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## Strengthen agricultural research for food security

**Peter Kamau** | Agricultural research is the engine that drives agriculture, developing new high yielding and disease-free seed varieties, animal breeds and addresses emerging pests and diseases. Research also enables the development of new technologies that enhance food production. These innovations lay the foundation for a highly productive agricultural sector that not only increases farmers' income but also helps set the country on the path to full industrialization as envisaged in Kenya's vision 2030.

Kenya's agricultural sector is currently facing many emerging threats such as the invasion of the fall armyworm, which has affected maize production this year, the Potato Cyst Nematode (PCN) poses a threat to future potato production in the country and even diseases such as the Maize Lethal Necrosis (MLN). Agricultural production is set to decline due to climate change, which requires immediate interventions such as new drought-tolerant crop varieties and irrigation technologies that optimize water usage to increase production.

Despite these challenges, agricultural research programmes responsive to the above agricultural challenges and carried out by Kenya Agricultural, Research and Livestock Organisation (KALRO) are at halt due to lack of funding. Apart from funds, the institution faces a critical shortage of scientists. Last month, during the launch of a four-year strategic plan (2017-2021) with an implementation budget expected to cost Ksh. 72 million; KALRO Director-General, Dr. Eliud Kireger said that more than 50 per cent of the scientists are set to retire next year. Proper retirement and induction programme to replace the retirees will further guide the actualization of the ambitious strategic plan which provides a roadmap to guide the institution and effectively contribute to Kenya's food security.

The 2017-2018 budgetary allo-



Scientists at work in KALRO Muguga Research Station

cation for the Ministry of Agriculture, Livestock and Fisheries is only Ksh. 38 billion. A large proportion of which will go into paying salaries and other priority areas such as inputs subsidies for farmers and buying maize for the Strategy Grain Reserve (SGR) leaving very little for agricultural research.

To carry out its research mandate, KALRO requires adequate funding from the government, bilateral donors and well facilitated team of researchers to efficiently and promptly carry out responsive research to emerging agricultural challenges brought about by the climate change and offer timely advise to farmers to ensure food security in the country.

Dear farmer,

It's that time of the year that the country receives short rains. This year the Meteorological Department reports that the country will receive higher rainfall for the period between October and December 2017. The rains are a relief to most Kenyans given that the country has experienced long periods of drought this year. Water rationing was experienced in most parts of the country while food stocks at the National Strategic Grain Reserve hit a record low. Due to the drought, the country had to import maize and sell at subsidized prices. If the rains come as expected, the Meteorological Department expects the rains to boost the country's water levels and improve food security.

According to the World Agroforestry Centre Kenya receives more than 350 billion cubic metres of rainwater annually. Unfortunately most of this water goes to waste as no storage or water collection points are installed. Such a high volume of water, it can support a population of 233 million people (Kenya's population is at 42 million). The Government is undertaking multiple infrastructural projects to improve water harvesting and storage. The farmers too can help by harvesting as much water as possible for both domestic and for irrigation during the dry spells.

Simple solutions such as collecting rain water using gutters to constructing water pans will go a long way in ensuring that the small-scale farmers and the country has adequate water all year round (A gutter is a structure/pipe that is used to collect water from the roof). Most iron-roofed houses have gutters which collect rain water.

A storage point can be a simple domestic water tank. A water tank can be purchased from leading retailers such as Roto tank, Toptank, Ramco and other local manufacturers. Most local banks have credit schemes for people interested in buying water tanks.

Farmers can harvest rainwater for irrigation purposes by constructing waterpans. A water pan is an excavated water storage structure that is square, rectangular or round in shape. Waterpans are used to collect runoff water. If the runoff water is for domestic use, one should ensure that the water is treated before consumption (to get information on how treat water, visit <http://www.infonet-biovision.org/Environmental-Health/Water-domestic-use>)

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# How to make hay from brachiaria Push-Pull plots

Apart from providing the day-to-day fodder requirements for the farmer, excess forage from brachiaria can be dried and stored as hay for use during the dry season when pasture is scarce to maintain milk production.

**Amina Day Ojijo** | The search for fodder has always been a perennial problem for livestock farmers and a shortage of animal feed represents one of the most serious constraints to animal production. In our continuing series of the "wonder grass" brachiaria, we focus on fodder preservation. Fodder grass is an important resource for farmers who practise the push-pull technology.

Push-pull technology provides all-year-round quality fodder, and this is one of the main motivating factors for its adoption by many livestock farmers. The push-pull technology, therefore, opens up significant opportunities for growth to small-scale farmers. The technology represents a platform around which livestock keeping and other new income generation activities can be integrated. This provides small-scale farmers with an opportunity to increase their income.

## Harvesting seeds

Towards the end of the rainy season, about four months after planting, the seeds from brachiaria will be ready for harvesting. You will notice that they will become full and start to drop on their own. Harvest them into bags and dry them for use in the next planting season.

