fertility when ploughed back into the soil.



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. The articles in the *The Organic Farmer* do not necessarily reflect the views of ICIPE.

License This work is licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported License.



Publisher icipe-African Insect Science for Food and Health, P.O. Box 30772, 00100 Nairobi, KENYA, +254 20 863 20 00; icipe@icipe.org; www.icipe.org

Editors Caroline Nyakundi, Peter Kamau

Administrator Lucy W. Macharia, 020 863 21 86

Editorial Advisory Board Dr. Sunday Ekesi (ICIPE), Dr. Nguya Maniania (ICIPE), Dr. Joseph Mureithi (KARI), Dr. Henry Kiara (ILRI), Dr. David Amudavi

(ICIPE), George Nyamu (KENDBIP), John Njoroge (KIOF), William Makechi (farmer, Likuyani), Regina Muthama (farmer, Machakos) and Rt Snr Chief Josiah Arende (farmer, Rongo).

Layout James Wathuge

Sponsor Biovision, a Swiss-based foundation for the promotion of ecological development, based in Zürich, Switzerland. www.biovision.ch



Groundnuts as food and a cash crop

How to grow groundnuts

Groundnuts grow well in warm areas, below 1500 M above sea level. The best temperature requirement is about 30° C. They do not grow below 15° C. The crop does not tolerate frost and cold conditions including delay in flowering and seed formation. For good growth, they also need 500 to 600 mm of rainfall, which is well-distributed throughout the growing season for proper growth. The crop can survive drought or reduced rain but yields will be low.

Well-drained soils are needed although the crop can also grow well in clay soils.

Land preparation and planting

Groundnut is an early season crop, which means that at the slightest sight of some rain, you need to plant. Plant when the soil is not soggy as the crop does not do well in waterlogged soils. To prevent blights caused by soil bacteria and fungi, ensure you use certified disease free-seeds. If you are using seed from the last season, ensure that the seeds for sowing are stored in their pods and only shelled a few days before planting. Shell the pods 1-2 weeks before sowing and select only good quality seed for sowing.

Plough the land and harrow to a fine tilth. Spacing depends on the variety. Small seeded types (bunch) are spaced at 30cm between rows and about 15 cm between plants. This has a plant population of 167,000 per hectare. The large-seeded types (runner) are spaced at 45cm between rows and 20cm between plants, giving an optimum plant population of 89,000 per hectare.

The seeds are planted in two rows on top of the ridge. Select clean and well formed seeds for planting. Sow seeds to a depth of 5-8 cm at a seed rate of 40-50 kg per ha.

Use Biofix organic fertilizer when planting

Biofix is an organic nitrogen fixer for planting leguminous crops like beans, cowpeas, groundnuts and soya beans; leguminous pasture crops like Lucerne and desmodium; and leguminous trees like Sesbania and caliantra.

Being a natural product made out of nitrogen-fixing bacte-

ria, Biofix is environmentally friendly and is not expensive to buy or apply.

When applied to groundnut seeds, it helps in the formation of more root nodules (small growths on the roots). These nodules help the plant to convert nitrogen in the air into into utilizable form by the plant. Nitrogen helps in leaf development and plant growth.

Ensure that when buying the Biofix inoculant, you buy the right one for the type of crop you want to grow- there is biofix for groundnuts, and different ones for other legumes. The packet (which is available in 10g, 50g or 100g) should contain the inoculant and a sticker made of gum Arabic or sugar solution.

During planting, one needs one packet of biofix (100g) for 15kg of seed, which is enough for a 1 acre farm. Follow the instructions given on the package.

Once the seeds are inoculated with biofix, crops can take up nitrogen much easier and faster, which results in more rapid growth and plentiful harvest. When using biofix ensure you plant when your soil is still moist.

Weeding

Groundnuts should be weeded promptly especially during the early stages of growth. earthing up should be done at the time of weeding to encourage pegging, or penetration of young nuts

into the soil. It is recommended that farmers use hand weeding after the start of pegging to avoid disturbing the growing nuts or damaging the flowers. Clean weeding should take place up to 6 weeks after which only hand weeding should be done.

The crop requires adequate amounts of Calcium when pods are forming, otherwise the farmer ends up with empty pods. Nitrogen fertilizers are not needed since groundnuts are leguminous plants. If soils are acidic, you can apply lime to raise the pH and



Julia Kerubo, a farmer in Kisii County planting groundnuts (above). Unshelled groundnuts (below)



supply calcium. If there is no rain during flowering or pod formation, irrigate if possible to ensure the yields do not drop. For soils that are not fertile, Rock phosphate is recommended at a rate of 200kg/ha.

