



Fleckvieh is a dual purpose breed that is reared for both meat and milk. It is a strong and high yielding animal that does not fall sick easily. Farmers must provide the animal proper housing and practice good hygiene, feeding, breeding and disease control to achieve high production.

Maize varieties suitable for the short rains

TOF-Most farmers are about to harvest some of the crops that they planted at the beginning of the long rains in March and April this year. Many are already planning on what to plant during the short rains and most farmers will plant beans as the second crop during the short rains.

The country is likely to have reduced maize yields this year because parts of the country did not get adequate rains in the first rainy season, which is the most critical period for growing



maize. Farmers in the affected areas should take advantage of the short rains that are expected in October to December and grow early maturing maize varieties. Due to the unpredictable weather, it is important that farmers choose the right varieties to increase their crop yields and reduce the chances of crop failure. Below we give farmers a range of maize varieties, which can do well with reduced rains and also take a short period to grow:

Medium altitude varieties

Varieties that grow well in medium altitude areas are likely to do well even in high altitude areas during the short rains because they take a short time to mature. Farmers whose maize did not do well can take advantage of the short rains to replant. The following are some of the varieties they can use:

Kenya Seed Company: H513, H515, H516, H517, H518, H519,

H520, H521 and H522.

Western Seed Company: WH507, WH505, WH403, WH403 and WH402.

FRESHCO: KH500-33A and KH500-13A.

Dryland varieties

Due to the unpredictability of the weather pattern, it is important that farmers do not plant only the medium altitude varieties. They can also plant dry land varieties. The following dryland varieties are available in the market:

KARI: Katumani composite (open pollinated*).

Kenya Seed Company: DH01, DH02, DH03 and DH04.

FRESHCO: KDV1 and KDV-6 (open pollinated).

* Open pollinated varieties can be planted as seed without having to buy again for two or three planting seasons (see TOF No. 105, February 2014 for more information on maize seed varieties).

Dear farmers,

Climate change poses the greatest threat to food security and the very existence of mankind. Industrial pollution has been identified as the major cause of climate change. There are a lot of efforts at global, regional and national levels to reduce the harmful emissions that contribute to climate change. Kenya is one of the countries taking urgent measures to reduce emission of green house gases like carbon dioxide, methane and nitrous oxide, which contaminate the air and water thus affecting agricultural production.

Farmers can contribute to reducing green house emissions by planting more trees. Trees absorb excess carbon dioxide from the atmosphere through photosynthesis. This gas is one of the main elements that create 'holes' in the atmosphere that allow dangerous sun rays to reach the earth, causing a rise in temperatures (global warming).

Trees also create the right conditions for increased rainfall that enables crops to grow and replenish our water sources. They also provide food for insects, birds, animals and other micro-organisms that sustain life on earth. We get firewood, timber, and fodder for farm animals from the trees. Grevillea trees are an example of high value trees with multiple benefits and farmers should plant and nurture them in their farms (page 5).

To cope with climate changes, farmers are also advised to plant crops that best suit the available rains and adjust planting dates according to temperature and rainfall patterns. They should also use crop varieties that are more resistant to heat and drought. Farmers, however, need the support of the national and county governments to deal with such changes.

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Growing the right avocado for the market

There is a big demand for avocados in the local and the export market if farmers can grow the right varieties and use the latest grafting technologies.

Samantha Ayienga | The avocado is one of the most popular fruits, not only in Kenya but also in most parts of the world mainly because of its high nutritional value. Farmers can make very good returns from avocado production if they grow varieties with the right qualities. With the increasing population, the price of avocado fruits remains high regardless of the season. There are also good opportunities for export if farmers plant the right varieties.

Avocados are easy to produce organically because the grafted trees are not prone to many diseases and pests like other fruit trees. Such avocados can fetch much better prices in the international markets bringing more income to producers.

Classification and grafting of avocados

The avocado tree has unique flower behaviour and is classified into two (type A and B) depending on the time its flowers open for pollination. Flowers of type A open in the morning when they are fertilized and close around noon. They remain closed until noon the following day when they re-open and release their pollen (male stage). In type B avocado trees, flowers open at noon (female stage) and close in the morning (male stage). To come up with the best cultivars for fruit production, avocado trees are grouped and propagated (or reproduced) according to their flowering behaviour.

Grafting Fuerte and Hass

In Kenya, propagation of avocados is mainly done between the Hass (Type A) and Fuerte (Type B) cultivars to produce avocado



fruits suitable for the local market. Apart from domestic use, avocado fruits from these cultivars are used for oil extraction for the cosmetics industry and herbal medicine. The choice of Fuerte is important because it sets fruits even without assistance from pollinators such as bees. Fuerte is mainly used as a rootstock (lower part of graft)

while Hass is used as the scion (upper section of graft).

