



Dear TOF reader,

Thank you for partnering with Biovision Africa Trust in the production, distribution and postage of TOF magazine. Subscription to each TOF magazine edition is KES. 20. Options for subscription are quarterly, biannual and annual, sent from the comfort of your home to Mpesa Pay bill number 833589. The bank name and account number are Commercial Bank of Africa, Account number 6681320068, TRM Branch.

Your partnership is invaluable as we seek to increase the monthly copies from 34,000 to 40,000 to meet the ever increasing demand for this publication. Empowering small-scale farmers with ecologically sustainable agricultural information and knowledge is a big step towards the attainment of food security in Africa.

Thank you for your continued partnership!

Choose right maize varieties for short rains

Peter Kamau | Every year, we advise farmers on maize varieties best suited for the short rains. Although the rains in most parts of the country are scanty, there are maize varieties that can do well with limited rains.

Maize flour is in short supply across the country due to acute grain shortage and the demand exceedingly high due to maize being the staple crop in most Kenyan homes. The imported maize hardly reaches Kenyan rural areas. A few regions that

depend on relief food, especially in Northern parts of Kenya might have a share of the imported maize.

However, many families in other parts of the country will have to depend on what they grow for their food security. Farmers, therefore, need to take advantage of the short rains that begin from October to December to grow maize varieties that take a short period to mature. Below are some of the early maturing maize and drought tolerant varieties which can do well in different altitudes during the short rains season:

a) Medium altitude varieties

Most of the medium altitude areas seldom receive adequate rains from the beginning of the long rains season (March to May). Farmers whose maize did not do well can replant during the coming short rains. The following are some of the maize seeds varieties suited for this season and the various suppliers:

Kenya Seed Company

Varieties: H513, H515, H516, H517, H518, H520, H521, H522.

Western Seed Company

Varieties: WH507, WH505, WH403, WH402.

African Seed Company

Varieties: SC Tembo 73, Punda Milia 529



Photo: IN

A farmer planting maize seeds

East Africa Seed Company

Variety: KH 500-43A

b) Low altitude areas

Elgon Kenya Limited Ltd

Varieties: Prestige 02 WE 1101

African Seed Company

Variety: SC Sungura 301

East Africa Seed Company

Variety: Tosheka MH401

c) Dry land varieties

Kenya Seed Company

Variety: DH02, DH03, DH04

FRESHCO Seed Co.

Variety: KDV-6, KDV-1

KALRO: Katumani Composite

Note: It is important for all farmers to increase their farming acreage if they have adequate land for maize production. Besides the sale of dried maize many farmers can also get an extra income by selling the crop as green maize.

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

Dear farmer,

Last month, we attended an international agricultural exhibition held at the Kenyatta International Convention Centre (KICC), which showcased various products and technologies developed by local and international companies. Most of these companies were from the US, Europe, Middle East and the Far East Countries.

What impressed us most about the trade fair was that the world is slowly shifting to sustainable agriculture especially organic farming. More than a decade ago when we started *The Organic Farmer* magazine, there were very few organic remedies that we could recommend for control of pests, diseases and even fertilizers in the local market.

However, some local companies have noticed and embraced a niche area for organic products. Various agribusiness outlets have started to stock organic products unlike in the past when only conventional farming products filled the shelves. An achievement is that most companies participating in the trade fair sought local partners to market most of the organic products they manufacture. We hope that, more local entrepreneurs will take up these business opportunities and stock organic products for our farmers.

Certainly, a positive silent revolution is taking place in global agriculture where organic farming methods are slowly substituting conventional farming techniques. The organic products and solutions are gaining popularity, especially with the increased awareness of the harm that chemical products can cause to people, animals, soils and the environment. The increasing demand for safe food and environmentally friendly farming methods will spur the development of more organic solutions to agriculture. This makes it urgent for governments to embrace organic farming policies and an ultimate implementation of the same in the near future.

In Kenya, Biovision Africa Trust and other organizations with shared values continue to create awareness on the benefits of organic farming methods. However, our policy makers have lagged behind in supporting this initiative mainly due to vested interests. For example, there has been a lot of money changing hands as international companies fight to be awarded lucrative tenders for chemical fertilizer imports into the country.

In such a scenario, very little effort is made to encourage farmers to adopt sustainable methods that can help restore soil fertility in their farms and wean them off expensive chemical fertilizers, which continue to damage our soils.

We hope all stakeholders in the agricultural sector, will take up the emerging opportunities especially in organic agriculture sub-sector to ensure the country is able to produce safe food for all in a safe environment not only for us but also for future generations.

In this issue

Potato pest 2&3



Health benefits of gooseberry 5

Water harvesting 6

TOF on the web

theorganicfarmer.org
[facebook.com/theorganicfarmer](https://www.facebook.com/theorganicfarmer)
twitter.com/TOFMagazine

TOF partners on the web

biovision.ch
infonet-biovision.org
icipe.org

TOF Radio
KBC Thursday 8.45 pm
Mbaitu FM Friday 8.30 pm

Let us work together to control potato pest

Urgent interventions are needed to stop the spread of Potato Cyst Nematode (PCN). It is possible to control the pest if all stake holders including farmers, researchers, the government and donors can work together.