Dealing with pests and diseases

Like other crops, groundnuts are attacked by various pests and diseases. The table below shows how different pests and diseases can be controlled without using chemicals.

The major pests and disease challenging groundnut growing are shown below:-

Harvesting and storage

Groundnuts mature from 90-130 days depending on the variety. Mature nuts should be firm and dry and brown on the outside. The inside of the pods should be grey and produce a rattling sound when shaken.

To harvest, dig up nuts with great care to avoid them breaking off and remaining in the ground. Dry for 2-3 days, after which you can remove the nuts from the plants and dry them on mats for 7-10 days, to a moisture content of 10%. Shelling should be done by hand followed by sorting to remove the broken, dirty, damaged nuts which lower the quality and consequent selling price. Storage should be done in clean dry conditions to avoid growth of *aspergillus spp* which releases aflatoxin fungi that are poisonous to humans.

Pest or disease	Stage attacked	Type of damage	Control measures
White grubs	All stages	Roots, pods, young nuts	Well decomposed manure
Termites	All stages	Roots, stem base, pods	Early planting, field hygiene, timely harvesting.
millipedes	seedling & plant	Pods, flowers	Cover exposed pods, close soil cracks
Aphids	Early growing stages	Vector of rosette virus	Early planting, conserve natural enemies e.g. ladybirds.
Damping off disease		Rotting of stem seedling, petioles	Certified seed, crop rotation
Leaf spot	leaves	Brown ring spots shedding leaves	Crop rotation, field hygiene
Rust	All aerial parts except flowers	Leaves, stems	Remove volunteer groundnut plants, crop rotation
Aspergillus crown rot	All growth stages	Wilting of the plant	Rapid drying of nuts to 10% M.C
Bacterial wilt	All stages	Plant wilting	Rotation with cereals
Groundnut rosette Virus	All growth stages	Yellowing, mottling, stunting	Early planting, control of vector-Aphids

Organic fertilizers have many benefits to your crops

Natural fertilizers have immense benefits for the soil and crop production. They add soil organic matter, improve soil structure and preserve essential nutrients that crops need in order to grow well.

Peter Kamau | It is the time for planting again and farmers are struggling to buy inputs for use in planting maize, beans and other crops. Apart from seeds, the other most important input is fertilizer. Many farmers planting maize will of course buy chemical fertilizers especially Diammonium Phosphate (DAP). But chemical fertilizers will not help much.

At least many farmers have noted that even after using chem-



ical fertilizers, the crop yield in their farms have reduced over the years. The major reason for this is the continued use of chemical fertilizers, which have depleted their soils. Fertilizers such as DAP, Urea and CAN tend to lower the soil pH, which causes acidity and leaching of essential nutrients from the soil; any crop planted in such soil cannot

do well. The best solution for farmers in such situations is to switch to organic fertilizers.

Organic fertilizers have many benefits for the soil. Unlike chemical fertilizers, organic fertilizers reduce acidity in the soil and do not cause leaching. They do not kill beneficial microorganisms in the soil. Organic fertilizers also help improve the structure of

the soil including the circulation of air, which sustains beneficial microorganisms that help release nutrients to the soil.

The major nutrient that crops such as maize require is nitrogen (N), phosphorus (P) and potassium (K). Apart from these, growing crops also require micro-nutrients such as copper (Cu), manganese (Mn), magnesium (Mg), iron (Fe), calcium (Ca) and sulphur (S).

The most important step farmers can take is to ensure that any organic fertilizer they use has these nutrients in sufficient quantities in order to provide their crops with adequate nutrients for each of them. Below are some of the organic fertilizers that farmers can buy in place of chemical fertilizers to restore soil fertility and get good crop yields and income.