Puebla and Pinkerton

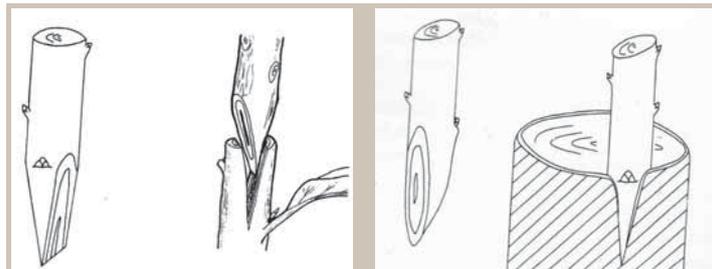
For farmers targeting the export market, the Pinkerton is grafted with Puebla variety. The Pinkerton avocado cultivar becomes the scion while Puebla remains the rootstock. Fruits from this graft are big in size, and some

are as heavy as 900g. The fruits are firm and do not spoil easily.

Grafting of these varieties has many advantages for the farmer. To start with, the trees are short in size. They also grow fast, thus reducing the maturity period from 8 to 10 years to about 4 years. Farmers working with these varieties find it easy to reach every part of the tree when picking avocados and when spraying biopesticides and foliar feeds. The plants can also get adequate sunlight.

Using the low bark grafting method, farmers can plant about 644 plants per acre. To improve the quality of fruits Pinkerton/Puebla graft can be further grafted with Fuerte/Hass graft. The resulting fruits have high oil content that are good for industrial processing.

Farmers intending to start avocado grafting need to undergo practical training in order to do it the right way. Those intending to grow the above varieties should only buy seedlings from certified seedling producers who are registered with the Horticultural Crops Development Authority (HCDA). The same applies to farmers targeting the export market. A medium size fruit costs Ksh 30 in the local market.



Wedge cliff grafting

Low bark grafting

Nutritional value of avocado fruits

(Calories and nutrients per 100g edible portion of avocado).

Nutrients		Minerals		Vitamins	
Calories	50-220 kcal	Calcium	10mg	Vitamin A	612. I.U
Protein	0.8- 4.4	Iron	1.18mg	Vitamin C	7.9 mg
Carbohydrates	1.2- 10.0	Magnesium	41.0mg	Thiamin	0.11mg
Fats	5-32g	Phosphorus	42.0mg	Riboflavin	0.12mg
		Potassium	634.0mg	Niacin	1.92mg
		Sodium	12.0mg	VitaminB-6	280.0ug
		Zinc	0.42mg	Folacin	65.5ug
		Copper	0.27mg		
		Manganese	0.24mg		

Source: USDA - Nutrient Data Lab (1996)

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

Editors Caroline Nyakundi, Peter Kamau

Administrator Lucy W. Macharia, 020 863 21 86

Address *The Organic Farmer*, c/o ICIPE, P.O. Box 30772, 00100 Nairobi, KENYA; +254 738 390 715; 020 863 21 87 info@organickenya.org; www.theorganicfarmer.org

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Advisory Board *icipe*: Sunday Ekesi, Nguya Maniania; farmer: Charles Kimani; KARI: Joseph Mureithi; ILRI: Henry Kiara

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Fleckvieh: Why more farmers want this cow

Farmers need to know that it is only through proper management and feeding of Fleckvieh dairy cows that they can get good returns from this breed.

Peter Kamau | In 2011, we featured the Fleckvieh dual-purpose cattle breed and since then thousands of farmers have acquired it. Farmers' feedback to TOF shows that Fleckvieh is now the breed of choice for many dairy farmers who desire a cow that can be used for both dairy and beef production. Following increasing enquiries from farmers, we would like to highlight the qualities and management of this breed.

Origin of Fleckvieh

Fleckvieh is the second largest dairy breed in the world – and one of Europe's oldest. Through many years of selective breeding, Fleckvieh has acquired most of the desired traits that farmers want in dairy and beef cows.

Active genetic potential

Fleckvieh cow is durable, hardy and easy to handle even within a small farm. They have excellent feet and legs to move easily even in the most difficult terrain. A mature Fleckvieh has good strength and well-developed body and weighs 650-800 kilograms.

Good milk and meat

Studies show that every 1 kilogram of milk from Fleckvieh cow milk contains 4.2% fat and 3.7% protein. The milk also contains Omega 3 fats – which are essential nutrients for human



A pure breed Fleckvieh dairy cow – good for milk and meat.

beings.

According to Fleckvieh Genetics East Africa, the company that sells Fleckvieh semen in Kenya and East Africa, Fleckvieh bulls are fast growing and gain muscle

at a rate of 1.5 kilograms per day for the first 200 days. When cross-bred with other breeds, the farmer is assured of high quality milk and beef. Under intensive fatten-

ing conditions, young bulls reach a daily weight gain of more than 1300 grams (1.3 Kg) per day. In the first 6 months after birth, a bull can attain up to 300 kg with proper feeding and management.

Disease resistance

Compared to other breeds, Fleckvieh owners do not incur huge veterinary bills due to the breed's ability to withstand some of the common livestock diseases such as mastitis. This is an inflammation of the udder that cuts down milk production. The infection is caused by somatic cells (dead cells) from the bloodstream that end up in milk. With its thick skin, insects such as ticks, tsetse flies and even houseflies find it difficult to suck the blood from Fleckvieh cattle. It is therefore fairly resistant to common diseases such as ECF and trypanosomiasis.