Peter Kamau | The latest findings on the level of infestation of the deadly Potato Cyst Nematodes (PCN) (*Globodera rostochiensis* and *Globodera pallida*) in potato growing areas in Kenya (TOF No.145, June 2017) is disheartening and paints a bleak future for potato production in Kenya. Although the pest is hard to eradicate once it has established itself in the soil, the government, potato growers and other stakeholders need to work together to draw a strategy on how they can control it especially in the few areas not affected by the pest.

But before we do this, there is a need for farmers to be sensitized on the pest in order to know how to control and stop its spread to areas that are not yet affected. In this issue we show farmers how the pest is identified and ways they can reduce its spread in their farms:

Identification

Potato Cyst Nematodes (*Globodera rostochiensis* and *Globodera pallida*) are tiny, thin worms that live in the soil they cannot be seen with the naked eye unless they are placed against the light. They are usually one millimetre in length and are cylindrical in length (they resemble tiny earthworms). PCN Cysts are the size of a pin head and they are very difficult for farmers to identify them especially without the assis-

tance of qualified nematologists or trained field technicians.

The pest is indigenous to Peru, South America but it has spread to other parts of the world such as Europe where potatoes have been cultivated for thousands of years. However, in Europe PCN cannot spread because there are strict restriction and quarantine measures that have been put in place.

In Africa, PCN has been identified in Northern Africa countries such as Morocco, Algeria, Tunisia, Libya and Egypt, Sierra Leone and South Africa. In all these countries, the pest is quarantined. It is not easy for farmers to identify the pest in their potato farms. Potatoes affected by the pest show similar symptoms to those affected by other pests diseases. These symptoms include stunted growth, yellow leaves that may be wilted. Potato tubers in infested farms are very small in size while others do not show any symptoms at all. However a keen look at plants affected can reveal the following symptoms;

- The root system is bushy with many branches.
- In severe cases of infestation, the root system is reduced drastically.
- Infested roots have a dark colour.
- Infested plants have tiny tubers
- Some of the infested potato plants do not set any tubers.

Damage

Potato Cyst nematodes cause huge losses to farmers. Potato farms with high levels of infestation have recorded losses of between 80-100 per cent of their potato crop. Research has established that farms with high infestation (e.g. where soil samples show 20 PCN cysts for every 100g



A potato plantation

of soil) can lose up to 2 tonnes of potatoes per hectare (about 1 tonne of potatoes per acre).

How to control PCN

The most effective method for control of the pest from spreading is to stop growing and even transport of potatoes from areas where the pest has been identified. Another measures that can be taken to control the pest is to ensure that all areas not affected by the pest are identified and set aside for future potato production.

Potato growers and even other farmers can play a very big role in their own farms by setting aside a portion of their land for future potato production. The farmers can then use this virgin land when they get certified seeds to grow potatoes. This calls for a big awareness campaign where farmers in all potato growing areas are sensitized about the pest and measures they need to take to prevent its spread.

Crop rotation

Farmers can also be trained on how to practice crop rotation. This entails planting other crops in the land that has been previously used to grow potatoes. This will require the planting of crops that are not in the potato family such as maize, beans, cabbages, peas, onions, etc.

Where crop rotation is practiced, farmers should ensure that no potatoes are planted for up to 7 years. In temperate coun-

tries where PCN was discovered many decades ago, farmers practice rotations of 5-7 years by which period PCN infestation are reduced. However, it is not yet known if the same can work in the tropics.

Resistant varieties

Research needs to be conducted to come up with potato varieties that are resistant to PCN. This is one challenge that research institutions and university need to take up to ensure new varieties that can withstand the pest are developed.

However, the government has to play a key role in the PCN campaign. One of the steps it can take is to identify pest free areas in the country and try to keep them free of the pest through quarantines. Such land can be used in the future for seed potato production.

Provide certified seed

Another measure that can be effective is the increase in production of certified seed especially of popular seed varieties such as shangi which has been blamed for the rapid spread of PCN due to its widespread exchange and use among farmers in the country. Lack of certified seed is one of the reasons that PCN has been able to spread across the country in a short period of time.

For more information on potato pest and diseases <http://www.infonet-biovision.org/PlantHealth/Crops/Potato#simple-table-of-contents-3>



The Organic Farmer is an independent magazine produced monthly for the East African farming community. It promotes organic farming and supports discussions on all aspects of sustainable development. The articles in the *The Organic Farmer* do not necessarily reflect the views of ICIPE nor Biovision Foundation or Biovision Africa Trust (BvAT).

License This work is licensed under a Creative Commons Attribution-



ShareAlike 3.0 Unported License.