Organic Fertilizer	Application Rate	Application time	Method of Application	Company
Vitazyme Turbo seed Maxiboost	5ml of vitazyme per kg seed, 2.5g of turbo seed for every kg of seed 10ml per kg of seed	Seed dressing	Make a slurry Mix the seeds with slurry	Lachlan (K) Ltd 0722 209 474
Mbolea Mambleo Black Majik	50kg per acre	At planting	Mix 2.5 kg of Black majik with 50kg of mbolea mambleo	Juanco SPS 0721 492 844 Lachlan (K) Ltd
Vitazyme Maxiboost	20ml 40ml	At two weeks after planting	Mix both vitazyme and Maxiboost at 20ml (vitazyme) and 40ml Maxiboost)	Lachlan (K) Ltd
Vitazyme Maxiboost	20ml 40ml	Before tasselling	Mix vitazyme (20ml per 20litre knapsack and Maxiboost (40ml per 20 litre knapsack)	Lachlan (k) Ltd

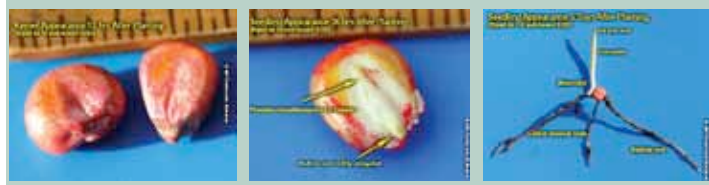
How much fertilizer to use when planting

All farmers mix chemical fertilizers with maize seed when planting. The conventional thinking is that the germinating seed will use the nutrients in the fertilizer to grow well and vigorously. But this is not the case; every seed at germination utilizes the nutrients stored within itself during the first 7 days. After this period the seed will have exhausted all its reserves of stored nutrients and it will therefore require supplementation of nutrients through fertilizers.

By planting maize seed together with fertilizers, farmers hope that the seed will use the fertilizer after it has exhausted its reserves of nutrients. What exactly happens is exactly the opposite of what the farmers expect- when you apply chemical fertilizers such as DAP when planting, they can have

two effects- The fertilizer is acidic in nature so it burns the seeds, therefore no germination will take place. If it is raining heavily, the fertility causes the leaching of essential nutrients such calcium, potassium and magnesium.

Back to the issue of the germinating seed, farmers do not need to plant their maize with chemical fertilizers. Currently there is new technology that involves dressing the seed with organic fertilizers that are well balanced in terms of nutrients. After dressing, the farmers can plant and wait until the maize has germinated; they can then spray their crop with the same organic fertilizers (see table below), which are relatively cheaper in comparison to chemical fertilizers. The maize yield will be the same or even better than that planted using chemical fertilizers.



Important maize planting tips

- Before, planting buy seed that is suitable to your area. Seeds are developed specifically for particular areas; if farmers, uses seed that is not recommended for their areas, they will encounter problems with their maize due to rotting, diseases or even low yields.
- Always plant early, maize that is planted early has an advantage over that which is planted late. Early planting will reduce incidence of diseases such as MLN and even crop vigour.
- Farmers should only buy varieties that they know or understand very well. Never plant a new variety in the whole *shamba*; isolate a section of the farm and plant any new variety, observe its perfor-

mance and only use it if it does well in terms of yield, disease resistance, weight and other parameters such as taste etc.

- Always buy seed from recognized agrovet shops. All genuine seeds have company labels with a Kenya Plant Health Inspection

Service tags

showing lot number and other details. Some agrovet shops stock fake seed obtained from commercial maize.

- A ways

practise crop rotation to reduce chances of diseases. Divide your farm into blocks and rotate crops from different plant families such as, beans, potatoes, onions, sweet potatoes in order to avoid diseases such as the Maize Lethal Necrosis (MLN).



Compost making should be a continuous process

Farmers can help restore and build soil fertility in their farms if they can make compost preparation an integral part of their farming. In an organic farming system, compost is never enough.

Peter Kamau | Many farmers continue to ask questions about compost making. This is an indication that they have not had an opportunity to read past issues of *TOF* magazine where we have handled this topic. For the sake of these farmers and anyone who may want to know more about the value of compost including how to make it, we hereby explain further the benefits of using compost to improve our soils for increased crop production and income.

Soil keeps on losing essential nutrients when it is leached, washed down slopes in heavy rain, by wind when the topsoil is blown away or broken down during ploughing. The soil also loses its carbon content as carbon dioxide (CO₂), which is responsible for the climate change. The only way farmers can replenish the lost nutrients is through returning them to the soil as compost.

All these material are available on the farm and can cut down the cost of buying chemical fertilizers by a large margin.