The breed has a more efficient feed conversion rate compared to other dairy cattle. Studies show that the breed can give more milk than other breeds with the same amount of feed. For example, if a Friesian-Holstein dairy cow is given 60 kg of feed, the amount of milk it will produce is equal to what a Fleckvieh cow will produce with only 45 kg of same type of feed.

With good management, Fleckvieh dairy cows can produce between 25-30 litres of milk per day. On second calving, it produces 30-35 litres, increasing this to between 30-40 litres after the third calving. The breed has a consistent milk production throughout the lactation period – this is a big plus compared to other breeds. It produces milk steadily for 305 days a year without any decline. The breed has been known to produce 10,000 litres of milk in every lactation (milking period) with good management.



Left: A Holsten-Friesian and Fleckvieh cross breed cow. This dairy cow is 50% Fleckvieh and 50% Holstein-Friesian.



Right: A Fleckvieh-Boran cross. Farmers are now crossing local indigenous breeds with Fleckvieh to improve their milk yields and meat quality.

Farmers interested in Fleckvieh genetics can get in touch with the company. Call Dr. Gichohi on 0727 665 885. To get a list of Fleckvieh AI service provider in your district, visit the Fleckvieh Genetics (EA) website at www.fleckviehgeneticsea.com.

The best way to house a dairy cow

The productivity of dairy cows depend on proper housing and feeding. Maintaining hygiene and providing adequate space is also important.

Space

Each adult cow needs at least 8 square metres apart from her resting pen. The easiest way is to confine this area in front of the stall.

- All animals must be able to stand in the shade and shelter under the roof. It must be high enough for a person to stand up and work under it.
- The floor should be made of concrete or hard-packed soil.

Concrete is easy to clean.

- The floor should not be too smooth; otherwise the cattle will slip on it. A rough floor also keeps the hooves short.
- The ground must slope gently towards a channel leading to a manure pit outside the pen for urine and water to flow.
- Each cow must have her own resting box pens or cubicle where she can lie down, chew cud and sleep.

Water

- The shed should be close to a reliable source of clean water. One dairy cow needs between



50 and 180 litres of water every day (5 to 18 buckets).

Milking area

- Provide a separate area for milking with a trough, so the cow can feed during milking.

Maintenance

- Dung and urine have to be swept into the manure pit at least once every day. Keep the pit covered.
- The bedding material must be changed as soon as it is wet and dirty. This is necessary to keep the animals clean and dry and will prevent serious diseases like diarrhoea, foot rot and mastitis (page 7).
- Clean the feeding troughs every time before you put fresh fodder into them.
- The water trough needs to be cleaned and brushed out from time to time.

Legumes improve farmers yield in Kakamega

Planting soya beans in rotation with maize and use of compost has revived exhausted soils that had been depleted by years of chemical fertilizer application. This has increased productivity and income for many farmers.

Peter Kamau | Kakamega County is a high potential area in agricultural production. It is, however, one of the most heavily populated regions in the country, with an estimated population of over 1.6 million people. The land is divided into very small portions averaging 1 acre, that are heavily cultivated to produce food for the large



Soya beans can fix between 18-56kg of nitrogen per acre making it unnecessary to use chemical fertilizers.

population. This has resulted in depletion of the soil nutrients. Many years of fertilizer use have worsened the situation by increasing soil acidity, which has resulted in low crop yields,

and consequently inadequate food and income for many farm families in the region.

Three years ago, The Rural Outreach Programme (ROP), a local organization in Western

Kenya embarked on changing the situation. With local partners, the organization started the Integrated Soil Fertility Management (ISFM) Project targeting more than 30,000 farmers in the 6 Sub-Counties of Vihiga, Sabatia, Hamisi, Emuhaya, Lurambi and Butere.

Soya beans introduced

According to the organisation's Project Coordinator, Ms. Doris Anjawa, the farmers were introduced to soya beans and other legumes like bush beans, lablab and climbing beans as sources of nitrogen to restore soil fertility. The beans also provided a rich source of protein in the family diet.

Soil tests, showed high acidity levels

The project, which was implemented in collaboration with Ministry of Agriculture and KARI started with soil tests in sampled farms to determine soil fertility and acidity levels. "Through the soil tests, we discovered that apart from the depletion of nutrients, most of the soil samples tested recorded high acidity levels with some showing a pH of up to 3.2," says Anjawa.

Demonstration plots set up

The project selected 50 farmers in each of the regions where they set up demonstration plots. Each plot was divided into 5 plots of 10 by 10 metres. In the first plot, maize was planted alone as a pure stand. In the second plot, maize was intercropped with soya beans. The third plot was put under maize and soya beans fortified with Biofix, a nitrogen fixing inoculant. A pure stand of soya beans was planted in the fourth plot. In all the four plots, compost manure and some fertilizer were incorporated in the treatment and lime added to reduce acidity. The fifth plot was treated in the conventional way with local maize and limited amount of fertilizer. No manure was applied.