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

Chief Editor Venter Mwongera

Editor Peter Kamau

Administrator Lucy W. Macharia, 020 863 21 86

Editorial Advisory Board Dr. Sunday Ekesi (ICIPE), Dr. Nguya Maniania (Consultant), Henry Neondo (ASNS), Dr. Jane Njuguna (KEFRI), Dr. Joseph

Mureithi (KALRO), Dr. Henry Kiara (ILRI), Dr. David Amudavi (BvAT), George Nyamu (KENAFF), John Njoroge (KIOF), William Makechi (farmer, Kakamega), Regina Muthama (farmer, Machakos) and Rt Snr Chief Josiah Arende (farmer, Rongo).

Layout James Wathuge

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

www.biovision.ch



Ways to control stubborn *Tuta absoluta* pest

Tuta absoluta is an invasive pest that has become very difficult to control since it has developed resistance to most chemical pesticides in the market. However, Integrated Pest Management (IPM) methods have proved effective in the control of the pest.

Joan Mukiri | The tomato leafminer *Tuta absoluta* is one of the most destructive pests in tomato production. It has been a serious threat in tomato production resulting in almost 100% crop losses in some regions. The pest has been a stubborn one to eradicate in many countries all over the world. It has recently invaded East African countries including, Uganda and Tanzania and it is causing huge losses in tomato production in Kenya. The pest is spread by wind from one plant to another.

Host range

Tuta absoluta also affects other crops in the solanaceae family (tomato or tomato family). These crops include: Potatoes, eggplants/brinjals, tobacco, sweet pepper, black nightshade and non-cultivated plants from the same family such as common thorn apple (*Datura stramonium*). The pest has also been reported as a secondary pest in beans.

Management of *Tuta absoluta*

Below are various ways of controlling *Tuta absoluta*:

a) **Chemical Control:** The control of this pest is mainly by use of insecticides. Several insecticides have been used and there are active ingredients that have been effective against *Tuta absoluta* larval infestations; Imidacloprid, cartap, permethrin, abamectin, Indoxacarb and spinosad.



Damaged fruits



Damage on stems

However, frequent and intense insecticide applications led to resistance. Many insecticides are not compatible with natural enemies and therefore kill many predators and parasitic wasps. Other active biopesticides such as Chlorantranilipro (trade names Renaxypyr®, Coragen®) from the real IPM is an effective insecticide which is compatible with natural enemies.

b) Non-chemical control

Neem oil (Azadiractin) can be used as a systemic and contact insecticide during low infestations of *Tuta absoluta*. Additionally, *Bacillus thuringiensis* together with the neem oil for low to medium infestations. Dustable sulphur can be used as a repellent to prevent oviposition (egg-laying) on the plants. On the other hand, UV insect attractants are recommended to attract the moths in the greenhouse when using yellow sticky traps.

c) Monitoring

Monitoring of pest is done using sticky traps or water traps together with a pheromone bait (lure) to attract the pests to a trap. A fresh lure is put in the trap every 4-6 weeks.

The Russell IPM supplies these pheromone lure traps as well as the Kenya Biologics Company that markets their traps as Tutatrack®. These traps should be placed about 40cm above the ground since the moths fly low. Light traps can also be effectively used for low to medium infestations.

d) Mass trapping

This is possible by making use of pheromones to lure *Tuta absoluta* moths into the trap. This works better in greenhouses

than in the open-field. This is because greenhouses allow only a little movement of the moths in and out of the plants. In mass trapping, more lures are used than in monitoring.

Use of lures to kill pests is a safe and environmentally friendly measure and also a constant control of pest over a long time. This is because it targets specific locations leaving lots of area pesticide-free for the beneficial insects to develop. This should always be incorporated into an IPM strategy. An average of 30-40 pheromone baited traps should be used per hectare.

e) Biological Control

Biological control by use of



Stickytrap

natural enemies and their conservation is an effective method. Use parasitoids, predators (predatory bugs) and entomopathogens. Predators such as the *Nesidiocoris tenuis* Reuter, prey on *Tuta absoluta*. Some predator adult can consume more than 100 eggs daily and these can be able to manage the *Tuta absoluta* populations at field conditions. *Nesidiocoris* is a bug that is indigenous to Kenya and is also commercially reared for the management of *Tuta absoluta*.

The egg parasitoids *Trichogramma achaeae* can reduce *Tuta absoluta* damage by 91% when

released at a rate of 75 adults/m² every 3-4 days. The use of the damsel bug *Nabis pseudoferus*, can reduce the number of *Tuta absoluta* eggs by about 96%.

f) Microbial control

Bacillus thuringiensis has shown satisfactory efficacy against *Tuta absoluta* larvae infestations. Even better, the *Bt* application can be combined with the release of natural enemies for better management of the pest. Weekly applications of *Bt* are recommended for effective control of *Tuta absoluta*. Entomopathogenic fungus such as *Metarhizium anisopliae* and *Beauveria bassiana* are also very effective in control of the pest.

g) Good Agricultural Practices (GAP) and Integrated Pest Management (IPM)

GAP and IPM are the best ways to manage this destructive pest. GAP involves incorporation of rotation with non-solanaceous plants, removing infested plants and debris after harvest (field sanitation), proper irrigation and fertilizer application, avoiding overcrowding of plants.

