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Thank you for your continued partnership.

## Take advantage of the short rains to plant

**Peter Kamau** | The Kenya Meteorological Department has forecasted increased short rains in many parts of the country beginning this month. Indeed, most regions of the country such as the coastal strip that cover Mombasa, Tana River, Kilifi, Lamu, and Kwale counties are already experiencing enhanced rains.

For farmers, the rains will come with mixed blessing. According to the forecast, areas that have had a prolonged dry



Growing early maturing maize varieties can ensure food security in areas currently affected by drought

spell will receive significant rains and these will enable them to plant early maturing crops such as maize, beans, vegetables and even fruits. In regions that are harvesting maize, the rains are expected to cause damage due to rotting of maize that has not been harvested (*see editorial*).

### Buy certified seed

Some regions in Central such as Nyeri and Kirinyaga, and Eastern province such as Ukambani have had very low rains this year. Farmers in these regions should take advantage of the short rains to plant maize to increase to meet their food needs and even get a surplus for the market. Extra care should be taken to ensure that farmers buy certified seed from licensed seed stockists to avoid being cheated by unscrupulous people who sell commercial maize as seed (*Read TOF No 146, July 2017 for suitable varieties*). Farmers should

also ensure they grow only varieties suitable to their regions.

### How to identify genuine seed

When buying maize seed farmers should check the labels to ensure the seed is genuine. Most of the maize seed, especially that packed in 2 kg packages has an Inspection label from the Kenya Plant Health Inspection Service (KEPHIS). To check if the seed is genuine, all a farmers needs to do is to scratch the label as they do with mobile airtime scratch cards. Type the number revealed and send to **1393**. You will receive a message showing the seed is genuine. For seed packages of 10kg to 25kg, farmers are advised to check the KEPHIS tag inside the bag after opening. Call or text KEPHIS using the number given in the tag to confirm if the seed is genuine.

Dear farmer,

It is once again that time of the year when farmers are getting prepared to start harvesting their maize. Although the delayed onset of the long rains combined with the invasion of the fall armyworm in most of the maize regions in the country may lead to decreased maize yields; farmers should make an effort to ensure that their maize crop is not damaged by the rains that may continue upto December in some regions.

Every year, farmers lose substantial portion of their harvest due to failure to harvest their crop early, poor drying and storage. Since the current rains may be prolonged it is important that farmers make arrangements to remove the crop from the fields as early as possible.

Farmers should, therefore be prepared to harvest early to ensure they save their crop. Proper drying ensures the maize does not develop mycotoxins that render it unusable, for both human consumption and even as livestock feed.

Over the years, we have featured several technologies that farmers can use to store their maize to stop it from rotting and reducing pest damage such as the use of diatomite, the PICS bag and even metal grain silos that can store the grains for a long period until the farmer decides to sell or use it for home consumption. Many farmers have adopted these technologies with very good results.

Another major problem that many farmers face is that they are unable to store their maize after harvest since they have not invested in good storage facilities; all the maize they harvest is sold immediately due to lack of storage.

When you sell your maize immediately after harvesting when all other farmers are selling theirs, prices are very low, sometimes even lower than your production costs. This leads to huge losses to low income small-scale farmers, who rely on maize as their main source of income leading to a vicious cycle of low earnings.

While we agree that farmers may be forced to sell maize due to pressing needs such as hospital bills, school fees and to meet other financial commitments it is always wise to sell a small portion of the maize and store the rest for sale when prices are favourable.

### In this issue

Banana production 3



Breastfeeding 5

Pawpaw diseases 7

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# It is easy to establish a Push-Pull plot using brachiaria grass

Brachiaria is a good alternative to Napier grass when used in push-pull plots since it is drought tolerant and not prone to diseases. Brachiaria grass is more nutritious, possessing 12 per cent protein at harvest unlike Napier, whose protein content diminishes after about four months.

**Amina Day Ojijo** In Kenya like many Sub-Saharan countries, maize, sorghum and millet are the preferred cereal crops of many small-scale farmers. However, most of the farmers continue to experience challenges like poor soils, parasitic weed like striga and pests such as stemborer in the production of cereals.

Striga also known as the witch weed causes between 30% to 100% yield losses thus affecting the livelihoods of many farmers. The parasitic weed attaches to the roots of host plants, and sucks its water and nutrients causing the plant to wither. This hinders crop development, resulting in crop yield losses. Striga flourishes in soils with low fertility.

Stemborer, on the other hand, is one of the worst pests that viciously attack maize. According to National Farmers Information Service (NAFIS), the harmful pests can lead to between 13% and 70% losses of the total maize yields.

Agronomic practices such as field sanitation, crop rotation, intercropping, use of organic