## Harvesting hay from a push-pull plot

Brachiaria is one of the best grasses for making hay. Two or three weeks after the last rain, it is advisable to harvest the grass and dry it for storage. The yield will range from 18 to 20 tonnes

of green fodder per acre and when dried and baled as hay, it gives 8.5 to 10 tonnes of hay.

Start by harvesting the brachiaria one row at a time. Start with the inner row nearest the maize. After the first forage has been harvested, you can start harvesting the second row. This gives time for the inner row to grow again. Harvesting a row at a time ensures that there is always brachiaria grass for animals and a trap for stem borer control.

## Making Hay

Haymaking is a common practice of preserving fodder. It is the process of turning green, perishable forage into a product that can be safely stored and easily transported without danger of spoilage while keeping nutrient loss to a minimum.

Hay is made from fresh grass with a moisture content of 80% by a drying process taking it to a moisture level of 20%. This can be stored for use during long dry spells. Allow the freshly harvested grass to dry for two to three days in sunny weather before packing it and baling it.

When making hay, you need dried grass, sisal strings and a hay box. The box dimensions are more effective when they are 40x50x75 cm. This makes it easier to bale the grass.

Put two lengths of sisal strings in the hay box, with the strings over the sides of the box it is easier to pull the hay out.

Place the hay in the box and keep compressing as you add more hay. You can press it down tightly by jumping on it. Compressing the hay helps to push out air that is present in spaces inside the grass and have more weight. Keep adding hay as you press until the box is full. Then tie the hay and pull the bundle out of the box. You can sprinkle the hay with some maize bran.

## Storage

Hay must be stored in a dry envi-

ronment. Hay can be baled and stored under shade or in a store by creating hay-stacks. These may be created in a field near the source, or close to where the hay is required. Stacks may be covered by plastic sheets to keep out rain and prevent exposure to the excessive sun. If fodder is well-dried and preserved, nutrients such as proteins and carbohydrates will be maintained thus ensuring good milk and meat production.

## Hay can be sold for additional income

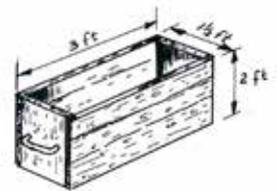
If you have huge parcels of land, you can earn an extra income from fodder agribusiness by supplying other small-scale dairy farmers, especially during prolonged dry seasons. On average, a bale of brachiaria sells at Ksh 250.

Feeding hay to livestock helps reduce the amount of concentrate feeding, and thereby, the cost of feeding your animals.

## How to bale your hay

**Baling:** Small-scale farmers can use a simple wooden box and sisal strings for baling the hay after drying.

A box measuring 3 feet long, 1½ feet wide and 2 feet deep. The box should have no bottom.



Hay making box



**Step 1:** The box is filled with hay and tightly compacted.

**Step 2:** The compacted hay is then tied.



**Step 3:** Removing hay.

## Qualities of good hay

- It is green in colour.
- It has a pleasant smell.
- It is not easily broken.
- It has more leaves than stems.
- It is palatable (animals like it).

Source: Coping with feed shortages during dry seasons - KALRO

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# Take care of your soil to increase land productivity

Farmers rarely take care of their soils. Good farming practices can restore and build soil fertility, increasing crop yields and income for the farmer.

**Margaret Kimani** | Soil fertility is the ability of the soil to support agricultural production by providing all essential nutrients for the crops to grow and yield bumper harvest in form and suitable balance that are available for plant uptake. On the other hand, land productivity is dependent on several factors such as soil fertility, good management practices, water availability and suitable climate.

Fertile soils, contain an adequate supply of nutrients, sufficient content of organic matter, a proper balance of soil pH, water draining and retention capacity, active soil life and a good soil structure. Proper balance of the nutrients and other factors in the soil are important for the soil to be highly productive.

Various factors lead to the loss of soil fertility. Below are some of these factors and the proposed ways of mitigating them.

**Soil erosion:** The top soil is rich in nutrients and organic matter which are important for soil health. These nutrients can be lost through the soil erosion is very common in many regions in Kenya. It can occur because of human activities such as deforestation, overgrazing and poor soil management. Besides human activities, other agents such as wind and water through floods leads to the loss of the fertile top soil. Planting cover vegetation, mulching, retaining walls around areas of erosion to prevent runoff water, leaving crop residues lying on the soil, mixed cropping and intercropping, practising minimum cultivation, early planting among others can prevent soil erosion.

**Nutrient mining:** This is as a result of the removal of more nutrients by crops and no adequate replenishing by use of manures or fertilizers leading to depletion of the soil nutrients.

Physical degradation of the soil (poor structure, compaction, crusting and water logging e.t.c) are some of these factors that



Bare soil is prone to soil erosion

come about as a result of poor management practices e.g. poor tillage (ploughing, weeding, etc) techniques which may cause the development of hard pans that limit water infiltration. Also, poor land use planning such as failure to integrate intercropping systems and crop rotation leads to the physical degradation of soils. Water-logging causes loss of nitrogen into the air.