Pest management packages should integrate cultural, biological and chemical control strategies to successfully control *Tuta absoluta* in infested regions. Cultural practices such as optimizing of the greenhouse structure, use of double-doors and avoiding alternative hosts can go a long way in pest management in a greenhouse. Pheromone trapping should also be adopted for monitoring and mass trapping. Once the *Tuta absoluta* is observed on the traps, then preventive measures using *Bt* should be started and integrated with the release and conservation of predatory mirids. Finally, curative treatments with approved insecticides should be applied when one is dealing with high levels of *Tuta absoluta* outbreaks.

After harvesting of the last fruits, then the farmers should remove all the remnants of the crop. All the products can be easily accessed by farmers in the local agrochemicals.

For biocontrol agents (natural enemies or biopesticides) farmers can contact Real IPM Real IPM 0725 806 086

Russel IPM +44 1244 281
email: info@russelipm.com

For more information on tomato plant management <http://www.infonet-biovision.org/PlantHealth/Crops/Tomato>

Potato seed crisis threatens production in Kenya

Potato seed producers complain that they can no longer get clean material for production forcing potato growers to use commercial potatoes as seed, thereby spreading diseases and pests.

Peter Kamau | Joseph Mburu is a large-scale potato grower in Mau Narok. The father of 5 says that potatoes have been the main source of income for his family in the last 20 years. However, in the last five years his potato production has been going down; but he does not know the reason for the low yields. He suspects the problem could be due to poor soils and lack of certified potato seed.

Farmers recycle potatoes for seed

Whenever he needs to renew his seed, Mburu buys his potato seeds from his neighbours who maintain seed plots in their farms. But the seeds are not certified because many farmers in this region rely on farm saved seed for their planting material.

"I have a lot of experience in potato production but we do not know what has happened to the soils because we use enough fertilizers and manage the crop well. Diseases are not a problem here because we know what chemicals to use to control them," says Mburu.

Infected soils

Joyce Kishoiyan, another potato farmer in Entiani in Orkuto area in Mau Narok has stopped growing potatoes. "I think this soil is bewitched. I have tried growing potatoes here for the last three years but they wilt and dry up even before flowering. I have switched to growing peas, which now give me a good income. If I need potatoes for home consumption, I now buy from the few neighbours who may have them. This land is no longer suitable for potatoes," she says.

Lack of clean planting material

The story is the same for other farmers in Mau Narok, Sub-county. Although potatoes is the main crop that does well in Mau Narok, many farmers complain that the yields have gone down.



Women sort recycled potato seed at GK farm In Mau narok

Another major problem is lack of certified seed. Many growers say they have been forced to recycle ware (commercial potatoes) for seed because the government seed production units in KALRO, Tigoni and the Agricultural Development Corporation (ADC) cold storage facility in Molo no longer supply potato seed to farmers.

"The last time we got certified seed here was in 2014 which was donated by the African Wildlife Foundation (AWF) as part of its efforts to encourage farmers to stop the destruction of the Mau Forest," says Mr Kevin Machuka, an official of the Mau Narok Rural SACCO.

Mr Machuka says the foundation donated 240 bags of seed potato to seed producers and other for multiplication and sale to other farmers. The seed producers and farmers were expected to multiply the same

in a 1/4 – acre seed units in their farms after which they would sell to other farmers.

Ms Margaret Mungai, a potato seed producer says that although she benefitted from the donation, it was inadequate because farmers rarely maintain potato seeds especially when the market prices are good.

Seed producers cannot renew planting material

"They will sell everything, and then come to us for potato seeds during the planting season, creating acute shortages, which force many of them to plant ware potatoes as seed. Most of them travel as far as Nyandarua, Limuru and even Molo to look for potato producers who have seed," she says.

Ms Mary Wanja Mbugua who produces seed in her 10-acre farm says she has abandoned the venture due to lack of potato seed for multiplication. The government has to look for a way to restart the seed production programme because farmers are really suffering. If this is not possible then the County governments should allocate funds for potato seed production and even support farmers to produce seed," she adds.

Ms Wanja Mbugua, another seed producer in Molo says she has been growing seed potatoes for the last 12 years but, she has stopped seed production for lack of certified seed. "Farmers have been calling me from all parts of the country wanting to buy seed, but I can no longer get clean planting material from our main source in KALRO Potato Centre in Tigoni, Limuru where

I used to buy seed for multiplication. So I stopped production two years ago and hope to continue if they provide us with clean planting material," she says.

A survey by The Organic Farmer shows that all government potato seed production farms including the KALRO Potato Centre in Tigoni have no certified seed this year as all the material that had been produced last year were condemned by the Kenya Plant Health Inspection Service (KEPHIS) due to the presence of the Potato Cyst Nematode (PCN) and bacterial wilt in their basic seed production farms across the country.

The immediate former KALRO Potato Centre director in Tigoni Dr. Joseph Kabira says the crisis facing the potato industrial is as a result of structural failure on the part of the Ministry of Agriculture.