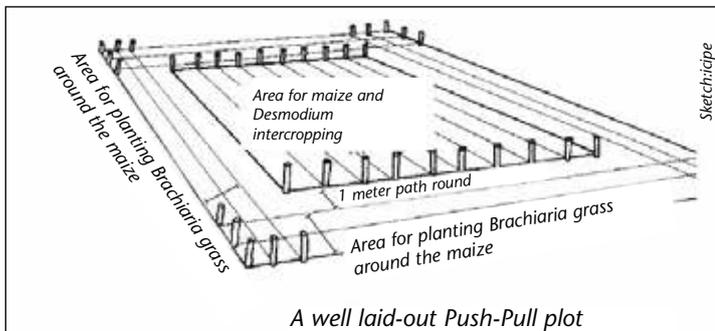


An experimental plot under Push-Pull technology in Mbita, Homabay County

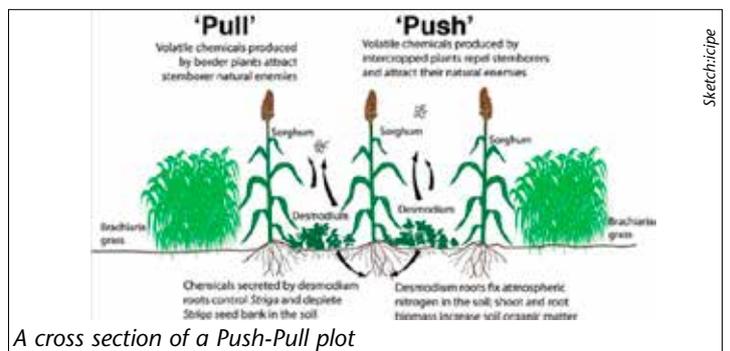
matter, improved fallows, and Push-Pull systems are adopted by farmers to help manage striga weed and stemborer. In this issue, we continue with the series of how Push-Pull can help improve cereal farmers' livelihoods.

## How to prepare and lay out a Push-Pull plot using brachiaria

1. Using pegs and ropes, measure a plot of 21m x 21m. A Push-Pull plot can be as small as 10m x 10m. If your acreage is big create several plots of the same size.
2. Use a string to measure and ensure that you have a square shape of the land.
3. Put pegs at opposite sides of the square at intervals of 75cm each.
4. When you have finished marking the plot with pegs and strings it should look like the illustration (below).



A well laid-out Push-Pull plot



A cross section of a Push-Pull plot

5. Clear the land, plough and break down the soil until it is fine.
6. Dig holes along the demarcated lines ready for planting.
7. Select healthy brachiaria grass for planting.
8. Dig holes at each peg on border of the marked plot then apply 2 handfuls of well composted farmyard manure in each hole.
9. Place three-node splits into each hole at an angle of 30° to 40° all facing in one direction.
10. If you are using root splits, place them upright into the planting holes and cover with soil.
11. The rows should be 75cm apart and 75cm between the plants within rows.
12. Your newly planted Brachiaria grass field should look like the diagram (above).
13. Next, plant the desmodium.
14. Mix 300g of silverleaf desmodium seed with fine sand; one part desmodium to two parts dry sand.
15. Put desmodium in the furrows at 75cm row-to-row distance.
16. Put farmyard manure along furrows, mix with soil using a stick, without covering or disturbing the furrow.
17. After planting the desmodium, you can now plant maize between desmodium rows.

Remember that if you follow good management practices, the brachiaria and desmodium you establish now will benefit you for five or more years. In the next series we will explain in more detail how to manage and harvest from a push pull plot.

For more information on push pull <http://www.infonet-biovision.org/PlantHealth/Intercropping-and-Push-Pull>

*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 nor Biovision Foundation or Biovision Africa Trust (BvAT).

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# Banana production has good income if done well

Bananas are easy to grow. But, farmers need to know how to grow tissue culture bananas as they are free of diseases, require good management to produce more and fetch good prices in the market.

**Joan Mukiri**

Knowledge on proper management can increase banana production. Good farming practices can increase yield, quality and income for farmers.

Below are various factors, stages and strategies of growing and caring for banana crops:

## Climatic requirements

Bananas do well under warm, humid conditions. Their growth and development are optimum at temperatures between 22°C and 31°C. Plant development retard at humid conditions below 16°C, stops at 10°C, and may die below 2°C. It gets scorched at or above 37°C. Generally, bananas require a minimum of 2000–2500 mm of rainfall annually or 25 mm per week.

They are best planted on a flat area (slope 0–1 %), well-drained deep soils with high organic matter content and a pH of between 5.5 and 7.0. Soils with high acid levels (low pH) increases susceptibility of bananas to Panama disease. Poor soils such as light sandy soils can be improved by mulching and adding organic matter. This improves water retention and nutrients to the soil. Bananas cannot withstand water-logging. It causes rotting of its roots, which can be solved by planting in raised beds.