Value of compost

- It holds moisture the way a sponge holds water.
- It holds nutrients that plants need for growth and facilitates the growth of microorganisms in the soil such as beneficial bacteria, fungi and larger organisms such as ants, beetles and earthworms.
- It acts as a protection against changes in pH of the soil.
- It contributes to a good soil structure.

A good soil must contain at least 12 per cent organic matter (carbon). The organic matter provides energy for the bacteria, fungi and other beneficial microorganisms in the soil. Microorganisms help break down dead plants and animal remains and in the process release carbon dioxide, water and mineral salts including nitrates, phosphates and other nutrients that crops need to grow healthy.

Compost is important because of the following reasons:



- It contains the main plant nutrients eg Nitrogen, (N) phosphorus (P) and potassium (K).
- It improves the organic matter in the soil by providing humus.
- It helps hold water and air for plants.
- It makes micronutrients and trace elements available to the growing plants.

but not wet. This layer is called the foundation layer- the spaces between the plant material allows air to circulate and excess water to drain out of the upper layers of the compost.

Three basic layers

Layer 1: In this layer, put dry plant material such as grasses, dry leaves mixed with topsoil, manure and ashes. The layer should be about 20-25cm thick such the palm of your hand. Mix the material with soil, manure and ashes and sprinkle water to make it moist (not wet!). Mix the material thoroughly and evenly and spread it across the layer.

How to make compost

Compost can be prepared in two ways:

- The piling method
- The pit method

The pile method

The pile method is the easiest and most common method used by farmers.

1. Select an area in your farm that is protected from strong wind and sun e.g under the shade of a tree.
2. Mark the area where you intend to locate the compost, the minimum area is 1.25m x 1.25m.
3. Dig a shallow trench, which is the same size as the compost heap 20 cm deep. Smear the sides of the trench with water or a mixture of water and cow dung to prevent moisture and nutrients in the compost to not leach out of the compost heap. The shallow trench will become the foundation of the compost heap, the trench also helps to hold moisture especially during the dry season.

Making the compost

Foundation layer

1. Put the dry plants material such as small tree branches, maize stalks or sorghum stalks. Cut the plant material into small pieces. Spread the dry material evenly over the bottom of the trench to make a layer of 15-25cm. Sprinkle with water using a watering can or basin to ensure all the material is moist

but not wet. This layer is called the foundation layer- the spaces between the plant material allows air to circulate and excess water to drain out of the upper layers of the compost.

Three basic layers

Layer 1: In this layer, put dry plant material such as grasses, dry leaves mixed with topsoil, manure and ashes. The layer should be about 20-25cm thick such the palm of your hand. Mix the material with soil, manure and ashes and sprinkle water to make it moist (not wet!). Mix the material thoroughly and evenly and spread it across the layer.

Layer 2: Make another layer of moist (green) material which is fresh or wilted such as weeds or grass cuttings, stems and vegetable leaves, tree branch leaves, damaged fruits, or vegetables or even kitchen waste. DO NOT sprinkle water in this layer but you can spread it to remain even (flat)

Layer 3: This layer should be composed of animal manure collected from fresh or dried cow dung, chicken waste, donkey manure sheep or goat droppings. The animal manure can be mixed soil old compost and some ashes to make a layer that is 5 -10 cm thick. If the manure is not adequate, make a slurry (watery mixture) and spread it over as a thin layer about 1-2cm thick.

NOTE: After each layer you can sprinkle water mixed with EM1 to speed up the decomposition process. (See page 7)

4. Continue adding more layers in the same arrangement as layer 1, layer 2 and layer 3. The layers should make a gentle slope such that the middle is higher than on the sides until the heap is 1- 1.5 metres high.
5. Drive one or more ventilation sticks into the heap- these are used to test if the heap is decomposing well. The sticks also help

to take out carbon dioxide and bring oxygen into the heap.

Covering layer

The finished heap has to be protected from the sun or drying out or from animals or anything that might disturb. The farmer can take the following measures to protect it:

- Prepare wet mud mixed with grass or straw, or with wide pumpkin leaves, banana leaves plastic polyethylene sheets. The cover should be completely covered with only the ventilation stick (also called thermometer stick).

Turning the compost

After three weeks, you can open up the compost heap and turn the compost, mixing all the layers while sprinkling water to make it moist but not wet. A little EM1 can be mixed with water to hasten the decomposing process.