## Decrease in organic matter content and soil bioactivity

A decrease in soil organic matter results in poor physical, chemical and biological properties of the soil. Soil bioactivity or microbial activity is dependent on soil organic matter and as a result, plays a significant role in nutrient availability and recycling.

## Soil acidification, salinization, alkalinity

All the above factors cause a reduction in soil fertility and eventually problems of nutrient deficiencies, toxicities and imbalances.

## Inefficient soil management

Monocropping practices (planting only one type of crop every year) and improper crop rotation practices lead to decline in soil fertility as it results in depletion of various nutrients.



Purple vetch is a good soil cover crop and fixes nitrogen

Also, excessive soil tillage will lead to erosion which results in decreased soil fertility and productivity in general.

## Soil pollution

This comes about as a result of introduction of chemicals and heavy metals into the soil through the indiscriminate use of chemical fertilizers. Hence, the growth of useful soil organisms is adversely affected, which eventually causes a decline in biological soil fertility.

## Land fragmentation

This refers to the subdivision of land to create settlement areas for the rapidly growing population especially in the high potential areas (areas with good rainfall and soils). As a result, the size of agricultural land is decreased and productivity, in general, is lowered.

## Inadequate extension services and infrastructure

When there isn't enough back up from the extension agents and the only available infrastructure is poorly maintained; there is lack of motivation to invest in soil fertility improvement.

## How to maintain soil fertility

**Using organic manure:** Soil organic matter is very important in soil fertility and productivity.

Organic matter is important in physical soil structure thereby improving drainage of water, infiltration of the water into the soil, aeration and water holding capacity.

**No-till farming:** This can also be referred to as conservation agriculture. It leaves the soil undisturbed, allows residues on the surface of the ground to naturally decompose and build more top soil to minimize erosion. It also makes it easier to manage weeds.

**Planting cover crops:** Cover crops while maintaining soil moisture also helps prevent soil erosion and puts nutrients back into the soil, keeping it fertile, more sustainable thus contributing to better harvests.

**Precision agriculture:** Precision agriculture is whereby real-time data on the conditions of the crops, soil, air as well as other local weather predictions are obtained using information technology (IT). Farmers can use mobile software applications to monitor their fields and maximize their harvests. For this service contact Soil Cares Africa, Tel. 0706 511 149.

## Adopting improved methods of tillage

These while including conservation tillage methods such as reduced/minimum/no tillage also include direct drilling and strip cropping. These methods are widely recommended to protect against soil erosion and degradation of structure, creating greater aggregate stability and increasing soil organic matter.

**Promoting agroforestry:** Agroforestry involves the intentional integration of trees and shrubs into crop and animal farming systems to create environmental, economic and social benefits. Agroforestry reduces the need to use soil nutrients and fertilizers by improving soil quality and maintaining good nutritional balance and fertility.

## Developing and applying suitable crop rotations

Crop rotation involves growing different types of crops in the same area. This is done to replenish and balance the nutrients in the soil. This helps also to reduce soil erosion, increasing soil fertility and crop yields.

**For more on soil management** [http://www.infonet-biovision.org/soil\\_management](http://www.infonet-biovision.org/soil_management)

# Diversify your income by growing eggplant

The eggplant is a warm season crop. It is nutritious and low in calories, fat and sodium. It contains high fibre and has many nutrients such as potassium, folic acid, magnesium, vitamin B6 and A.

**Faith Bosire** | Eggplant (*Solanum melongena*) is a popular vegetable crop grown in the tropic and sub-tropic areas. It is called brinjal in India and aubergine in Europe. The name "eggplant" is derived from the shape of the fruit of some varieties, which are white and shaped similarly to chicken eggs. The eggplant is nutritious, low in calories, fat, sodium and is a non-starchy fruit that is cooked as a vegetable. It contains a large volume of water. It is also good in balancing diets that are heavy in protein and starches. The eggplant is also high in fibre and provides additional nutrients such as potassium, folic acid, magnesium, vitamin B6 and vitamin A.

## Climatic requirements

Eggplant can be grown in many parts of the country although it is a warm-season crop and does not tolerate frost. A long growing season of 80 days is required for the transplanted crop. Optimal temperatures for eggplant production are 26°C during the day and 20°C during the night. Plant growth slows down and pollination problems occur at temperatures below 17 °C or above 35 °C. Cooler temperatures can reduce fruit set and high temperatures and humidity levels also reduce yields. The temperatures should be moderate because during very high rains the produce reduces.

**Soil:** Eggplant does well in a variety of soils. Eggplant is usually grown in light or sandy loam soils that provide good drainage and favourable soil temperatures. Eggplant will root to a depth of 90cm - 120 cm. Therefore, sandy loam or silt loam soils free of physical barriers are better for plant growth and development. It grows best with a soil pH of 5.5 to 6.5.