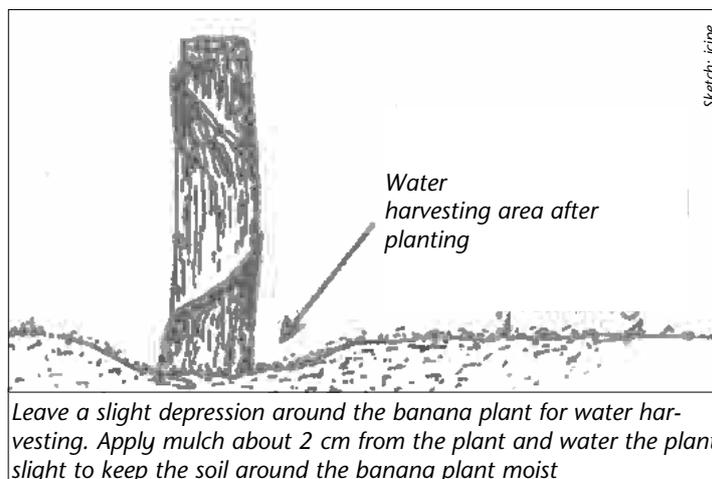
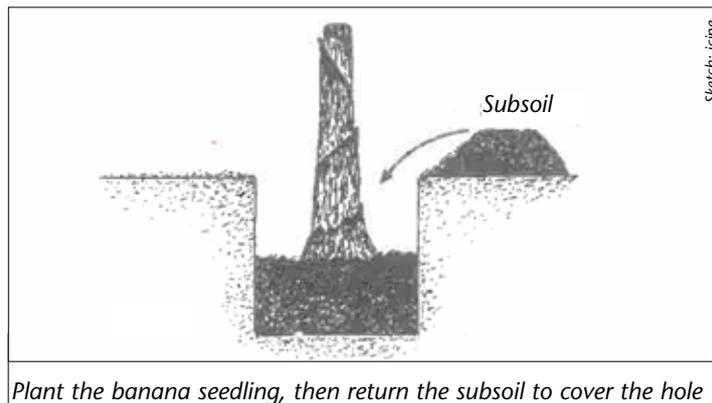
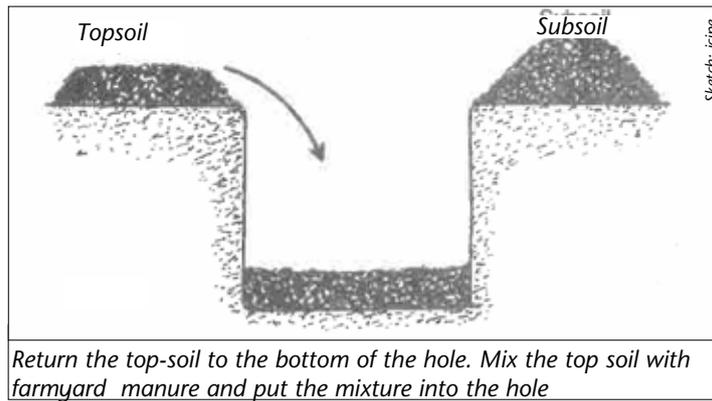
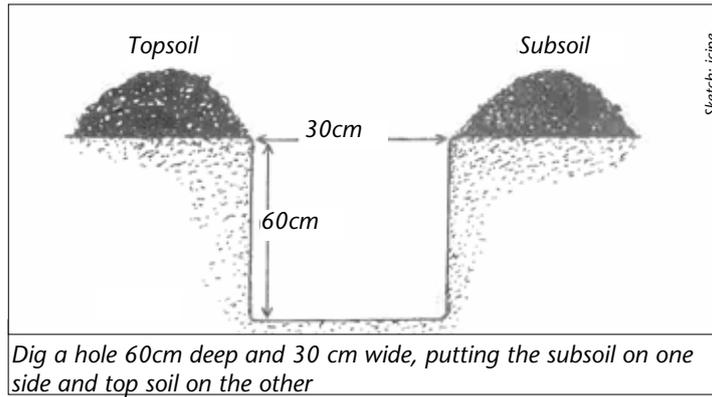
## Land preparation

Soil tillage is done by a mechanized method, by ploughing and harrowing, until all vegetation is removed.

Planting should be done at the onset of the rainy season. Bananas require about 4-6 months of continuous growth and rain shortage can be complimented with irrigation.

## Spacing

The spacing of banana plants varies depending on the soil fertility and the variety being planted. However, a spacing of 1.82m x 1.52m with 3,630 plants per hectare (about 1815 plants per acre) is efficient since it minimizes competition for light and



diseases such as sigatoka.

## Planting

Planting is done by preparation of 200-300mm deep planting furrows, marking out planting positions using a measuring tape, digging holes at the bottom of the furrow, adding

organic manure and an equal amount of organic manure and mixing thoroughly. When using suckers that had not been cleaned earlier, you can add some insecticide or nematicide in the planting hole.

The soil is then pre-irrigated to field capacity awaiting plant-

ing. Plants to be planted should be watered in the morning and placed upright in the middle of the 45cm deep planting hole. This to be at a depth of 30cm leaving 15 cm at the bottom of the hole for the mixture of topsoil and manure.

When dealing with tissue culture plants, one should carefully remove the plantlets from the plastic bag using a knife without disturbing the plant roots. After placing the sucker in the hole, the rootball is first covered with topsoil mixed with manure then topped with the subsoil.

The soil is then compressed lightly around the plant to remove air pockets and watered. When using corms, dig a small hole in the previously prepared hole and place the corm 10cm deep. Ensure that the bud/eye faces downward and the cut end upwards to prevent rotting of the bed.

## Mulching

One should place a 2-3cm thick layer of dry grass around the corm or sucker as mulch with at least a 2cm gap between the plant and mulch. Water the crop on daily basis using a watering can with small nozzles. Provide at least a half litre of water during the first two weeks. Watering should preferably be done in the evening.

## Use organic fertilizer

Bananas require fertilizers with nitrogen, phosphorous, potassium at a ratio of 3:1:6 for vigorous growth. An initial application of 100grams per plant can be made when plant growth starts. One can do fertigation or direct application after rain. After the plants establish, a topdressing with the above organic fertilizers can be made at a rate of 100-150grams/plant or 100kg /ha and applications of nematicides in the 1st year. Apply an inch away from the leaf. Use 15 to 20 tonne/ha (7.7 to 10 tonnes per acre). Farmyard or compost manure should be incorporated in the soil.

## Water management

Drip irrigation is the most efficient mode of irrigation. It saves on water and ensures there is even distribution of nutrients during fertigation. Overwatering should be avoided because excess water cause rotting of

Continues on page 4

# Banana production has good income

cont'd frm pg... 3

the roots. Newly planted plants should be irrigated for at least two weeks to protect leaves from heat stress. In case there is no rainfall, then irrigation should be done on a "little and often" basis.

## Mulching

Mulch is used to conserve moisture, keep the soil cool as it blocks sunlight, slow down the growth of weeds and add nutrients to the soil after decomposing. It's best done when the plants are young to promote faster growth. Mulch can be synthetic or natural. Sawdust, banana plant residues (dead leaves and pseudo stems) and dry grasses are some of the readily available kind of mulches. It should be placed at least 50 cm away from the base of the plant since it generates heat during decomposition.