The demonstration plots were set up in farms owned by 50 selected farmers who were trained and in turn trained other farmers. During the second year, plots previously put under soya were rotated with maize.

Legumes are food and fertilizer factories

John Mukalama and Wycliff Waswa ** | Small-scale farmers

in Kenya have low crop yields partly due to low levels of available plant nutrients in the soil, especially Nitrogen. Although it is the most abundant part of air around us, it is in a form plants cannot use. Fortunately, Nitrogen from the air can be converted by leguminous plants like beans into a form that is available and usable by plants.

Legumes fix nitrogen from the atmosphere

Legumes capture nitrogen from the atmosphere and convert it into plant protein, which helps build soil fertility. Legumes differ in terms of their abilities to fix Nitrogen and how they adapt to environment and the pest and diseases that affect them. Grain legumes planted in Kenya include soya beans, climbing beans, bush beans, green grams and cow peas as well as forage legumes such *Desmodium sp.*, *Leucaena leucocephala*, *Calliandra californica*, *Tephrosia*, *Sesbania sesban*, among others.

The most preferred fertilizer used by Kenyan farmers is Diamonium Phosphate (DAP) to provide nitrogen and phosphorus, which are inherently low in Kenyan soils. When repeatedly used, the fertilizer increases the soil acidity over time, which can result in less phosphorus in the soil, decreased microbial population and general reduc-

tion in legume yields over time.

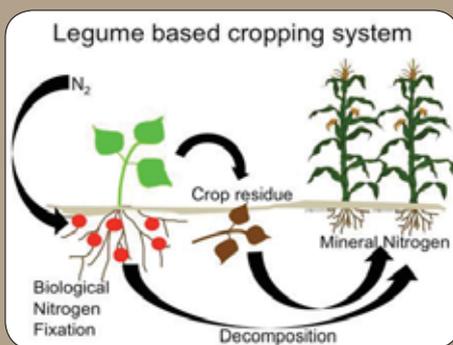
In Kenya, however, there is a huge potential of legumes to restore soil fertility, especially in replenishing nitrogen. Experimental results from the International Centre for Tropical Agriculture (CIAT) in collaboration with International Institute for Tropical Agriculture (IITA) indicate that soya beans can fix up to between 46-140 kg of nitrogen per hectare (18.4- 56kg per acre), while climbing beans can fix 46-80 kg of nitrogen per hectare (18.4- 32kg per acre).

They increase crop yields

The amount of nitrogen fixed is so much that it becomes unnecessary to use chemical fertilizer for top dressing a cereal crop planted in the same land the next season, which saves farmers money. For example, rotating soya beans with maize in Butere Western Kenya has shown an increase in yield from 1.2 tons per hectare (0.5 tons per acre) to 2 tons per hectare (0.8 tons per acre), which represents over 67% yield increase.

Use inoculants

Inoculating legume seeds with specific rhizobia (such as biofix) strain can also enhance nitrogen fixation. Farmers in Western Kenya intercrop legumes with



cereal crops in many different ways: One line of legume to one line of maize or rice, or sorghum, or two lines of legume and two lines of maize famously called mbili mbili method. Others simply rotate cereals and legumes seasonally.

Legumes control striga weeds

Adding legumes to farming systems has other benefits. These include management of the striga weed through what is called suicidal germination (they initiate striga to germinate but it later dies). Legumes also improve organic matter and water retention of the soil after decomposition. They also help break disease and pest cycles. Trials carried out in Western Kenya by CIAT have shown that intercropping soya beans and *Desmodium* with maize, rice, sorghum and sugar cane significantly reduces striga and consequently increases yield.

**John Mukalama and Wycliff Waswa are scientists with CIAT-TSBF.

Trees generate money if well managed

Trees on a farm not only help us reduce greenhouse gas emissions that contribute to global warming, but also generate fuel wood and timber for household use and for sale. Some trees improve soil fertility, provide high quality fodder for livestock and are rich in nectar for bees.

Caroline Nyakundi | With the increasing Kenyan population, the demand for fuelwood and wood for construction has continued to increase over the past two decades. The demand for land for agriculture has also risen significantly, although only 20% of the land in the country is suitable for crop farming. As a result, cultivation of natural vegetation has suffered immensely and Kenya is now forced to import hardwoods (sometimes illegally) that are excellent for timber, furniture and carving industries.

Kenya's forest cover has increased significantly from 1.7% in 2002 to 5.9% in 2012. This is still below the United Nations' recommendation of a minimum of 10% forest cover. Farmers have played a key role in planting indigenous and exotic trees in their farms. This is referred to as agroforestry. Agroforestry is a system in which farmers combine trees and shrubs with crops. The combination of agriculture and forestry helps farmers use their land in a more diverse, productive, profitable, healthy, and sustainable way.

The Kenya Forestry Research Institute (KEFRI) recommends varieties of high value trees that grow well with crops without causing any harm when planted on the same piece of land. These include trees and shrubs like *Grevillea robusta*, *Sesbania sesban*, *Crotalaria*, *Calliandra calothyrsus* and *tephrosia*.