"As the director at the centre, I raised the issue of the threat posed by imported seed especially the threat of bringing into the country pests and diseases. But this warnings were ignored. The ministry continued giving permits for importation of potato tubers without following the protocols set up for such imports but they did nothing," he says.

"Unless the government moves fast," the industry, including the livelihoods of almost a million farmers who grow potatoes in the country faces a total collapse, he adds.

For more information on potato seed production <http://www.infonet-biovision.org/PlantHealth/Crops/Potato-Seed-Production>



Mary wanja, a potato seed grower in Molo shows the tiny diseased tubers in her potato seed farm

Try gooseberry for its many nutritional benefits

Gooseberry is an excellent source of vitamins A, B and C, as well as protein and phosphorus.

Tyson Wachira | Gooseberry, whose common name is Cape gooseberry, belongs to the solanaceae family (same family as tomatoes) and has the botanical name *Physalis peruviana*. Its species range from yellow to orange in colour, and they resemble a little tomato with a juicy pulp and has tiny little seeds. It was first cultivated in Europe before spreading to other parts of the world, where it was revered for its medicinal value. Gooseberries can be found growing in several parts in Kenya.

What are gooseberries?

There are different types of gooseberries which are normally classified according to their species. Some of these include the American species, (*Ribes hirtellum*), and the European one (*Ribes uva crispera*). Gooseberries can easily be found growing in different parts of the country. Once organically grown, they not only give good yields and profit to the farmers, but also have a great taste that suits the consumers' preference.

What are the specific health benefits?

Anti-inflammatory: Cape gooseberries are high in anthocyanins (members of flavonoid family of polyphenol phytochemicals that help the body to fight infections) which help to ease inflammation-pain, swelling, redness and also good for stomach disorders.

Antibacterial: Extracts of gooseberries in the studies kill a lot of the gram negative and positive bacteria including: *E. coli*, *Micrococcus luteus*, *staphylococcus*, *pseudomonas*, *Enterococcus*, many strains of *bacillus bacteria* and *borderetella bacteria*.

Antileishmanial and antiplasmodium: Cape gooseberries contain special steroids that in studies inhibit the growth of intra cellular microbes such as leishmaniasis and anaplasmosis.

Anti-Cancer: Studies reveal that these berries may have the ability to help with prevention of cancer. Some compounds in gooseberries have shown anti-hepatoma properties against liver cancer,



A fruiting gooseberry plant



Mature gooseberry fruits

lung cancer and leukemia. In addition to this, the cape gooseberries have a lot of anti-inflammatory chemicals, which are vital in curbing asthma.

Colds, flues and laryngitis: Cape gooseberries can be made into a tea, by simply taking a handful of dried berries and steeping in hot water. By taking this three times a day it helps with colds, flues and laryngitis.

Skin tumours: Gooseberry roots contain solanoside, glycosides and other compounds which are powerful agents for malignant skin tumors and carcinomas (Cancerous growth). And the stems and leaf extracts also work well for treating melanoma and squamous cell carcinomas.

Cholesterol: The cape gooseberries contain soluble pectin, a type of fibre that helps in lowering cholesterol. It in turn helps in the prevention of hypertension and other cholesterol related heart problems. In addition, gooseberries contain phytochemicals such as polyphenols, carotenoids and potassium which are effective in the management and prevention of hypertension.

Diabetes: The cape gooseberries contain lots of soluble fibre. It thus, can be made into tea which helps in the lowering of blood sugar, therefore helping in the management of diabetes.

Weight loss: Because cape gooseberries are very low in fat and calories, they can also assist in weight loss. This is because 11grams of cape gooseberries only contain about 50 calories.

Improves vision: Cape goose-

berry is rich in vitamin A and provides 14% of the daily requirement of vitamin A. vitamin A is good for eyes, prevention of cataracts including protection from macular degenerative diseases.

Neurological problems: *Physalis peruviana* (Cape gooseberry), has the power to control the movement of free radicals, thus helps in prevention of many diseases including neurological related disorders.

Boosts immunity: These berries are very rich in vitamin C, that fulfills 18% of the daily requirements. Having a profuse amount of vitamin C, it helps in enhancing the body's immunity.

Healthy liver: Scientific evidence has shown that gooseberries have the ability to protect hepatotoxins (like ethanol, paracetamol, carbon tetrachloride, heavy metals, ochratoxins, hexachloroclohexane, antitubercular drugs and hepatotoxicity resulting from iron overload. due the presence of antioxidants.

Skin and bone health: Cape gooseberry leaf juice is applied topically to treat skin inflammation. The herb is used in poultices for solving skin issues. Cape gooseberry is also used to improve bone health due its calcium absorption properties and high phosphorous content. It is also associated with the treatment of rheumatism and dermatitis.

Nutrients in gooseberries

Potassium: Cape gooseberries also contain abundant amount of potassium which helps in con-

trolling blood pressure levels. Potassium also plays the role in improvement of memory and proper cognitive development among children.