## Weed Control

Weeds compete with the banana plants for water and nutrients which can result in stunted growth. Therefore, banana plantations should be kept weed-free by hand weeding, hoe weeding in combination with mulching. Hand weeding is preferred to hoe weeding because it is less destructive to the delicate banana roots.

## Pests and diseases management

To overcome pests and diseases, plant certified seedlings such as tissue culture plantlets. Another approach is application of biopesticides.

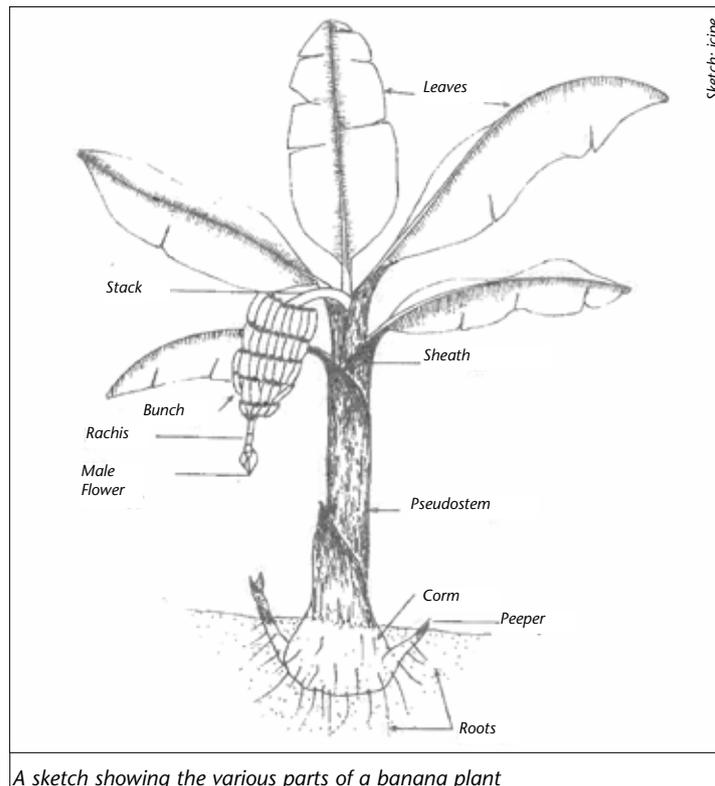
## Intercrop

Intercropping can be done during the early stage of the plantation. The banana can be intercropped with short duration crops between the banana rows e.g. beans, maize etc.

## Desuckering and pruning

Having too many suckers increases competition for light, water and nutrients. This leads to poor growth and reduced yields. It's advisable to maintain one mother plant and two followers (daughter and granddaughter).

Remove all other suckers by cutting the stem off the ground. It's advisable for the mother plant and the subsequent sucker to have an interval of 2 months. Also, it is better to choose the suckers facing eastwards to maximize on the morning sunshine if



A sketch showing the various parts of a banana plant

the terrain is relatively flat.

The removed suckers can be re-planted elsewhere within a day or two of its removal.

## Deflowering

Remove the male bud (the purple flower petals at the end of the bunch). Deflowering is done to promote growth of bigger bunches instead of longer stalks. It also reduces incidents of cigar end rot disease, which is transmitted by insects.

The buds are removed when the peduncle (the stalk at the end of the banana) is at least 15cm below the last female hand. The peduncle is carefully cut with a forked stick without damaging the fingers. Use of knives can easily spread diseases.

## De-leafing

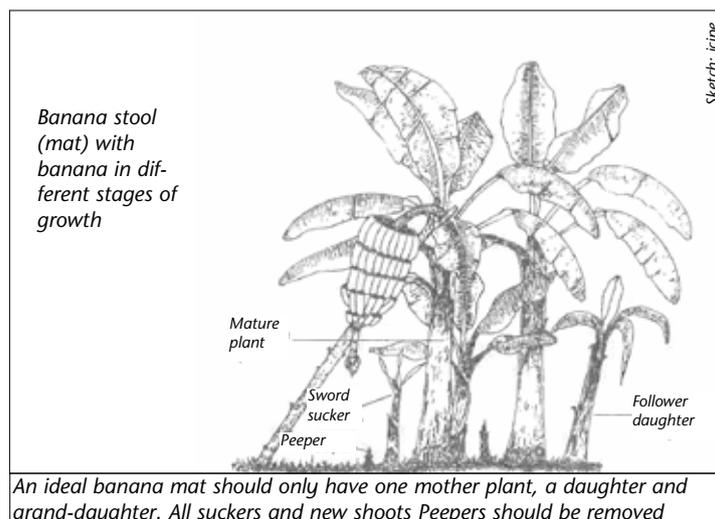
The removal of old, dead and infected leaves enhances light penetration, improves air movement, to get natural mulch and to reduce leaf diseases. Many leaves lead to scratches, damaged fruits and provide refuge for banana weevils.

## Earthing up

Heap the soil at the base of the plant three months after planting. This prevents falling of the plants during windy weather.

## Removal of female hands

The last one or two hands of the bunch are removed. This facilitates fruit development of the remaining bunches and increases bunch weight.



An ideal banana mat should only have one mother plant, a daughter and grand-daughter. All suckers and new shoots Peepers should be removed

## Bagging

The bunches are covered with bags (plastic sleeves) to protect them against insects, diseases, spray residue, sunburn, birds and wind. Bagging increases the weight, quality of fruits and increases the temperature within the bunch promoting early maturity.