**Planting:** Eggplants are normally grown from transplants. However, a few growers use direct seeding.

**Spacing:** In-row spacing of eggplant is 30cm - 60cm. The crop can be grown using a row width



A mature eggplant crop

depending on the space needed by harvest workers. Growers are experimenting with a bed spacing of 45cm - 70cm in an effort to maximize sunlight penetration onto the fruit to improve the fruit colour. Some growers remove the lower leaves, flowers and stake the plants in an effort to reduce fruit rot that occurs when the fruit touches the soil.

**Fertilizer application:** The nitrogen (N) requirement for eggplant is approximately 168kg - 224kg/ha. Organic fertilizers such as tithonia teas can be prepared and sprayed regularly to meet the high nitrogen requirement of this crop.

Eggplant also requires adequate amounts of phosphorus (90-134kg/ha) and potassium (22kg-45kg/ha) which can be obtained from organic sources such as tithonia or commercial organic fertilizers available in agro-veterinary shops. Organic fertilizers can be applied each week for the period of vegetative growth. At early flowering, 7kg - 11kg of nitrogen is applied each week. During fruit enlargement, 5kg - 7kg of nitrogen is applied each week.

Nitrogen is applied in foliar sprays by most small-scale growers. Use of organic fertilisers in eggplant production is being promoted because they are environmental-friendly to farmers, non-targeted organisms including beneficial insects and the environment. Use of manure

especially green manure or slurry is highly encouraged due to its high nitrogen levels. When using manure it is advisable that fully decomposed farm yard manure should be used.

**Weed control:** Eggplant is slow to establish and cannot compete with aggressive weeds. Weeds also harbour damaging insects and diseases. Weeds are controlled either by physical methods or organic foliar control. Physical methods, such as hand weeding, cultivation and mulching, are quite frequently used on small vegetable farms. Only shallow cultivation is necessary. Mulching with black plastic mulch effectively controls weeds and reduces labour. Natural organic mulches, such as rice straw will conserve moisture and add organic matter to the soil.

## Pests and disease control

Organic herbicides, insecticides and fungicides should always be used in compliance with the label instructions.

Many insect pests are attracted to eggplant. Spider mites, green peach aphids, lygus, flea beetles and wireworms can be very destructive to eggplant. Spider mites are especially harmful and should be treated as temperatures become warmer. Flea beetles are usually a problem in young plants. Fields should be closely monitored during flowering period and lygus will feed on flowers causing flower drop. Root-knot nematodes can cause plants to wilt and turn yellow.

## Diseases

**Leaf spot and fruit rot:** This disease is characterized by circular, brownish spots on fruit and leaves. Fruit rot may appear during post-harvest transport even when symptoms are not evident at the time of harvest. This disease can be controlled by doing crop rotation with any other crop other than solanaceous (tomato family) crop. The field should be cleaned as soon as the disease is detected, i.e. the diseased fruit should be plucked and burnt.

**Early blight:** Result into dieback known as collar rot in seedlings. Foliage can be affected at all growth stages, and fruit can drop owing to infection. This fungus is serious at temperatures between 16 and 32 °C. Stressed plants are more susceptible than healthy plants. The disease can be controlled by observing proper field cleanliness, using certified

disease-free seed and own seeds should be water/heat treated.

**Anthracnose fruit rot:** Causes sunken spots and lesions on the fruit surface. This fungus is favoured by temperatures between 13 and 35 °C with optimum growth at 27 °C and humidity at 93% or higher. It can be controlled by using resistant varieties if available, using certified disease-free seed, crop rotation and destroying infected crop residue.

**Wilt:** Affects the vascular system of a plant and results in stunted plant growth, yellow discoloration and eventually defoliation of the lower foliage and plant death. This fungus is favoured in temperatures of between 13°C and 30°C. Currently, there are no eggplant varieties available that are resistant to these soil-borne fungi.

**Tobacco ring spot virus (TSRV):** It is characterized by yellowing foliage and plants dying off. Crop rotation can help to lessen the effects of this disease.

## Harvesting

Harvesting of eggplant usually starts from 75 to 90 days after transplanting or 15 to 35 days after flowering expansion. Fruit is harvested when it reaches market size, and the skin is glossy but, before seeds begin to enlarge significantly and mature. Varieties with elongated fruit take more time to ripen. Over-mature eggplants become pithy and bitter. Fruit should be removed often to encourage continued fruit set. At market maturity, the fruit stem hardens and a sharp knife is needed to cut fruit from plants. The length of stem left on the plant can vary from 2.5cm - 5.0cm for American varieties and 2.5 to 7.5cm for Asian varieties. Harvesting is done by cutting the stem rather than pulling the fruit.

## Current market prices

In Kenya, depending on the season, eggplant prices vary. For instance, during the dry season, the production is high and one fruit can fetch up to Ksh 10 but this doubles when the rains are high. Prices can also depend on the variety. The types include beef, kabubbu, and kasolo. Most people prefer kabubbu, the long and dark purple ones because they sell faster in the market (all major seed companies in Kenya stock these varieties).