In TOF No. 107 of April 2014, we highlighted the benefits of agroforestry and how farmers



Grevillea robusta boundary planting in a farm.

in Mwingi have realized better production in rearing bees and silk moths through planting acacia trees on their farms. In this issue, we highlight how farmers can grow *Grevillea* tree species on their farms.

Grevillea – a high value tree with many benefits

Grevillea robusta originated from Eastern Australia and is widely planted in high and medium potential zones, up to 3000m above sea level. It grows well in medium loam or light sandy soils but doesn't in water logged soils. It is very common in farms in the central highlands in areas like Embu, Meru, Muranga, Thika and Kiambu.

Peak flowering is between January and February in South Western Kenya, and between September and December in central parts of Kenya. The tree is pollinated by birds, bats or insects. Its seeds mature after 2-4 months and can be harvested from March-June or December - February in South Western and Eastern regions respectively.

How to sow and germinate the seeds

- Broadcast the seeds thinly and evenly on a well-prepared seedbed (containing sand or a mixture of sand and soil) and covered with a thin layer of sand/soil. It is not necessary to treat the seeds before sowing.
- Spread light mulch (dry grass) over the seedbed to keep it moist.
- Water the seed bed regularly (morning and evening) and checking daily for any emer-

gent seedling. Seeds germinate within 8-20 days. The expected germination rate is between 50 and 70%. Remove the mulch immediately germination starts.

- When the young seedlings are large enough to handle (3-4 leaves) transplant them. Seedlings are transplanted to soil mixed with well prepared

compost. Seedlings are planted out when they are 30cm tall (4-6months).

How to collect the seeds: The mature yellow brown fruits (follicle) are collected from the crown by spreading a net or canvas under the tree and climbing to hand pick the fruits or cutting the branchlets with ripe capsules.

Seed extraction, cleaning and drying: Capsules are sun dried by spreading on fine wire mesh/screen, turning regularly and threshing lightly to release seeds. Seeds are light and therefore care should be taken when threshing to avoid damaging them. After extraction, the seeds are cleaned using sieves, hand sorting and winnowing. Seeds are sun-dried to required moisture content (<10%) by spreading in thin layer and turning regularly to avoid overheating.

Seed weight: There are 70,000-100,000 seed per kilogram depending on their origin and the climatic conditions of the ripening year.

Seed storage: Seeds can be stored in airtight containers in cool dry place for up to 2 years without significant loss of viability.

Important uses of *Grevillea robusta*

Grevillea robusta stems are useful for timber (furniture, plywood, veneer) and poles/posts. Other uses of the tree include:

- Production of nectar for bees
- The combination of *Grevillea* leaves and manure makes good organic material for improving soil fertility.
- Branches are useful for firewood.
- Leaves can be used as mulch for crops.
- The trees act as windbreaks and provide shade to crops.
- Leaf litter can be used as bedding material in livestock zero-grazing units.
- Ornamental – they provide beauty where they are planted.
- Can provide fodder for livestock during the dry season.

In the next issue we continue with how to grow *Grevillea* trees.

For certified tree seeds and seedlings contact KEFRI on Phone no. 0722 322 140.



Photo: Nezar Kingly

Grevillea trees grow very fast if planted the right way.

Local names of *Grevillea robusta*

- Silky oak (English)
- Mukima, Mubariti (Kikuyu)
- Bolebolea (Luo)
- Wakhuisi, Eshichuma (Luhya)
- Kapkawet (Nandi)
- Omokabiria (Kisii)

In the first year, farmers could clearly notice the difference in various treatments of the demonstration plots. In plots intercropped with certified maize seed and soya beans, the yields were much higher with most of the plots recording between 90-100kg of maize. In fields with pure soya inoculated with biofix, an average of 90kg of soya was harvested while in those put under soya alone 70-75kg of the beans was harvested.

Rotation with soya increased yields

A significant finding was that in all plots where maize was rotated with soya, the maize yield increased by an average of 20kg. In the fifth plot, which acted as the control, maize yields remained the same with an average yield of 10kg or less in all the demonstration sites. This showed that planting soya as an intercrop or in rotation with maize significantly increased maize yield.

Farmers preferred compost

Although farmers participating in the trials were encouraged to use lime in order to restore soil acidity, most of the farmers found it difficult to access lime from agroveterinary shops. Instead, they opted to use compost that was readily available in their homesteads. The positive effect of repeated use of compost begun to show slightly in the second year, and more prominently in the third year when crop yields noticeably increased.

Increased earnings for farmers

Kenneth Madaga, a farmer in Mbale who has a demonstration plot says that he has noticed a remarkable change in crop yields in his 1 acre farm. Previously he only managed to get 8 *garogoros* (a 2kg tin used to measure cereals) of maize from a ¼ acre portion of farm where he used to grow maize. Last year he harvested 3 bags of maize (each 90kg) from the same portion of land. He has also diversified his farming activities and has planted indigenous vegetables from which he makes Ksh 300 everyday. Mr. Madaga also has 75 bananas groves in the farm from which he makes Ksh 3000 every month. From his farm proceeds he has bought 2 dairy cows and put up a tree nursery.