## Propping

Banana plants need support to prevent breakages and toppling (uprooting) due to heavy weight of the bunches. Strong winds, nematodes and weevils increase the chances of toppling. Support can be done using, wood props (mostly bamboo), wooden pegs or ropes. The pegs can be placed along the pseudostem or underneath the bunch.

## Harvesting and storage

Fingers are ready for harvest when they are fairly evenly rounded. Assessment for maturity can also be done by cutting the fruit open. A yellowish appearance is a sign that it is ready for harvest. Harvesting is done by cutting the pseudostem using a *panga* and carefully lowering the bunches down.

Harvested bunches should be placed in well-padded basket to avoid bruising. They should be kept in a cool shaded place. Bananas can be refrigerated to slow down the ripening process.

## Good returns

Mature bananas without marks or injuries have high demand from the consumers. A finger of unripe and ripe bananas trade at Ksh 100 to Ksh 150 and Ksh 150 to Ksh 200 respectively. Depending on the number of fingers a bunch holds. The price of a bunch of ripe bananas ranges from Ksh 1,000 to Ksh 2,000. Demand is high in all the major towns in Kenya.

Tissue culture plantlets are the recommended planting material since they are disease-free, uniform and take a shorter time to mature unlike suckers. Tissue culture plantlets can be purchased from Jomo Kenyatta University of Agriculture and Technology (JKUAT) Nairobi or at Kenya Agricultural and Livestock Research Organization (KARLO) centres across the country.

For more information on banana production <http://www.infonet-biovision.org/PlantHealth/Crops/Bananas>

# Why breastfeeding is important for your child

Breast milk provides just the right balance of nutrients for optimal growth and development. Mother's milk has antibodies that help protect the baby from common childhood illnesses and infections such as diarrhoea.

**Linah Njoroge** | Each year, the world comes together every first week of August to celebrate the role of breast feeding not only for our children but also the mothers and the community at large. The theme of this year's celebration was *Sustaining Breastfeeding Together*.

Breastfeeding is one of the best ways to ensure your baby's health and development. It is a convenient, cost-effective, natural way to feed your baby. It is widely recommended as the best way of feeding infants. Healthy mothers should consider breastfeeding exclusively for the first six months of life and continue up to 2 years.

Breastfeeding is the safest and healthiest option for children everywhere and has great potential to save lives. Exclusive breastfeeding is the recommended feeding method for children up to six months. Exclusive breastfeeding means that the infant is only fed on breast milk from birth up to six months of age.

## Reduces mortality

According to UNICEF 2016 report titled *'From the first hour of Life'*, "infants who receive foods and liquids in addition to breast milk before six months were up to 2.8 times more likely to die than their exclusively breastfeeding peers. The risk of dying is 14 times higher among those not breastfeeding at all," the report says.

The report further emphasises that breastfeeding contributes to the health and well-being of mothers; helps to space children, reduces the risk of ovarian cancer and breast cancer to the breastfeeding mothers, increases family and national resources and is a secure way of feeding.

Globally, continued breastfeeding lowers the mortality rate of children between 12 and 23 months from 74 per cent to 46 per cent in 2016.

The Kenya Demographic Health Survey (KDHS) reports a



*A mother suckles a young child: Breastfeeding improves children's health, boosting their immunity against diseases*

significant improvement in the under-six (6) months exclusive breastfeeding rates, from 32 per cent in 2008, to 61 per cent in 2014.

Kenya's Director of Medical Services, Dr. Jackson Kioko says, "Exclusive breastfeeding has a direct link to Kenya's development agenda. In addition to preventing death of over 13 per cent of all under-5, breastfeeding contributes to poverty reduction and provides food security for millions of infants, particularly those in difficult situations this ensures zero hunger, which is part of the Sustainable Development Goals (SDGs)."

According to him, it is very important to educate and support new mothers and their partners about the clear, long-lasting health benefits of breastfeeding for the mother, the child and the community.

Dr. Joy Mpaata, a Pediatrician practitioner at a Nairobi hospital says that breastfeeding also reduces newborns' and infants' risk for developing chronic diseases, such as celiac disease, inflammatory bowel disease, allergies, asthma and some childhood cancers.

Long periods of breastfeeding are associated with higher intelligence score and there is evidence of improved academic performance.

Other benefits of breastfeeding include:

## For Your Baby...

- Breast milk provides the right balance of nutrients for optimal growth.
- The milk has antibodies that protect the baby from common illnesses and infections, such as diarrhoea, painful ear and bacterial infections among other ailments. Studies show that exclusive breastfeeding provides the child with natural immunity.
- Breast milk also offers protection against overweight or obesity years later in childhood as well as in adulthood.

## Benefits for the mother

Breastfeeding releases oxytocin hormone that helps the uterus return to its normal size and reduces any bleeding after delivery.

Exclusive breastfeeding is the best natural method for the mother to shed extra weight.

Breastfeeding also deepens the emotional bond between mother and baby. Such physical contact can help the baby feel secure.