Check the decomposition progress

Using the ventilation or temperature stick, you can keep on checking the decomposition process of your compost every week by pulling out the stick- if the stick has a white substance on it and has a bad smell, it means the decomposition is not going on well- you can turn the compost further and sprinkle some more water mixed with EM1 to make it moist but not wet.

Check if compost is ready

A mature compost heap is about the half the size of the original heap. Check to ensure the compost has a dark brown colour or black soil, which has a nice smell. All the original material should not be seen if the decomposition process went on well.

Using the compost

Ready compost can be used immediately by incorporating into the soil (ensure it is not left in the top of the soil as it loses nutrients. Alternatively compost can be covered and applying in the planting furrows; here it requires immediate covering once it is applied during planting to ensure the nutrients are not lost. Never leave compost exposed to the sun or rain as most of the nutrients such as nitrogen are lost in the atmosphere.

Making compost in pits will be covered in the next issue.

Avocado has many nutritional and health benefits

Beginning this month, TOF will carry a series of articles on health and nutrition to educate farmers on how the food they grow and eat can affect their health.

Peter Mokaya | Avocados are one of the most exceptional sources of healthy fats, along with coconut, coconut oil, organic raw butter, ghee and other locally grown nuts e.g cashewnuts, of the good and healthy fats. The avocado tree is botanically called *Persea Americana*; there are several varieties, including Hass type, which is the most popular, locally (This is covered in more details in *The Organic Farmer* article No. 110 July, 2014).

Avocados are rich in monounsaturated fat. By removing unhealthy grain carbohydrates from your diet, and replacing them with avocados, is one of the best ways to improve your nutritional status and health and manage your weight.

How to eat avocados

Avocado is best eaten alone or as mixes, in salads, smoothies, sandwiches and other salad combinations. Aside from providing healthy fats, avocados give you close to 20 essential nutrients, such as potassium, which helps balance your vitally important potassium to sodium ratio. Most fruit consists primarily of carbohydrate, while avocado is high in healthy fats.

Here below are 10 health benefits of avocado that are supported by scientific research.

1. Highly nutritious

Avocados contain 20 different vitamins and minerals essential for good health. These include:

- Vitamin K
- Folate
- Vitamin C
- Potassium
- Vitamin B5
- Vitamin B6
- Vitamin E
- It also contains small amounts of Magnesium, Manganese, Copper, Iron, Zinc, Phosphorous, Vitamin A, B1 (Thiamine), B2 (Riboflavin) and B3 (Niacin).

Avocado does not contain any cholesterol or sodium, and is low in saturated fat. In



Photo: TN

summary avocado is loaded with healthy fats, fiber and various important nutrients as outlined above. Several studies show that having a high potassium intake is linked to reduced blood pressure. High blood pressure is a major risk factor for heart attacks, strokes and kidney failure.

2. Contain more Potassium than bananas

Avocados are actually very high in potassium with a 100-gram (3.5 ounce) serving containing 14% of the recommended daily allowance, compared to 10% in bananas, which are a typical high potassium food. Several studies show that having a high potassium intake is linked to reduced blood pressure.

3. Avocado is good for your heart health

In fact, 77% of the calories in avocado are from fat, making it one of the fattiest plant foods in existence. But they don't just contain any fat, the majority of the fat in avocado is oleic acid. This is a monounsaturated fatty acid that is also the major component in olive oil and believed to be responsible for some of its beneficial effects. Oleic acid has been linked to reduced inflammation and been shown to have beneficial effects on genes linked to cancer.

Fibre is another nutrient found in relatively large amounts in avocado. Fibre is indigestible plant matter that

can contribute to weight loss, reduce blood sugar spikes and is strongly linked to a lower risk of many diseases. A distinction is often made between soluble and insoluble fiber.

4. Eating Avocados can lower cholesterol

Heart disease is the most common cause of death in the world. It is known that several components such as cholesterol, blood pressure in the blood are responsible for heart disease.

5. People who eat avocado are healthier

People, including farmers, who eat avocados have a much higher nutrient intake. They have more of the good omega 3 fats, as opposed to the not so good omega 6 fats, which are a key component of most vegetable oils, like Elianto oil. Eating avocado lowers your risk of obesity, diabetes and heart conditions, among other chronic conditions.

Did you know that avocados help your body absorb nutrients from other plants foods? When it comes to nutrients, the total amount of them is not the only thing that matters. We also need to be able to absorb them; that is move them from the digestive tract and into the body, where they can be used. Some nutrients are "fat soluble," meaning that they need to be combined with fat in order to be utilized. These include vitamins A, D, E and K along with antioxidants like carotenoids.