A pure stand of soya beans. The beans have a high nutritional value, and are rich in proteins, potassium, calcium and magnesium.

"All I can say is that the project has benefited me a lot. I never thought I would be where I am now but I have this project to thank for all I have achieved," he says.

Like many other farmers, Mr Madaga says he did not know that the previous low crop yield was caused by soil acidity. Now he incorporates well composted manure into the soil before planting all crops. Every year, he rotates his maize crop with soya beans, which has continued to increase soil fertility in his farm.

Esther Nego Olindo, another farmer from Gisambai Farmers Group in Hamisi Sub-County, used to harvest 8 bags of maize from her 1-acre plot of maize in 2010 but after undergoing the training offered by ROP, she started using organic manure and intercropping soya with maize.

Farmers now use certified seed

She also learnt the advantages of using certified seed and planting early before the rains. Through these practices she has doubled her maize yield to 16 bags in the same one-acre of land. She has also diversified her farm activities and now grows indigenous vegetables and bananas. Through her earnings, she has acquired 2 dairy cows, which provide her with milk and farmyard manure as fertilizer.

Ms Olindo has increased her savings in the farmers group and this has made her financially independent. She is now a major supplier of indigenous vegetables to hotels and markets in Hamisi, Mbale and even Kisumu. The high demand for indigenous vegetables has made it possible for her to sell indigenous vegetable seeds to other farmers throughout the year.

Soya beans improve nutrition

Besides increasing the production of other crops such as maize through nitrogen fixation, the introduction of soya beans has had a great impact in household nutrition in the entire region. Ms Avaya says that one of the objectives of introducing soya beans was to use its rich source of nutrients to reduce malnutrition especially among children in

most of the farm families, which had limited source of proteins.

Farmers benefit from value addition

Farmers have been trained how to make soya flour and use it in food preparation. Gladys Avedi, a farmer in Vihiga says that after harvesting soya, she incorporates the residue into the soil. Later, she roasts the beans and grinds it into flour for making soya tea. Like many other families, she also mixes soya beans with maize or amaranthus and mills it into protein-rich flour that is used to make porridge, chapatis or even mandazi (buns).

The project has taught farmers other soil conservation measures such as making terraces, strip cropping and use of cover crops to increase and maintain soil fertility. Farmers have also been taught how to make savings from their earnings to enable them meet various needs such as paying fees, labour and even buying inputs.

Vegetables: A money spinner for Butere mother

Eglay Amakobe Okello is a mother of eight children living

on a 4-acre farm in Butunyi sub-location Butere Sub-County. She belongs to Judea Womens' Group. Eglay used to plant sugarcane, maize and beans, and in the year 2000 Ms Okello's group joined the ROP training programme, which changed her farming.



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Poor crop yields

Before joining ROP, Ms Okello used to earn Ksh 10,000 from sugarcane after 18 months. Further, she could only get 1 bag of maize and her family literary starved.

After the training by ROP, she engaged fully in indigenous vegetable production. She grows spider plant, amaranths, cowpea, crotolaria, pumpkin, corchorus, black night shade and Ethiopian kales. The indig-

Increased income

Today Eglay's farm is a major source of indigenous vegetables, which she sells along with seeds. The ROP project supports her with marketing. She supplies them to local markets, supermarkets, schools, hotels and neighbours. With income from vegetable sales, she is to educate her children. One of her daughters is now attending a local university. She has put up a house and her family diet has improved.

Bought dairy cows

Mrs Okello is able to make Ksh 20,000 every three months, which she uses to pay fees for children. Last month, she made Ksh 35,750 from indigenous vegetable sales. Through savings with the ROP project, she has bought 3 dairy cows and now sells milk to her neighbours. Ms Okello makes high quality compost that has improved the soil and crop yields. Many of her neighbours have learnt from her and have started indigenous vegetable gardens.

"The ROP project has transformed my life completely. I would not be where I am today if I had not joined the project," she says.

Cleanliness is key to keeping away mastitis

I have tried treating my cows for mastitis infection but so far I have been unsuccessful. I have administered vetagenta, Colvasone and even pin strip treatment but the udder remains as hard as a stone. Please advise.

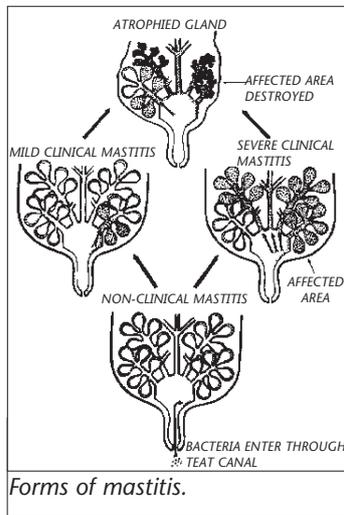


Dirty dairy cow: Dairy cows housed in dirty sheds easily contract mastitis.