It may guard against depression and certain cancers especially breast, uterine and ovarian. For exclusive breastfeeding to work, the mother has to get support from the family, community, trained health workers, lactation consultants, and friends. In addition, breast-

feeding mothers need the following support:

- Allow time and space for mothers to breastfeed while at home (providing a comfortable sitting area, assisting to take care and control of older children, allowing the baby to breastfeed adequately).
- Provide emotional and physical support for mothers to exclusively breastfeed (helping with household chores, assisting the mother in feeding the baby with expressed breast milk, offering to take babies to their workplace for breastfeeding if necessary).
- Provide mothers with foods that contain all nutrients, and ensure they take at least 3 meals per day. They can also eat snacks in between meals, plenty of fruits and vegetables, and drink sufficient water everyday (8 glasses or 1.5 litres).
- Community leaders also have a big role in advocating for creation of a breastfeeding site for mothers working in farms and in informal workplaces in the community (e.g. markets, churches, hair salons, e.t.c.). They should sensitize the community to support women to breastfeed in public and workplaces.

The role of the health care givers is to provide information to mothers and the community on the importance of exclusive breastfeeding.

The health care givers can encourage and teach the breastfeeding mothers how to maintain breastfeeding while at work.

They also need to show them the correct breastfeeding position, how to express, store expressed milk and manage breast conditions.

"Breastfeeding mothers require a balanced diet to help in the production of rich breast milk for the babies. A balanced diet rich in proteins, vitamins, carbohydrates, minerals fiber and water. Some of these natural foods can be wholegrains (rice, pasta, bread, oatmeal) beef (grass-fed beef richer in omega-3 fatty acids), eggs, indigenous vegetables, legumes, beans, nuts and seeds," says Ms Faith Gotahi, Deputy Chief Nutrition Officer, Kenyatta National Hospital.

# A day in the life of an extension officer

Since the government stopped direct extension services to farmers three decades ago, the private sector has come in to fill the gap. A TOF team recently accompanied a private extension officer and filed this report.

**Faith Bosire and Peter Kamau**

It is 5.00am in the morning in the sleepy and misty Silanga village, Nyandarua County. Mr Francis Warui is preparing himself to start off the day's work. First, he gets out of his house and surveys the compound to make sure everything including his dairy cows are safe. Later, he puts on his motorbike riding suit and checks it together with his tools of trade that include an Artificial Insemination (AI) cylinder to make sure the nitrogen levels are right, then the syringes, insemination straws and record books are all put in his backpack.

We follow the private livestock extension officer as he moves from farm to farm helping farmers solve various problems affecting their dairy cows' management. First we visit Cecilia Muthoni's farm, about 3 kilometres from Ol Kalou town. Ms Muthoni had 10 dairy cows of mixed breed which used to give her a total of 30 litres of milk in a day. However, her situation changed immediately when she sought the services of Mr Warui who trained her on dairy cow breeding. Now she has 6 dairy cows and 6 heifers. Due to information empowerment, she gained from reading *TOF* magazine and the continued livestock management advice from Mr Warui, Ms Muthoni has even diversified into pig keeping.

## Rotting hay

On arrival at the farm Warui goes round the livestock shed, checking to ensure that everything is working as it should. Immediately, he calls Ms Muthoni's attention to the condition of the hay the animals are feeding on in the feed tray, "this hay is exposed to rain and has signs of rotting, which is not healthy for dairy cows as it contains aflatoxins," he advises. He recommends that the fodder requires to be mixed with a toxin binder to neutralize the aflatoxins since the same can end in the milk, making it unsafe to consumers. He prescribes a toxin



Mr Warui (left) shows farmers in Kariko village, Nyandarua County how to make silage for their animals

binder they can buy in Nakuru town for mixing with the fodder. He also advises the farmer to also refer to an article in response to a farmer's question (2017), Importance of toxin binders to animal health. *The Organic Farmer*, Issue No. 144 (7).

"We have seen a big change in milk production. Our mixed breed cows would only give us 30 litres of milk in a day, now each of our upgraded dairy cows gives us 30 litres per day (15 litres in the morning and 15 litres in the evening)," says Muthoni. She attributes the improved production to Mr Warui who has continued to offer his services to the farm for the last 5 years. An article published in the *TOF* magazine - Peter Kamau (2016), Use locally bred semen to improve dairy cows, *The Organic Farmer* Magazine, Issue No. 133 (4).

## Improved milk production

His next appointment is with Ms Esther Njeri, the farm owner is one of the oldest beneficiaries of his services, having participated in Farmer Field School (FFS) training sponsored by the Ministry of Livestock Development and Fisheries in conjunction with the International Livestock Research Institute (ILRI) in which Mr Warui was the trainer back in the year 2005. Njeri has 4 dairy cows and 2 heifers which she has been able to upgrade after training.

## High demand for extension service

Ms Njeri says she used to get 8 litres of milk per dairy cow every day from her mixed breed of dairy cows, but now she has replaced and upgraded her animals, increasing the milk yield to 15 litres or more per day from

each of them. Ms Njeri can now meet all her financial needs from milk sales.

"We were so ignorant about good animal husbandry practices but we thank him for the positive change he has brought in dairy farming in this region. We have learnt a lot and we have put all we learn into practice," she says. Ms Njeri has a well-organised zero-grazing unit complete with a hay storage shed upstairs. Her 4-acre farm is well divided into pasture and food crop portions where she uses farm-yard manure to fertilise the pasture and food crops.

"I do not know what we could do without his service to farmers in this region," Ms Njeri sums up.

## Artificial inseminating

After visiting two other farms, we now set out for the next farm where Mr Warui will serve a dairy cow. The farm owner already has a thermos flask with warm water. The dairy cow is secured in the milking shed ready for service.



Inseminating a dairy cow

Mr Warui proceeds to prepare his AI equipment, starting with immersion of a thermometer in the warm water for thawing the semen (the water temperature has to be 36°C to ensure it does not kill the semen in the straw leading to failed conception). The farmer does not have the money to pay for the service. Warui will have to take the insemination receipt to the Ol Kalou Dairy Cooperative Society where the farmer delivers her milk, which will in turn pay him.