**For more on growing eggplant**  
<http://www.infonet-biovision.org/PlantHealth/Crops/Eggplant>

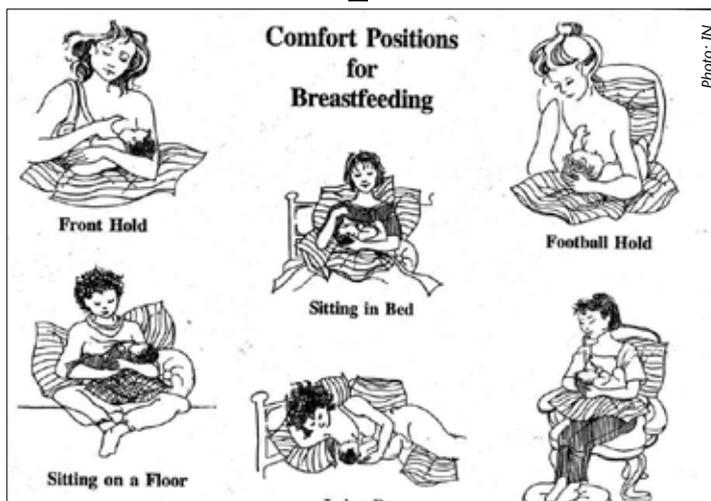
# A balanced diet is important for your child

Complementary food should be introduced slowly after six months of exclusive breastfeeding. The food should be balanced to ensure the growing baby gets all vitamins and minerals crucial for a healthy growth.

**Linah Njoroge** Starting at six months of age, children's nutritional needs increase and cannot be sustained only by breastfeeding. That's where complementary foods are introduced. Complementary food is food that is introduced gradually to the breastfeeding baby after six months of age. It is called complementary food because it is meant to complement the breastmilk. It is recommended that solid foods be introduced after six months of age. Complementary food should be derived from a balanced diet comprising of foods from all the food groups.

These include:

- Starches such as potatoes, sweet potatoes, arrowroots, raw bananas, ugali, pumpkins and butternut.
- Proteins which should come from both animal and plant source. Animal sources of protein such as meat at that age is recommended but at small minced quantities or even soups. Do not feed your child with egg white at six months due to the high albumin content which can trigger allergies. However, you can introduce only egg yolk and give a full egg from 8- 12 months.
- Fish is also cautioned because of the high risk as an allergen and therefore should not be introduced too early.
- Chicken can be introduced at six months, but it has to be blended with baby food.
- Plant proteins such as beans, peas, green grams can be introduced into the diet. These can be soaked overnight and the water discarded before cooking them. This helps to remove the gas or other anti-nutritional elements (that can cause gas discomfort to the child).
- The other foods are indigenous vegetables. These should be incorporated into the complementary food.



Vegetables such as green leaf vegetables (spinach, and other traditional vegetables like cassava and arrow root leaves) that are soft can easily be blended into the diet.

- Avoid very coarse vegetables such as sukumawiki, cabbage and greengrams.
- Other vegetables, like green peas, carrots, broccoli, cauliflower, aubergine (known as eggplant or brinjals), grated carrots can all be included into the diet.
- Fruits are also important and can be introduced at six months. It is important to include both vitamin A rich fruits (mangoes, pawpaws) including vitamin C rich fruits (tangerines, oranges).
- Oil is part of a balanced diet and complementary foods should be prepared with oil in moderation as oil helps the body to absorb fat soluble vitamins e.g. vitamin A, D, E, and K.
- Water can now be introduced at six months in very small quantities such as 2- 3 table

spoons in a day.

## Traditional diet is important

Traditional foods are very important complementary feeding because they provide dietary diversity. A variety of nutritious local food, given in small quantities can be used in complementary feeding. The following foods including; finger millet (for porridge), pumpkin, butternut, groundnuts, milk, green leafy vegetables, matoke, Irish potatoes, sweet potatoes, cassava and arrow root are the best because they have fibre to aid in proper digestion and have all the vitamins and minerals required.

Maternal nutrition is also very important in having a successful breastfeeding. Good nutrition is key for the health of the breastfeeding mother and the nutritious breast milk for the baby. A breastfeeding mother should also eat from a variety of foods to ensure they have a balanced diet. For example, she can feed on traditional foods like yams, arrowroots, black beans, all natural vegetables and traditional

beverages like porridge made from millet, finger millet and sorghum. Additionally, she can also follow similar food groups as the baby. But, her quantities should be much more than an infant.

## Eat a balanced diet during breastfeeding

Malnutrition in a breastfeeding mother can present in form of a deficiency of certain nutrients like calcium, underweight or overweight.

Each form of malnutrition has unique health risks or consequences for both the mother and the infant during or after breastfeeding. Insufficient uptake of milk leads to unhealthy bones. Feeding on beans, vegetables, green grams among other legumes adds iron in the body of the mother and the breast milk. It is important to educate young mothers and even the community on the importance of a healthy diet and the uptake of enough water during breastfeeding period.

## No food can replace breastmilk

The Breastfeeding Act protects breastfeeding through various regulations. One of which is to prohibit advertising of breastmilk substitutes or accessories such as feeding bottles. The Act also protects the working mother both in formal and informal sectors to get support for breastfeeding by adequate maternity leave and paternity leave for the parents of a newborn.