Mastitis is a swelling of a dairy cow's udder caused by several strains of bacteria mainly of the streptococci and the staphylococci family. Mastitis is one of the biggest challenges facing Kenyan dairy farmers today. This is mainly due to the conditions under which many small-scale farmers keep their animals.

In many farms it is common to see dairy cows housed in very dirty sheds where they are forced to lie on their own droppings mixed with urine and turns soggy especially during the rainy season. When the dairy cows live in these conditions, it is easy for the bacteria to gain access to the cow udder through the teat canal especially when the animals lie down to rest.

Mastitis infection causes economic losses of up to 40 per cent in milk production, which is a big loss to the farmer. There are very high chances of infection unless utmost care and hygiene are put in place and continuously observed.



Forms of mastitis.

Clinical signs of mastitis

There are three clinical forms of mastitis:

Sub-clinical mastitis: This type of mastitis is caused by a bacteria called *streptococcus agalactiae* that is found in dairy cows. It cannot be easily detected because no sign of infection can be seen through visual observation. It is only a laboratory test that can determine if a cow is infected. This type of mastitis is often detected on milk meant for export because the milk has to undergo mandatory laboratory tests before it can be exported. Milk containing the bacteria is rejected.

Mild clinical mastitis: In this type of mastitis, the animal

shows distinct changes in the udder which can be detected by touching. The udder becomes hard in one or more quarters of the udder. There are also changes in the quality of the milk coming from the infected animal. Farmers can also detect this form of mastitis by using a strip cup (picture). The milk from such a cow is watery with abnormal colour, which can be pinkish or yellowish due to blood staining. Flakes or clots in the milk can be noticed by the strip cup test.

Acute or severe clinical mastitis: When this type of mastitis affects a dairy cow, the udder is swollen, hard and painful when touched. The milk from the infected cow is yellow in colour with blood clots. It may also appear yellow-green with a foul smell especially if the infection is caused by *Corynebacterium pyogenes* - a pus forming bacteria. The teats may also show signs of injury. The cow produces less milk that is watery or grey in colour.



A strip cup

How to prevent mastitis



Cow udders should always be washed with a clean cloth before milking.

Mastitis can only be controlled through proper dairy cow management.

Dairy farmers can take the following preventive measures:

- Infected cows should be milked last.
- Thoroughly wash your hands before and after milking each cow (this prevents transfer of the bacteria from one cow to another while milking).
- Hot water mixed with a disinfectant should be used at all times when milking.
- A separate clean cloth for washing the udder should always be used to wash the

udder before milking.

- The first jet or stream of milk coming out of the udder while milking should always be directed to a container with a dairy disinfectant (do not let any of this milk to spill on the floor of the dairy as it may spread the mastitis-causing bacteria).
- Wash milk container and other dairy equipment thoroughly and continuously.
- Change your cows' beddings or clean the floor with water daily to keep the cow udders clean.
- Do not treat the infected animal yourself. Always allow a qualified veterinarian to do it.

A simple white fly control method

My tree tomatoes are infested by white flies. What can I do to protect them?

You can control white flies by simply hanging yellow polyethylene paper around your fruit orchard at least 1 to 2 metres high on the fence around the orchard. To trap them on the polyethylene paper you can put any sticky substance e.g. wax on the surface of the polyethylene paper. The white flies will be attracted to the yellow colour but they cannot leave as they get stuck once they land on the plastic paper. Alternatively you can eradicate the white flies in



White flies

the already affected fruit trees using hydrogen peroxide solution. Buy the peroxide from any chemist, put 20ml hydrogen peroxide in a 20-litre knapsack full of water and spray the trees ensuring you reach all the leaves. You can add 20ml of liquid cooking oil in the solution and spray. You can harvest fruits any time after spraying.

Why do bees occupy hives hung high up a faster than those placed on the ground?

Bees move in swarms at a height of 8 -10 metres and easily occupy hives placed at that height. Bees also occupy hives placed 1 - 2 metres high if the bees spot them. Beekeepers can

smear hives with propolis which increases chances of hive occupation. Align the hive in the bees' direction to improve chances of hive colonization. If a hive takes too long to be occupied, bring it down then clean it with leaves from *ocimum killimandscaricum* (*mutaa* in Kikamba).

TOF Radio answers your questions

TOFRadio: TOFRadio is broadcast on Milele FM at 8:30pm on Tuesday, and KBC on Thursday at 8:15pm. Tune in and listen to farmer experiences and expert advice on agribusiness and eco-friendly farming methods. On this page, we respond to some of the issues raised by farmers in their correspondence to the radio program. Send your questions and comments via SMS 0715 916 136.

Farmers need to adapt to climate change

Musdalafa Lyaga and Elias Ndiritu | In the past, the farming calendar was much easier to predict. From certain types of insects or ants, the farmer could tell when to plant, what to plant and even the health of the soil. Certain birds, frogs and even small animals used to signal the advent of the planting or harvesting season. But now the farmers' allies are being replaced by destructive pests in the farms.