Vitamin C: Vitamin C is an antioxidant that prevents free radical that damage DNA and cell tissue. To get the most vitamin C out of fresh gooseberries, store the fruit in a cool dark place and use the berries within three to four days.

Dietary fibre: Gooseberries are a good source of both soluble and insoluble fibre. Soluble fibre intake is linked to decreased risk of diabetes and hypertension, in addition to lowering cholesterol. Insoluble fiber on the other hand, regulates bowel movements and helps prevent digestive problems like haemorrhoids and colon cancer.

Manganese: The body needs manganese to promote calcium absorption, to aid with energy metabolism, blood sugar regulation and trigger the function of the antioxidant. A diet deficient of manganese, has a high likelihood of developing diabetes, osteoporosis or arthritis.

Vitamin A: Vitamin A that the body gets from carotenoids help prevent heart disease, diabetes and neurodegenerative disorders like Alzheimer's disease. The vitamin A in gooseberries contribute to eye health, helps regulate genes and stimulate red blood cell production. A diet high in vitamin A may lessen your risk of infections and eye problems like age-related macular (eye or sight) degeneration.

Harvest water for use during the dry season

At a cost of Ksh 30,000, farmers in Nyandarua County have managed to construct earthen water tanks that can hold about 125,000 litres of water.

Venter Mwongera | Harvesting and management of the rain water would favour continued farming during the dry season. Farming activities are greatly affected during the drought period while much water is frequently wasted in floods during the wet season.

Currently, water stress affects more than 2 billion people around the world, a figure that is projected to rise. To ensure availability and sustainable management of water as guided in Sustainable Development Goal six (6), there is a need for holistic harvesting and management of the water during the wet season.

Group makes water reservoirs

Many farmers in Nyandarua County have embraced the use of local resources to build water reservoirs for harvesting and storing rainwater for use during the dry seasons. Bidii Self-Help Group in Murungaru is one such group. Each member of the group has a reservoir. Others have plans to construct their own. The members have zealously read and applied various Ecologically Sustainable Agricultural (ESA) techniques published in *TOF* magazine for the last 8 years.

How to make a traditional water harvesting tank

Construction material

A traditional water reservoir measuring 5m x 5m x 5m (height, width and length) to hold 125,000 litres of water requires the following equipment for construction:

- 1 kg of iron sheet nails;
- 3 kg of 3 and 4-inch nails;
- 25 pieces of iron sheet each measuring 2.5m;
- 125 square metres of dam-liner with 0.5 mm thickness @ 220;
- 32 reeds of 8x4 (height and width);
- Soil and water for mud preparation
- 1 moneymaker water pump machine @ Ksh 14,000;



Mrs Veronica Kimotho watering vegetables using a 12-holes poked pipe as (below) Mr Michael Kimotho uses a moneymaker pump to draw water from a traditional reservoir

"*TOF* magazine has not only taught us dairy management, bee keeping, poultry management, farm management, compost manure preparation, biogas preparation, but has also continued to publish varied knowledge and information on plant, animal, soil and environmental health," The group leader Mrs Veronicah Kimotho says.

Improved farming methods

Her husband Mr Michael Kimotho adds that they use *TOF* magazine during their field training to impart ESA knowledge to fellow farmers. "We have more than 15 active families affiliated to Bidii Self-Help Group. Our lives as a group have changed for better due to improved farming methods learnt from *TOF* magazine," he says.

Mrs Kimotho who doubles up as a community Health Volunteer in ESA says. "I have practised organic farming techniques on an eighth (1/8) acre land for more than 7 years. This has enabled me to buy 5 acres of land where I practise animal and crop husbandry. I bought the land from the sale of the crops that I produced on the 1/8 acre farm. I'm a happy farmer and thank you to the financiers of *TOF* magazine," she says gratefully.

They use local material for construction

Due to climate change, farming



activities have been hard hit. Hence, farmers ought to plan on best strategies to harvest water during the wet season for use during the dry season. Members of Bidii Self-Help Group embraced the use of the locally available materials to harvest and preserve the water that they use for farming activities during the dry season. Below are the raw materials and instructions to construct a water reservoir with a capacity of 125,000 litres:

How to do the construction

Identify an area with an even terrain;

- Measure the length, width and know the actual height to dig (5m x 5m x 5m);
- Dig the hole according to the above measurements;
- Scoop the soil from the hole;
- Fix the 4 reeds at each of the 4 corners;
- From the ground level, place

2 layers of reeds;

- Mix part of the scooped soil with water and mix it evenly;
- Put the mud in between the 2 layers of reeds formed above;
- Lay the dam liner and ensure it overlaps the reeds;
- Place the iron sheets on the roof to protect it from dust and water evaporation;
- Put gutters on your house roofs and connect with pipes to channel the collected water to the dam;
- Put an outlet to control overflow.

How to use the water from the reservoir for irrigation

- Connect one pipe from the dam to the money maker pumping machine;
- Poke 8 to 12 holes at the edge of the pipe to sprinkle water;
- Manually fix the moneymaker pump at one end and the water sprinkler at the other end.