Some of the traditional nutritious foods best for breastfeeding mothers and weaning the babies are; millet, legumes such as green grams and beans. Also you can check additional varieties with KALRO and JKUAT.

Professor Ruth Nduati a renowned authority in Paediatrics and HIV, a paediatrician and a lecturer at the University of Nairobi, emphasizes the importance of supporting the pregnant mother, breastfeeding mother and a healthy baby.

"As a community, let us support breastfeeding and maternal nutrition so that we can have healthy children and a healthy nation," emphasized Prof. Nduati.

*In the next issue we look at the food requirements of a young child and that of a breastfeeding mother.*



Sweet potato



Oranges



Groundnuts



Arrowroots



Pumpkins



Broccoli



Bananas



Pawpaws



Butternut



Eggplant

# TOF reader earns more through organic farming

Since she started reading TOF magazine, Ms Waraka has managed to improve soil fertility in her farm, increasing crop yields and income. She now supplies vegetables to schools and customers, who prefer her chemical-free vegetables and fruits.

**Peter Kamau** | Six years ago, Ms Phillis Waraka and her husband Mr Protus Waraka used to grow sugarcane in their three and a quarter-acre land in Samiji village in Bungoma County. Delays in payment and low earnings from sugarcane production discouraged them from farming.

However, their farming took a turn for the better when the VI Agroforestry Project started organizing organic farming training workshops for Samiji Women Group in which Mrs Waraka is a member.

After the training Ms Waraka increased the number of indigenous chickens and built a better housing shed. She fed them well as she started putting into practice what she had learnt during the training.



Mr Protus Waraka and Ms Phillis Waraka harvest their sukumawiki vegetables

## Learnt compost-making

She would make compost using manure from the chicken shed and would spread it in her maize and vegetable garden.

Being a regular reader of TOF magazine, Mrs Waraka has come to learn many sustainable farming technologies from the magazine. Her farm, part of which lies in a swamp has been reclaimed through digging canals to drain out the water. It is also divided into different portions where she grows maize, beans, soya beans, cassava, sukumawiki and indigenous vegetables,

passion fruits and tree tomato in rotation.

"I have learnt many beneficial lessons from TOF magazine. I can use resources from within the farm to improve soil fertility and even plant extracts to control pests. I now rely entirely on compost, which has saved me from buying chemical fertilizers," she says.

## More maize yields

Previously, Mrs Waraka would manage to harvest only three to four bags of maize from an acre. Last year, after a contin-

ued use of compost manure and farm residue on her farm, she harvested 15 bags of maize from one acre last year, adding "I do not even do top dressing as many farmers do here. Instead I prepare plant extracts from tithonia combined with other plants with pesticidal properties and spray weekly as I read from TOF magazine. My maize is even healthier than that of other farmers who use chemical fertilizers," she adds.

## Ready market

Producing vegetables organically and being near Bungoma town has given her a chance to reach to a large number of buyers of her produce because the large market for quality produce. She reveals, "Many buyers flock to my farm because I don't use chemicals on my indigenous vegetables and fruits." She has also been contracted by several schools to supply them with both indigenous vegetables and sukumawiki to enrich the diet for feeding their students. Improved income has enabled her to send her three children to universities and also meet her other family needs. On a monthly basis, Mrs Waraka fetches at least Ksh 30,000 from vegetable sales alone making the highest earning member in Samiji Women Group.

## Vetiver grass has many uses for farmers

**Rachael Wangari** | *Vetiveria zizanioides* commonly known as vetiver grass is a perennial bunch grass which is native to India and is widely cultivated in the tropical regions of the world. It is closely related to sorghum but shares many morphological characteristics with other fragrant grasses like the lemon grass. Vetiver grows up to 5ft high and forms clumps; the stems are tall and the leaves are long, thin and rather rigid. Vetiver roots grow downward to about 7ft - 13ft in depth and does not form stolon nor rhizomes hence not invasive and weedy.

Commonly used genotypes of vetiver do not produce fertile seeds. Vetiver is propagated from plant parts including shoots, crown and the roots. Mature tillers are split from mother plants that yields bare root slips for immediate propagation in a nursery. Clumps from the nursery are trimmed leaving leaves of about 15cm long and 8cm of root depth. The



Vetiver grass planted along contours to control soil erosion

clumps are separated into slips with three tillers each which are then planted 10cm - 15cm apart. Weed management should be carried out after 3 months of germination and the top is cut back to 30cm - 35cm to promote tillering.

Vetiver grows in a wide range of soil types and is sustained in a wide range of climatic conditions. It requires minimum space for growing as it has an upright growth habit hence vetiver hedges can be introduced on

farms with minimum changes to the existing farm layout. Ease of propagation of vetiver and low maintenance needed to keep a vetiver hedge in good shape is just enough. Vetivers is also resistant to pest and diseases, its fire resistant and repels rodents and other animals.