Plant drought tolerant crops

For farmers, it's becoming more difficult to know when to plant, or even what to plant. Already this year first season rains have failed in many areas yet again. Farmers can expect increased temperatures and more frequent droughts, floods and storms. As weather patterns increasingly becomes harder to predict, farmers need to understand climate change, and plan for the changing and variable yields, water shortages, and possible increases in pests and diseases. They also need to plant crops that are either drought tolerant or those that can survive in flooded conditions.

Growing maize no longer sustainable

Indeed the argument has been that the majority of the population will have to adapt to different diets especially those from crops that require less rain and those that are drought tolerant such as millet, cassava, sorghum among others and those that mature early such as include bananas, groundnuts, cowpeas to reduce reliance on maize, which is the main staple in Kenyan diet and which requires a lot of water to grow well.

Farmers are now realizing that reduced yields and changes in rainfall patterns with longer dry seasons and heavier rainfalls that destroy farms are partly due to climate change and the rise in the world's temperature or global warming. Climate change therefore has huge implications for food security, rural livelihoods and poverty reduction.



Unpredictable weather patterns brought about by climate change have seriously affected crop production and farmers' incomes.

Indicators of global warming

The effects of rising temperatures are already being felt across the world, which has serious implications for our health, environment and economy. These include:

- Changes in rainfall patterns with more severe droughts incidence.
- Increased likelihood of extreme events such as flooding, hurricanes.
- Widespread vanishing of animal populations, following widespread habitat loss for feeding of the animals.
- Increased spread of diseases such as malaria in previously cold areas that are now warming up.
- Unpredictable and extreme weather in our environment with delayed onset of the rainy season.

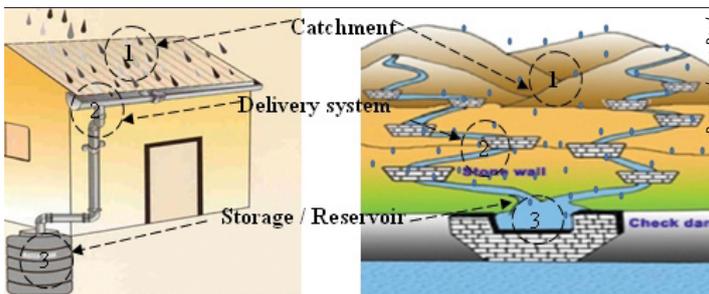
What can farmers do?

Farmers need to combine best traditional practices with improved research methods

such as planting improved drought tolerant and fast maturing crops. Scientists also working on improving crops such as maize which are drought tolerant and early maturing. Other measures which can help the farmer adapt to the changing climate include restoring soil fertility by planting trees and use of composted manure and organic fertilizers, conserving and harvesting rainwater and good water management practices like use of drip irrigation and other other organic and eco-friendly practices.

What can the community do?

Many climate change adaptation approaches require collective action. Communities should have collective strategies for coping with climate change like soil conservation, planting trees up with strict measures to protect the environment. If we plant more trees starting today, we shall get more rainfall in five years time and the rising temperatures will be controlled greatly. ■



Farmers can adopt this simple water harvesting methods as good water management practice.

 farmers forum

0717 551 129 / 0738 390 715

Chicks for sale: Month-old chicks from Kenchic. Call 0729 358 593, Narok.

Breeding buck for sale: A five way cross Toggenburg, indigenous Nubian and German Alpine, 5 month-old. Call Carboytto 0722 943 214.

Chicks for sale: Quality day old chicks for sale. Call 0719 808 222

Metal silo for sale: We make metal silos for cereal storage. Call 0720 409 161.

Geese for sale: I have geese for sale to interested farmers. Call 0721 580 952.

Apple seedlings: I have 3 varieties of apples for sale to interested farmers. Call 0722 638 937, Kinangop.

Trees seedlings for sale: Indigenous tree seedlings, *Prunus Africana*. Call 0722 849 919.

Organic foliar fertilizer: We sell imported organic foliar fertilizer (KEPHIS certified). Call 0726 754 014 (office hours, week days).

Land for sale: 6 acres, high potential agricultural land in Nyahururu, near Laikipia university. Call 0723 899 340 or email: charmmathenge@gmail.com

Groundnut seeds wanted: We need groundnuts seeds, runner and bunch varieties. Call Ivan 0722 264 835.

Organic foliar fertilizer: We sell imported organic foliar fertilizer (KEPHIS certified). Call 0726 754 014 (office hours, week days).

Fruit tree seedlings: We have fruit tree seedlings for sale. Call 0721 720 242.

Dairy goats wanted: Do you have hybrid Toggenburg goats, which are registered? I would like to order them. Call Alice Njonjo on 0704 771 130.

Dairy goat for sale: I would like to sell a Galla/indigenous cross breed buck. Contact me on 0710 19 61 72.

Fleckvieh bull for sale: I have a 9-month Fleckvieh bull for sale. Interested farmers can contact me on 0726 434 521.

Sangi potatoes: I have 3 acres of certified sangi potatoes for sale to interested farmers to be ready in October 2014. Godfrey Ndirangu. Call 0722 892 510.