Note: The importance of placing two reeds is meant to offer reinforcement to the sticks and the dam liner is to prevent evaporation.

With a budget of around Ksh 30,000, you will have a traditional water reservoir for harvesting and store water during wet season.

For more information on water management http://www.infonet-biovision.org/water_management

There are many causes of infertility in dairy cows

I have served my cow twice without succeeding, what might be the cause of the problem?

There are several causes of infertility or failure of conception in dairy cows. The causes of infertility in dairy cows can be classified into four groups:

Management: Among the major causes of failure of conception is poor heat detection on the part of the dairy cow farmer. As a rule of the thumb, if a cow shows heat signs in the morning, let it be served in the evening. If it starts showing signs of heat in the evening, then it should be served in the morning (this is called the AM-PM rule).

Sometimes the failure of conception may be as a result of low-quality semen used to serve the cow. Inexperienced or careless Artificial Insemination (AI) inseminators are at times responsible for failed conception in dairy cows. For example, a nitrogen cylinder that is not tightly closed can allow nitrogen to escape, which leads to a dry cylinder and that leads to the death of the semen or its expiry). Poor management of dairy cows such as poor feeding and lack of mineral supplement such as salt licks can lead to failure in



A healthy looking cow: Artificial inseminators are at times responsible for failed conception in dairy cows

conception.

Infectious infertility: Any disturbance in the reproduction system of an animal can cause infertility and failure of conception. The most common infections in a dairy cow include inflammation of the uterus lining (a condition known as pyometra). Sometimes, there is pus formation in the uterus, protozoal infections such trichomoniasis, brucellosis, mycotic fungal infections and even bacterial vibriosis and related infections. These conditions can be treated with specific drugs if identified at an early stage.

However, they can cause permanent infertility if not treated on time.

Partial infertility: Conditions caused by hormonal imbalances can bring temporary infertility; these include inactive ovaries, ovarian cysts and prolonged luteal function (a process in the ovary that facilitates ovulation and the right conditions necessary for conception or pregnancy to occur).

Congenital (before birth) causes: Permanent infertility may occur if a cow was born as twins (one as female and the other as a male), since the two

calves share the umbilical cord, hormonal imbalances may affect the female calf making it to be permanently infertile (unable to become pregnant) such a cow or heifer is called a freemartin.

More than 90 per cent of female freemartins are infertile due to the abnormality. Their reproductive organs are undeveloped. Farmers are always advised to cull or keep them for meat. Another congenital condition is the White Heifer Disease also called *segmental aplasia* - this is simply the obstruction (blockage) of the reproductive tract and is common with white coat coloured heifers. Depending on the site of the blockage, fertilization, conception and parturition (birth) may not be possible due to the fact that only one of the uterine horns may be affected. Such heifers should also be culled (sold off for slaughter).

Since you do not give us details about the condition of your dairy cow, we would advise that you to consult a qualified veterinary doctor to examine your animal and find out the cause of the problem.

For more information on causes of infertility <http://infonet-biovision.org/AnimalHealth/Birth-and-Reproduction-complications-NEW>

How to prepare fermented concentrates for dairy cows

I would like to prepare fermented concentrates for my dairy cows to improve digestion as you explained in your TOF May 2017 issue. How do I go about it?

As we mentioned in the article all feed given to a dairy, sheep, goats and other ruminants has to undergo fermentation process in the rumen (big stomach of the cow). In the rumen, there are bacteria, protozoa and fungi which break down the feed especially carbohydrates to release energy and proteins. The bacteria use some of the proteins from the feed for their own maintenance while the excess protein (by pass protein) goes into the animal's bloodstream to produce milk.

So, a dairy cow requires carbohydrates for energy and protein generation, which is the end helps it to produce milk. When a farmer feeds fermented concentrates to their animals, they only make the process of energy and protein generation easier for the dairy cow which



helps to increase milk production but only slightly (most dairy cows given fermented concentrates add at least 1 extra litre of milk). Here is how farmers can make fermented concentrates:

Ingredients

40 kg of wheat bran or maize germ
2 litres of wet yeast
2 litres of molasses
70 litres of water

Preparation

Take 20 litres of water. Add the 2 litres of molasses and the 2 litres of wet yeast and mix thoroughly. Add the 40kg of wheat bran or maize germ. Mix thoroughly. Put the mixture in a 210 litre plastic drum and close it tight. After 3 days you can open the drum and start feeding the fermented concentrates to your animals. Give the animals according to the amount of milk they produce. You can start by giving 1 litre of the wet concentrate and add depending on the amount of milk the animal is producing. The highest a dairy cow can get is 4 kg of wet fermented feed. Give the animals their normal dairy meal concentrates but separately. Concentrates should only be fed after milking. Never use a metal drum to feed the livestock because it tends to rust. Use only plastic or concrete troughs. Answers by *Elkanah Isaboke*

For more information on animal nutrition <http://www.infonet-biovision.org/AnimalHealth/Animal-nutrition-and-feed-rations>

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.