Some studies have shown that adding avocado or avocado oil to either salad or salsa can increase antioxidant absorption by 2.6 to 15-fold. So, not only is avocado highly nutritious, but it can dramatically increase the nutrient value of other plant foods that you are eating. This

is an excellent reason to always include a healthy fat source, like avocado, when you eat vegetables. Without it, a lot of the beneficial plant nutrients will go to waste.

6. Avocados can protect your eyes

Did you know that avocados are good for your eyes? Not only do avocados increase antioxidant absorption from other foods, they are also high in antioxidants themselves, including Lutein and Zeaxanthin. These nutrients are very important for eye health and lower the risk of eye degeneration and cataracts. Everybody, including farmers need good eyesight!

7. Avocado can relief arthritis

Avocados, with their high nutrient content, including the good fats, such as Omega 3, are good for relieving arthritis. Arthritis, which manifests as chronic joint pains, sometimes its "cousin" gout, is a common problem in older people, including farmers. There are many types of arthritis, including gout, which is as a result of accumulation of uric acid in the body, especially in the blood system: Avocados, taken in combination with other healthy foods and some exercise, reduce symptoms of arthritis.

8. Can prevent cancer

Have you noticed how cancer cases have increased lately? Even among young people, this is becoming a problem. There is some evidence that avocado may be beneficial in preventing cancer. Avocado extract has also been shown to inhibit the growth of prostate cancer cells.

9. Can reduce weight

There is evidence that avocados are a weight loss friendly food. Obesity (overweight) is on the increase due to consuming junk foods with too much sugar: As such, any foods that can reduce weight and improve health outcomes are highly valued. Avocado is in this category of foods.

10. Blend well with other foods

Not only are avocados healthy, they're also very delicious and go with all sorts of foods.

In this issue Dr. Peter Mokaya, the director of Organic Consumer Alliance (OCA) focuses on the avocado fruit and its health benefits for consumers.



Photo: TN

EM is good for plants and animals

What is EM1? What is its purpose in Agriculture?

EM1 is a solution of beneficial bacteria that help stimulate plant growth and also speed up the decomposition of organic matter while facilitating rapid release of nutrients for plant use.

Effective Microorganisms (EM1) is a mixture of beneficial and naturally occurring microorganisms that can be applied to the soils to improve plant growth, yield and quality. It consists of microorganisms of lactic acid bacteria, a limited number of photosynthetic bacteria (which help turn carbon dioxide and water into plant food by use of energy from sunlight) and yeast. These three groups of microorganisms help to condition the soil, suppress disease causing bacteria and speed up the decomposition of the organic matter for the benefit of plants.

EM1 is developed from beneficial bacteria that are produced in a natural process. It has no chemicals or genetically prepared microorganisms. It has no side effects on humans, plants and animals. When applied to crops, EM1 helps to improve the process through which plants make their food using sunlight (photosynthesis), and also helps in the uptake of proteins.

Crops sprayed with EM1 have greater resistance to drought (water stress). When EM1 is applied to organic matter, eg compost, it helps in the release of nutrients to plants through faster decomposition of the organic matter. When EM1 is applied to soils, it helps improve its structure in the process making it easier for plant roots to penetrate the soil.

The beneficial bacteria in EM has the capacity to suppress other harmful bacteria in the soil, in this way helping to protect crops from harmful pests and bacteria that cause diseases. Research has shown that EM1 can suppress diseases such as phytophthora in black sigatoka in bananas.

EM1 is also used in poultry and pig production where it is added to feed to improve digestion and their productivity by hastening feed conversion rate. It is sprayed on the floor in poultry, pig sheds to reduce smell and improve sanitation.

EM1 has greater benefits to the environment where it is used in waste disposal through



composting of garbage. EM1 can also be used to purify sewage water for reuse or recycling.