## Uses of vetiver grass

- **Soil and water conservation.** Vetiver forms narrow, dense hedges when planted along the contours of sloping land

slowing down runoff and helping the water to soak into the soil rather than to wash away. The deep and massively thick root system of vetiver binds the soil making it very difficult to be dislodged under high velocity water flows.

- **Fodder.** Regular harvesting of young leaves of vetiver which are more palatable provides feed for animals when there is scarcity since they have a nutritive value similar to that of Napier grass. With improved management, vetiver would make an adequate dry season fodder when combined with high protein forage.
- **Crop protection and pest repellent.** Vetiver attracts stem borer which lays their eggs there but the larvae cannot move on the leaves hence falls down and die. Its extracts can also be used to repel termites.

To buy contact Plus-Kenya 0725 30 96 64.

# Requirements of organic livestock rearing and management

**Q.** Can I use veterinary medicines in organic livestock?

**Dear farmer,**

We have received this question from farmers many times. To enlighten you and other farmers interested in organic livestock production, we will look at all requirements of organic animal production as set out by the East African Organic Products Standards.

Organic livestock production mainly focuses on the rearing of livestock in their natural environment with minimal use of external inputs such as synthetic drugs, acaricides while optimising their health, productivity and interdependence. Farmers practising organic animal production are therefore encouraged to use indigenous knowledge combined with modern practices of livestock rearing. This leads to the growth of healthy animals that are productive and with sustained livelihoods and income.

## Veterinary drugs allowed

If an animal falls sick or is injured, it should be treated promptly and adequately. Use of herbal treatment is allowed where the herbal product being used is proven to work or is effective in curing any ailment or healing an injury. Chemical drugs or synthetic pesticides can be used to treat animals if preventive or alternative practices are not effective. All treatments with synthetic or veterinary drugs should be recorded. The farmers should ensure the withdrawal period does not double as required by law or particular instructions given on the prescribed drugs. This is an important caution to note since a minimum notice of 48 hours should be observed before human consumption of milk or meat from the affected animal.

## Vaccinations

Vaccinations are allowed in case of disease outbreaks or are expected where the disease cannot be treated by other means. Hormonal treatment may be used only for treatment purposes under veterinary supervision.

All animals should have access to fresh air, water and feed under hygienic conditions. Animals should be protected from excess sunlight, noise, heat, rain, mud and wind to reduce stress and ensure their well-being. Animals



*Animal welfare is a key practice in organic livestock production*

should not be beaten or mistreated.

## Housing and living environment

All animals should be allowed to live in an environment that allows them to show their natural behaviour. For example:

- Pigs should be provided with material to root- a natural behaviour for pigs where the pig uses his snout (mouth) to push or nudge into something repeatedly. It is important to give the pigs appropriate outlets for their rooting such as blankets or anything they can push (pigs explore their surroundings by rooting, sniffing, biting and chewing various food items as well as indigestible items).
- Goats should be provided with a place to climb while foraging.
- Chickens should be provided with some bare ground to scratch and take dust baths.
- Animal housing should be safe for their comfort without anything that can cause injury or disease.
- All animals should have sufficient space for free movements where they can exhibit their natural behaviour.
- The animal housing should provide adequate space for lying and rest, which is important in meeting the needs of the animals. The animals resting area should be dry at all times. Natural bedding should be provided where necessary. Sheds and resting areas should be cleaned regularly.
- The animal should have adequate feed, water and shade. Tethering may be practised as long as it does not affect the well-being of the animal. The method of tethering shall enable the animal to move

freely within the grazing area without being strangled or choked.

- Tethering should not cause wounds or physical injuries to the animal.
- The animals should have the opportunity to feed according to their natural grazing behaviour. In the zero-grazing environment, animals should be given adequate space where they can move out of the shed or an outdoor run area where they can move and exercise to reduce stress.
- An organic farming set-up should not have any signs of soil degradation due to grazing. There should be adequate pasture and water.

## Breeding

Artificial Insemination (AI) is allowed, but Embryo Transfer (ET) is prohibited in organic farming.

## Mutilations

Cutting or mutilating any part of an animal is not allowed in organic farming except the following:

- Castration
- Ringing
- Dehorning is allowed but only for young animals.

Any mutilations done in an animal should be done in such a way that the suffering or pain to the animal is minimized.

## Animal feeds

In organic animal production, any feed given to the animals should be organically produced and processed. The daily maximum non-organic feed should not exceed 40 per cent.

All animals should be provided with fresh fodder. Where fodder is not available, preserved fodder such as hay is allowed. At least 60 per cent of feed given

to organically produced animal should be produced within the organic farm or produced in cooperation with other organic farms.

The following products are prohibited from being fed to animals under organic management:

- Meat, bonemeal and related abattoir waste.
- Chicken manure or animal manure.
- Feed subjected to chemical processing or chemical agents.
- Feed processed with urea to make it palatable to animals is not allowed.
- Feed with growth promoting hormones.
- Feed processed with antibiotics.
- Feed incorporated with synthetic appetizers, artificial colouring agents.
- Feed from any pasture or crop grown using genetic engineering (GMOs).