Earn more from rearing productive goats

Musdalafa Lyaga | Goats rearing is suitable for small-scale farmers in semi-arid areas as they are profitable, they reproduce quickly, and they are able to feed on a wide range of shrubs and forages.

In the traditional goat rearing practice, farmers keep many goats which have been known to increase soil erosion because goats forage on shrubs and their hoofs loosen the soil crust.

However, Goat farming can be beneficial if farmers embrace ideals of climate smart agriculture. It should be practised in a suitable way that enables farmers to adapt to the changing climate, address issues of food insecurity, enhances their incomes, and mitigates climate change risks that hardly hit the arid and semi-arid areas.

Inbreeding reduces size and weight

For a long time, there has been a lot of in-breeding of local breeds and this has resulted in smaller-sized goats that do not fetch good market prices for the farmer.

Farmers groups can play a key role in helping fellow farmers improve their breeds by sourcing for the right breeds, sourcing for inputs and facilitating training for the key areas in goat production such as housing, disease control and feeding. Farmer groups can play a vital role in marketing the goats among members and even in other markets.

It is important for farmers' groups to adopt a market-led approach to help farmers market their goats.

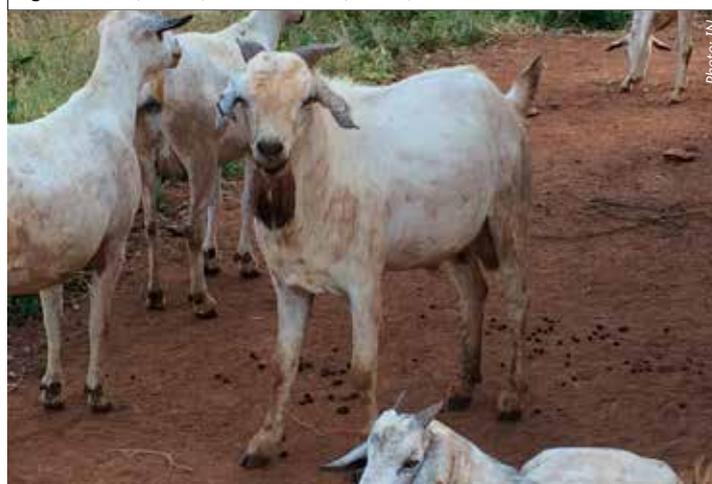
Galla goat is good for meat

Mr. Joseph Musyoki is a butcher at Kathonzweni Livestock market. He says a good meat goat should be white in colour which makes it easy to detect diseases on the fur, it grows fast reaching maturity early, has good body structure, a long neck, a straight back line and two-well-split testicles. This is important, especially for breeding bucks."

For goat meat, the Galla cross-



A galla doe (above) and a buck (below)



bred goat appears to be the most suitable in terms of production and growth rates. The Gala goat has long and tall body, typical of most meat-producing animals. This goat, if reared and managed well, has the ability to support a future herd rich in goat meat production.

Size is good for market

Galla goats are best-suited for arid and semi-arid areas. Being browsers, the goat can feed on different types of vegetation. This is advantageous to a goat farmer since it is within the reach of the average farmer. The Gala buck can grow to up to 75cm in height and weigh up to 70kgs while the doe can weigh up to 55kgs. This is quite huge compared to the local goat breeds which reaches a paltry weight of 30kg.

A farmer can earn more from

Galla goats than the indigenous ones because the Gala goats have a higher efficiency of feed conversion and a big body frame that accommodates more meat.

A mature Galla goat costs between Kshs. 5,000 to Kshs 8,000 while a local one costs Ksh 2,500 to Kshs 3,000.

There is a ready market for goat meat and farmers cannot sustain the ever-growing demand for goat meat. Hence, the need for more investments in improved goats breed for higher interest to farmers.

A goat's market price is more dependent on the weight. So, being heavier than indigenous goats, Galla goats get better prices. However, to maximise returns from goat keeping, it is more about good livestock management practices.

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.

Stingless bees for sale: I have stingless bees for sale to interested bee keepers. Contact me on Tel. 0710 155 415.

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

Dairy Cow for Sale: I have a giant Fresian cow for sale. It can give 26 litres of milk in a day. Call 0722 574 744.



STAR RAYS
AgrInfo
EDUCATION CENTRE
EDUCATION IS A LIFETIME GIFT
+254721245443
Whatsapp & telegram
GROUPS

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.

Proper breeding can improve quality of goats

In order to improve breed quality, farmers groups can help their members acquire improved bucks suited to target regions, establish buck stations and breeding units. It is common practice for groups to identify from amongst members one farmer to act as buck keeper responsible for ensuring that the buck is managed properly. It is possible for farmers to establish a breeding unit where diseases and inbreeding can be managed.

Goats are deeply embedded in almost every African culture and are true friends to the rural farmers because they are a means of survival and a way of boosting incomes.

For more information on rearing goats www.infonet-biovision.org/AnimalHealth/Goats-new-animal-welfare-information