To get the most benefits of EM1, farmers can use it to make Fermented Plant Extracts (FPE), which can be used on any crop to prevent diseases and pest and



Herb/ plant	Pest problem
Marigold	Nematodes, cutworms, caterpillars, ants
Red peppers and chillies	White flies, aphids, ants, slugs, snails, beetles, cutworms, caterpillars, mealy bugs.
Onions, leeks garlic	Ants, aphids, army worms, caterpillars.
Stinging nettles	Ants, aphids, cutworms, caterpillars, army worms and thrips.
Black jack	Aphids, ants, beetles, cabbages, mites, caterpillars, crickets, white fly and termites.
Tomato leave solution	Cabbage butterfly, caterpillars, and other insects.
Lantana camara	Potato weevil, cassava weevil, grain weevils.
Neem	Maize stalk borer, banana, weevils, storage pests and weevils.
Pyrethrum	Most insect pests.

also as a liquid fertilizer. To do this, a number of plants with ability to control pests and diseases are combined with green manures to supplement soil fertility. An example of FPE preparation is given below:

Preparation of FPE

Container – 200 litre drum

Ingredients

Tithonia
Stinging Nettle
African marigold
Comfrey

Optional

Onion leaves
Chillies

1. Chop all the vegetation into very small pieces.
2. In the drum add 4 litre EM 1 and 4 litre Molasses plus 20 litres of water, mix thoroughly.
3. Add chopped vegetation to this mixture, the vegetation should fill the drum approximately half full.

Now fill the drum completely with water and mix vigorously.

4. Cover the tank completely; fermentation must be anaerobic (with no air entering from the lid). Leave to ferment for 7 to 10 days.

Dilution to use

1. For spraying crops- 200ml of FPE mixed with 20 litre of water
2. For use in irrigation on soil, - 100ml of FPE mixed with 20 litre water (1 litre FPE: 100 litre Water)

NOTE: M1 is available in agrovets in almost all towns in Kenya.

Farming Tip

Planting early has benefits to crops

The month of March is always the time for planting. But many farmers tend to wait until the end of the March even April to start planting.

Barring the late arrival of rains, lack of resources to purchase seeds, fertilizers and even land preparation, there is no reason farmers should plant late. Late planting has so many problems for the farmer. When maize is planted late, germination is often very slow and the maize plants are weak.

Research has already established that farmers lose 2½ bags of maize every week from when the rains start. The reason for



this is that the soil temperature goes down daily affecting seed germination and even vigour. So

farmers should plant early when the soil temperatures are high. Planting early has another major benefit to your maize crop. The first rains pick nitrogen held up in the atmosphere and fix it into the soil- a process known as the nitrogen flush. So any maize planted with the first rains benefits from this natural source of nitrogen. Farmer can also do dry planting where maize is planted when the rains have not started- make sure not to mix it with chemical fertilizers as they can burn the germinating seed. Farmers should therefore give their maize crop a good start followed by proper management in order to get a good yield.

TOFRadio answers your questions

TOFRadio is broadcast on Milele FM at 8:30pm on Tuesday, 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 correspondence to the radio program. Send your questions and comments via SMS 0715 916 136.

Soil fertility the starting point for better crop yield

Musdalafa Lyaga | Among the biggest challenges facing the agricultural sector in Kenya and in most Sub-Saharan African countries is feeding a rapidly increasing hungry population through crop production in depleted soils.

For a long time, many farmers have continued to mine nutrients from the soil without giving back leading to our soils being just as hungry as the people farmers work so hard to feed the country. Soil fertility depletion has been described as one of the major limitations to crop production in Africa in general and Kenya in particular.

Soil depletion

Currently, cultivated land is being lost through soil degradation, soil erosion, nutrient depletion, desertification, deforestation, salinization or overgrazing. Soil depletion occurs when the components which contribute to fertility are removed and not replaced, and the conditions which support soil's fertility are not maintained. This leads to poor crop yields. Depletion can be due to excessively intense cultivation and inadequate soil management.

Loss of topsoil

The combined effects of growing population densities, deforestation, slash and burn agriculture and overgrazing, and other factors, have in some places depleted soils through rapid and almost total nutrient removal. Topsoil depletion occurs when the nutrient-rich organic topsoil, which takes hundreds to thousands of years to build up under natural conditions, is eroded or depleted of its original organic material.

Depletion may occur through a variety of other effects, including over-tillage (ploughing), lack of adequate fertilizers, which leads to mining of the soil nutrient bank, and salinization of soil.

Good soil fertility management practices

Soil fertility depletion has been mostly attributed to insuffi-



Atomato seedling: Fertile soils produce healthy plants.

cient nutrient input or chemical inputs, which are harmful to the soil. This results in loss of nutrients for basic plant nutrition including nitrogen, phosphorus and potassium over time.