**Preservatives:** Only feed preserved using plant-based products is allowed in organic animal production. Feed with by-products from the food industry (except molasses). Only feed processed with natural products such as bacteria, fungi and enzymes is allowed.

**Vitamins and minerals:** Organically managed animals may be fed with vitamins and supplements from natural sources. Synthetic vitamins, minerals and supplements may be used where natural sources are lacking in quality or quantity.

**Milk replacers:** Young animals should be raised on milk from their mothers or organic whole milk from their own species. Young animals should also be allowed to suckle directly from their mothers' teats.

## Transport and slaughter

Handling transport and slaughter should be carried out in a humane way to ensure only minimal physical or mental strain or stress for the animal. Farmers or handlers of organically-managed animals should minimize stress and other adverse effects such as thirst, hunger, extreme temperatures or humidity.

*Answers by Elkanah Isaboke*

For more on organic norms [http://www.infonet-biovision.org/animal\\_husbandry\\_and\\_welfare](http://www.infonet-biovision.org/animal_husbandry_and_welfare)

## 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.

### Seed banks increase production of indigenous vegetables

*Pamela Otieno and Bonaventure Buluma*

Christine Nafula of Women Without Borders Self Help Group in Busia asks how a farmer group can increase production of indigenous vegetables.

Indigenous vegetables are an important part of traditional diets and are consumed in a wide range of traditional meals. The vegetables offer numerous benefits in human nutrition as they are tasty, healthy with medicinal and nutritional qualities.

Ms Harriet Naliali is the boarding master in charge of nutrition at Mundika High School in Busia. The school offers its students a meal of indigenous vegetables twice a week, "many students don't take beef, others don't take milk, and there are those who do not eat kales because of ulcers. When the local vegetables were introduced, the school was able to solve that challenge as all the students do not have a problem with the indigenous vegetables," she says.

#### Easy to cook

On the other hand, Ms Agneta Ambundo who is the vice chairlady of Kakamega Isembe FAT group says that they decided to grow the traditional vegetables since many women could not afford to buy cooking fat due to skyrocketing of the commodity prices. This has seen the increase in the demand for indigenous vegetables as they are tasty even when cooked without cooking fat.

#### Seed banks started

For rural farmers, growing indigenous vegetables needs not to be difficult. Most of the traditional vegetable seeds are obtained from the previous season's crop. Farmers groups can establish seed bulking centres. These seed banks ensure availability of seed throughout the year to all farmers in the locality. With the initiation of such seed banks, production of indigenous vegetables for marketing



*A member attends to an intercrop of indigenous vegetables and onions*

is increased remarkably.

"When we started planting the various indigenous vegetables as a group, our main challenge was availability of seeds. We bought certified seeds of the different varieties from the agrovet and used it to set up our own seed bank. As a group, we are now able to supply other farmers with seeds and this has been a very profitable venture for us," says Ms Catherine Akhayati who is the Chairlady of Kakamega Isembe FAT Group.

#### They are easy to grow

Most of the varieties are fast maturing with vigorous growth, require minimal management as they do not need chemical fertilisers or pesticides, and do well in most soils as most of them are drought tolerant, transports well and have a high market potential.

There are many ways for vegetable farmers and sellers to fetch high profits from indigenous vegetables. By adopting good farming practices, the farmers are able to produce

enough vegetables for their families to eat, and sell the surplus at the local market and beyond.

#### How to plant indigenous vegetables

It is important to plant your leafy vegetables at the onset of the rains. When propagating the seeds, first make sure your soil is loosened and enriched with well composted manure. The initial stage is land preparation.

**Land preparation:** While preparing your land for sowing, make the soil fine by removing debris which can later be used as mulches in the farm and also reduce soil erosion when laid between raised beds.

**Planting:** Make furrows which will require different measurements for different variety of vegetables. Then mix your seeds with sand or ash for uniform sowing. Sow the mixture thinly either by broadcasting or in rows and cover with a thin fine layer of manure.

**Mulching:** After sowing, spread mulch (use grass or a similar material to retain moisture).

**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.

After 4 to 5 days, come and check to see how the plants are germinating. The first weeding is done after 2 weeks. Two weeks after weeding, you can do the thinning.

**Harvesting:** Most of the vegetables will be ready for harvest after a month. The stems should be cut above the ground to allow new side shoots to develop. Picking off indigenous vegetables should be done very early in the morning and if possible, the produce should be sold the same day. Alternatively you can still harvest in the late afternoon and place the produce on banana leaves in small bundles in readiness for the market.

After one week harvest again. A healthy vegetable crop can increase food for your family and an additional income for you.

*A farmer training video on Growing Indigenous Vegetables has been produced with support from Swedish Society For Nature Conservation (SSNC) and will be available to farmers groups and individual farmers in DVDs from January 2018. Contact Musdalafa Lyaga on Telephone 8632009 or Email: omusdalafa@biovisionafrica.org.*