## Training for extension work

Mr Warui learnt the ropes of extension work through various training opportunities by ACIDI/VOCA an American non-profit organization based in Washington DC and FIPS-Africa, a not for profit-organisation that specializes in dissemination of the appropriate farm inputs to farmers in East and Southern Africa. The two organizations trained him on fodder conservation and storage and later employed him to train other farmers. He has also incorporated *TOF* magazine as one of his training tools.

## Record keeping

Many companies supplying inputs to farmers also use him to train and also supply various veterinary and farm inputs. His services are sought by farmers in entire Nyandarua County and even Laikipia and Nyeri counties.

"The only problems I encounter are the bad roads and farmers who expect me to provide them with free services. Many farmers especially the older generation do not want to change their way of doing things. Fodder conservation is labour-intensive and many simply do not want to do it, they therefore end up starving their animals, reducing milk production. For AI services, I have to keep all the records for them since they do not, which can lead to inbreeding," he adds.

Mr Warui notes that farmers can solve a lot of problems if they are ready to invest in simple machinery and adopt new methods that are cost effective in all farming operations. The Livestock Department in Ol Kalou relies on him for information, data or alerts on disease outbreak since he is in contact with dairy farmers on a daily basis. He updates his skills through publications such as *The Organic Farmer* and the Internet's livestock information websites.

# Know pawpaw diseases and how to control them

The leaves of my papaya trees are getting wrinkled and the fruit production has also decreased. Can you suggest any organic remedy for increasing fruit production?



Papaya mosaic disease

Without pictures it's not easy for us to tell the type of disease affecting your pawpaws (papaya). However, to help you and other farmers growing pawpaws, we provide you with a range of diseases that affect pawpaws in Kenya and how to control them below:

## Powdery mildew

### Symptoms

- On the undersurface of the diseased leaves are found patches of whitish powder.
- On upper surfaces, leaves at the infection site show unsightly patches of yellow



Powdery mildew on papaya fruit

or pale green usually near the vein, surrounded by coloured tissue.

- Occasionally, the fungus may attack the stem of young seedling. When grown under reduced light conditions, the spots enlarge and cover the entire leaf.

### Control

- Collect and destroy fallen diseased leaves.
- Spray wettable sulphur. However, sulphur should not be applied when it is very hot (it may cause leaf scorch). Alternatives to the use of sulphur are baking powder, neem extracts and white mineral oil plus bar soap solution. Copper oxychloride can also be applied regularly (after every 7 days to prevent the disease). Copper is allowed in organic production.

## Papaya mosaic disease

### Symptoms

- Causes leaf mosaic and stunting in papaya.

- Symptoms appear on the young leaves of the plants.
- The leaves are reduced in size and show blister-like patches of dark green tissue, alternating with yellowish green thin layer.
- The leaf petiole is reduced in length and the top leaves assume the upright position.

### Control

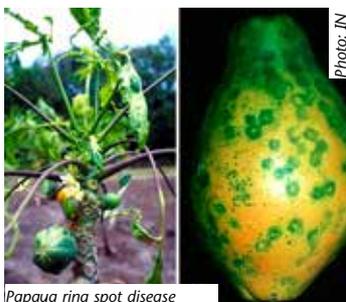
Control measures include: planting virus-free seedlings; transplanting clean seedlings into new fields or rotating with non-host crops; inactivating the virus on contaminated tools and pots by first removing excess dirt and plant debris, and then, heating for 1 hour in an oven at 150°C. Symptomatic plants should be destroyed and burnt if possible.

## Papaya ring spot disease

This is a viral disease that is difficult to control when it is established in a pawpaw plantation.

### Symptoms

- Infected plant initially shows chlorosis on the youngest leaves of pawpaw followed by vein clearing, wrinkled and prominent mottling (speckled spots) of laminae (leaf surface).



Papaya ring spot disease

- Malformation and reduction of the leaf surface which may become extremely filliformed (with threadlike in appearance).
- A dark green streak develops on petiole (a stalk that joins the leaf to a stem) and upper half of the stems, infected

fruits show round rings. The infection causes between 50-60 per cent yield loss.

### Control

There is no cure for papaya ring spot disease.

The early detection and prompt removal of infected plants can contain a localized outbreak. However, once the disease becomes established, diseased trees and severely affected blocks should be destroyed, as they promote further spread.

In home gardens, infected papaya trees should be selectively removed as soon as symptoms are noticed.

## Anthracnose (soft rot)

### Symptoms

- Disease occurs both in field and storage conditions.
- The spots on fruits first appear as brown, superficial discolouration of the skin. This develop in circular, slightly sunken areas, measuring between 1-3 cm in diameter.



Anthracnose (soft rot) on pawpaw fruit

- Under humid conditions, an crusts of salmon pink spores are released.
- Infection at early stages of fruit results in hardened and deformed fruits that later fall off.

### Control

Choose a planting site where pawpaws had not been planted before. Avoid excess humidity and conditions that favour the development of the disease. This reduces fungi which causes the disease.

## Cultural practices can include;

- Balanced fertilization and management of irrigation.
- Elimination of sources of disease causing fungi e.g. observing clean fields, getting

rid of fallen or infected fruits and leaves.

- Handling of the fruits harvesting i.e. at the correct time when the fruits turn from dark to light green and when yellow stripes appear. Apply correct post-harvest management practices.
- Use clean equipment at all stages of handling, storage and harvest. This prevents infection.