Good soil fertility management practices ensure soils maintain sufficient minerals or trace elements for plant nutrition including boron, chlorine, cobalt, copper iron, magnesium, manganese, molybdenum, sulfur and zinc which result in higher yields of up to 5 times.

Thus, there is dire need for adequate and better solutions to combat nutrients depletion. Integrated soil fertility management (ISFM) is the key in raising productivity levels while maintaining the natural resource base. ISFM aims to replenish soil nutrient pools, maximize on-farm recycling of nutrients and reduce nutrient losses to the environment.

How to practice Integrated Soil Fertility Management

Sustainable agriculture, as defined by FAO, means agriculture that conserves land, water, and plant and animal genetic resources, does not degrade the environment, and is economically viable and socially acceptable. Farmers, especially the Small scale farmers should endeavor to practice Agricultural strategies that manage and use natural resources to meet people's needs, both now and in the future.

Integrated soil fertility management (ISFM) is a set of agri-

cultural practices adapted to local conditions to maximize the efficiency of nutrient and water use and improve agricultural productivity to meet the farmer's production goals in their prevailing circumstances.

Use on farm resources

ISFM approach advocates for careful management of soil fertility aspects that optimise production potential through incorporation of a wide range of adoptable soil management principles and options for productive and sustainable agroecosystem strategies that center on use of composting which is the utilization of farm by products and house hold wastes to improve fertility and increase soil organic matter.

No-till farming also called zero tillage or direct drilling, a way of growing crops or pasture from year to year without disturbing the soil through tillage. This technique increases the amount of water that infiltrates into the soil and increases organic matter retention and cycling of nutrients in the soil. It improves soil biological fertility hence making soils more resilient. Farmers can also practice agroforestry and the use of crop rotation and intercropping to improve soil fertility.

Farmers can increase yields by adopting ISFM

Farmers who have adopted ISFM technologies have reported more than doubling their agricultural productivity and increased their farm-level incomes by 20 to 50 percent.

 farmers forum

0717 551 129 / 0738 390 715

Beehives for sale: We make beehives for sale. Interested farmers can make orders on any quantity they require. The following are prices for various hives: Langstroth Ksh 4,500, Kenya Top Bar Hive Ksh 3,800, Stingless bee hives between Ksh 400 and Ksh 1,500 depending on size. Interested farmers can call Stephen on 0734 371 557.

Grafted avocado seedlings: We have grafted avocado seedlings, selling at Ksh 70 per seedling. We can supply any quantity. Call 0716 795 253, Nairobi and Muranga.

Silage tubes for sale: We have silage tubes for sale. We also conduct training for farmers groups. Call Star Rays Education Centre Tel. 0721 245 443.

Seedlings: Eucalyptus at Ksh 10, grevillea at Ksh 10, Mwangi at Ksh 10, Calliandra at Ksh 10, pine at Ksh 10, Leucaena at Ksh 15, Muu at Ksh 15, Meru Oak at Ksh 15 and ornamentals at Ksh 15. Contact 0751 915 068

Fruit seedlings: We have fruit seedlings for sale. Grafted Apple mango at Ksh 150 per seedling, grafted Avocado at Ksh120, grapes at Ksh 300, grafted purple passion at Ksh 300, tree tomato at Ksh 50, pawpaw at Ksh 50, breadfruit at Ksh 500, tangerines at Ksh150, peach at Ksh 300, Pomegranate Ksh 150, strawberry and strawberry at Ksh 150 and strawberry at Ksh60. Call 0714 118 794.

Tree seedlings for sale: Eucalyptus at Ksh 10, grevillea at Ksh 10, mwagu at Ksh 10, Pine at Ksh 10, Hass at Ksh 70, Leucaena at Ksh 15 casuarina at Ksh 30, Muuat Ksh 80, Meru oak at Ksh15, and ornamentals at Ksh 15.

Piglets for sale: Two-month old piglets at Ksh. 1,500 per piglet. Three-month old piglets at Ksh 3000. Call 0724 237 453

Moringa powder: we have moringa powder for sale to interested buyers. We sell 50g for Ksh 100, 500g at Ksh 800, and 1kg at Ksh 1500.

Bermuda grass: I am looking for Bermuda grass cuttings in Kiambu or Kirinyaga. Call 0714 733 054

Chopper machine for sale: Ideal for cutting grass and fodder. Price is negotiable. Call 0724 495 613, Nyahururu.