## Foot rot in papaya (stem rot)

### Symptoms

- It is characterized by the appearance of water-soaked patches on the stem near the ground level.
- These patches enlarge rapidly and cover the stem. This causes rotting of tissues, which turn dark-brown or black. Such affected plants cannot withstand strong winds and tend to topple over and die.
- In mild cases, only one side of the stem rots and the plant remains stunted.
- If formed, the fruits are shriveled and malformed. Gradually, the plant dies off.

### Control

- Ensure good soil aeration.
- Good drainage and hygiene are important. They control these fungi in the orchard and in the nursery.
- If possible, do not plant pawpaw on the same field twice.
- Copper-based fungicide (eg Cupravit®) treatments at the



Foot rot in papaya (stem rot)

very beginning of first symptoms can reduce fruit rots.

## Answers by Elikana Isaboke

For more information on papaya diseases <http://www.infonet-biovision.org/PlantHealth/Crops/Papaya>

## TOF Rad answers your questions

TOFRadio is broadcast on KBC on Thursday at 8:45pm and Mbaitu FM on Friday at 8.30pm. Tune in and listen to farmer experiences and expert advice on agribusiness and eco-friendly farming methods. On this page, we respond to some of the issues raised by farmers in their correspondence to the radio program. Send your questions and comments via SMS 0715 916 136.

### Protect land after harvest to restore soil fertility

Sharon Chebet and Musdalafa Lyaga

As farmers continue to harvest maize across the country, many will grapple with the issue of restoring minerals in the soil. Maize depletes a lot of nutrients from the soil. Despite using the same amount of fertilizer, maize yields have been decreasing year after year.

Restoring the depleted minerals from the soil starts right after harvest. As farmers continue to harvest and enjoy the fruits of their labour, they need to think about preparing their land for the next planting season.

Soils should be taken as a living entity that requires regular maintenance for improved yields. As a farmer, you cannot achieve the objective of increased yields without addressing the issue of soil fertility.

Below is some of the best practices farmers could embrace to restore soil fertility:

#### What to do after harvesting

Some maize farmers burn the residue after harvesting while others put them into stacks for fodder and fuel. Burning the residue in the field might have short term benefits such as controlling pest and diseases. What farmers do not know, is that burning also kills beneficial microorganisms in the soil (which help in restoring and maintaining soil fertility).

Burning reduces the available carbon that living microorganisms in the soil use for their maintenance. Besides, killing the microbes reduces the available phosphorus and ammonia. This leads to gradual deterioration of the soil, which eventually results in reduced productivity and income for the farmer.

#### Decreasing maize yields

Farmers who used to harvest 40 (90kg) bags of maize per acre may experience decline of up to 10 (90kg) bags an acre. Most of the farmers will opt to solve the



If left on the farm after harvest, crop residue returns all nutrients back into the soil for use by the next crop

issue of soil fertility by heavy use of synthetic fertilizers, which often result to high acidity in the soils. Farmers who opt to stack the stalks (to use them as fuel or for feeding their livestock) incur both transportation and labour costs. This leaves the soil bare, hence depleting it of important nutrients. The crop residue then release the nutrients back into the soil when left to decompose in the harvested field.

#### Grazing leads to soil compaction

Some farmers let their livestock graze in the freshly harvested field. This is a better practice compared to burning the residue. The manure from the livestock can help in replenishing the minerals in the soil. However, the disadvantage of this practice is that it encourages soil compaction as the cattle trample on the soil. As the soil is compacted, the rate of infiltration is reduced. It also leaves the land bare, making it vulnerable to erosion.

The best practice that every farmer should adopt is to leave the residue in the farm. This is a good practice that helps

restore nutrients back into the soil. The crop residue plays a very vital role in enhancing soil fertility through release of essential nutrients that remain in the residue.

#### Residue covers the soil

This is important since it helps to reduce the impact of the rain drops on the soil, controlling erosion. It also reduces the speed of runoff water that normally carries the fertile top soil away. If the residue is minimal, a cover crop can be added to improve the soil cover.

The soil cover is also crucial in controlling the soil temperature and conserving moisture.

#### Increased amount of organic matter

Organic matter is important in any soil as it is utilized by the microbes to release nutrients back into the soil. This in turn enables mineralization to take place and release more soil nutrients. The microbial activity, soil fertility as well as crop productivity is increased.

#### Controlling weeds

The residue mulch controls

**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 cost Ksh 400 and Ksh 1,500 depending on size. Interested farmers can call Stephen on 0734 371 557.

**Jersey Heifer wanted:** I would like to buy a healthy Jersey Heifer preferably incalf for 5-6 months. Call 0722 357 918.

**Fleckvieh bull for sale:** I am selling a 1½ year old Fleckvieh bull. Call 0726 434 521.



**TOF Magazine Readers Whatsapp Group:** Would you like to join other TOF magazine readers WhatsApp group send your full name and County to 0715 422 460.

weeds by suppressing them. Weeds are a challenge in many ways. For example, they harbour pests and diseases and unnecessarily compete for water and nutrients with the main crop.

#### Practice crop rotation

Since maize takes a lot of nutrients from the soil it is important that farmers plan well to grow a different crop the following season. It is important to plant leguminous crops that will fix nitrogen such as groundnuts, beans, peas, soy beans, cow peas, dolichos (lablab) during the short rains. These not only provide more residue but also help cover the soil.

Apart from recycling crop residue, crop rotation is very important. It not only encourages nitrogen fixation but also helps in maintaining crop cover until the next planting season. It is also of economic importance; the crop you rotate can fetch very good prices at the market thus give you an additional income.

The best crops to rotate with are those that are early maturing.