

The Organic Farmer

The newspaper for sustainable agriculture in Kenya

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Thank you for your continued partnership.

Go organic to fight armyworm

Peter Kamau | Farmers are faced with a new pest that poses a great danger to the maize crop in the maize producing areas in the country. The Fall Armyworm has invaded maize farms in Western, North and South Rift regions of Kenya. Among the counties affected are Baringo, Bungoma, Busia, Kakamega, Kericho, Nakuru, Nandi, Narok, Siaya and Uasin Gishu. The pest targets mainly maize but, can also destroy sorghum,

rice, millet, wheat and barley. Pasture grasses such as Napier grass are affected. Vegetable crops such as kales, cabbage, legumes, beans and other pulses, banana, tomato, capsicum, ginger, spinach, amaranths, onions, sunflower among other crops are also affected.

The fall armyworm (*Spodoptera frugiperda*) was first reported last year in West Africa and later Southern Africa. It is suspected to have spread rapidly to other parts of Africa either through eggs or the wind since the pest is said to be a good flier, moving over great distances assisted by winds. It is most destructive at the larval stage when it attacks maize and other crops.

Pest destructive at larval stage

During the adult stage, the pest moves and feeds at night. The female will lay eggs in the soil or on plant crop residue. The eggs hatch 3 to 4 days later into larva, which feeds on maize leaves.

The feeding takes between 10 to 21 days after which the larvae changes into pupae stage. A female can lay between 1,000-1,500 eggs. During the larvae stage, which is also the feeding stage, the worms move in the ground like an army, searching for food. Hence, the name armyworm. The worms become very destructive at the larval stage.



Fall armyworm larvae

Chemicals unable to control worms

The use of chemicals to control the armyworm is not very effective because most of the chemicals in use do not kill the eggs. A chemical that can kill the eggs is expensive, which is beyond the reach of small-scale farmers. This is one reason why farmers have not been very successful in the control of the worms. However, farmers using organic pesticides have been more successful in controlling the pest than those using chemicals. In this issue, we feature various methods farmers in Western Kenya are using to control the armyworm. *Page 3 and 6*

Dear farmer,

A reader in one of the local dailies expressed concern last month at the way the government had responded to the emergency of the fall armyworm invasion in Kenya. He noted that the government was giving conflicting information that was not helping the farmers to deal with the pest. Although the government later placed adverts in all the mainstream dailies giving details about the pest and ways to control it, the information is still inadequate if what insect scientists say is anything to go by.

First, the information that came out is that the pest is resistant to most of the chemical pesticides in the market. Then, farmers were told that there is a class of chemicals that could control the worms. Farmers later learnt that these chemicals were too expensive and beyond their means. Up to now, the information given on the pest is very scanty and it may not help farmers prevent destruction of crops by the pest.

Before rushing to buy chemicals, there is need to understand what we are dealing with here. The fall armyworm is not an ordinary pest, especially when we look at the fast pace of its spread and voracious nature.

The pest has the ability to develop resistance to pesticides faster than other pests. Again, spraying of chemicals when the pest is beyond the third instar (pupae) stage has very little effect on it. That means that any spraying should be done at the second instar (larvae) stage to kill the larvae. Most of the chemicals in the market cannot kill eggs; because of this, farmers need to do scouting in their maize crop and spray when the pest is at the larvae stage to be effective.

For organic farmers, neem-based biopesticides are effective because they have anti-feedant properties and also reduce the capacity of the pest to lay eggs. Garlic-based biopesticides are also effective and work the same way as neem. Use of traps can also reduce the male moths and reduce its multiplication.

Finally, farmers should know that the fight against the fall armyworm requires an Integrated Pest Management (IPM) approach where several options are employed. There is no any one control method that can work in isolation. Let us use the integrated approach to prevent the destruction of this season's maize crop. *Page 3*

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Cassava can be processed into many products

From roots to leaves, cassava can be processed and combined with wheat, sorghum or millet to make various products such as flour, chips, bread, crisps, chapatti and biscuits for sale.

Linnet Mwangi | Cassava is the third most important source of carbohydrates in Africa and the second most important food crop after maize in the Western and Coastal regions of Kenya. Cassava provides over 500 calories daily making it an important food security crop.

Nutritional value

Cassava has a high calorific value of 160 calories in 100g. The young tender cassava leaves are rich in proteins, fibre and vitamin K which is important in helping blood clot. It has vitamin A, which is important for normal vision, boosts the immune system, and reproduction and B1, also called thiamine or thiamin and it helps the body to convert carbohydrates into glucose, which the body uses to produce energy and helps metabolize fats and protein.

Cassava tuber is rich in the B-complex group of vitamins such as folates, thiamin, pyridoxine (vitamin B-6), riboflavin, and pantothenic acid. It is a good source of some essential minerals such as zinc needed for the body's defensive system to work properly. It plays a role in cell division, cell growth, wound healing, the breakdown of carbohydrates and for the senses of smell and taste. The magnesium in cassava also helps to maintain normal nerve and muscle function, supports a healthy immune system, keeps the heart beat steady, and helps bones remain strong. The copper in the tuber works with iron to help the body form red blood cells, helps keep the blood vessels, nerves, immune system, and bones healthy. Iron is found in haemoglobin which is essen-



Biscuits made from cassava flour

tial for transferring oxygen in your blood from the lungs to the tissues. It contains manganese that helps the body form connective tissue, bones, blood clotting factors, and sex hormones. It plays a role in fat and carbohydrate metabolism and blood sugar regulation and potassium which is crucial to heart function and plays a key role in skeletal and smooth muscle contraction, making it important for normal digestive and muscular function.

However, cassava has a poisonous compound in the class of *cyanogenic glycoside* known as linamarin (96%) and lotaustralin (4%). These compounds are distributed largely in the leaves and the root cortex (skin layer) with smaller amounts in the root parenchyma (interior). Tuber injury releases linamarase which changes linamarin to hydrocyanic acid (HCN) which is responsible for cyanide poisoning after cassava consumption (do not throw cassava tubers when harvesting or handling it to prevent injury to the skin).



Cassava flour

Cassava processing techniques to reduce cyanide level

The initial cyanide level in cassava determines the safety of the product in relation to the processing method adopted. According to Food and Agricultural Organisation/World Health Organisation up to 10 mg Hydrogen Cyanide (HCN) equivalent to one kilogramme of flour is attained, if the initial cyanide level of roots does not exceed 200 mg/kg.

a) Soaking, storage and boiling: Soaking the tuber for three days followed by boiling in salt-vinegar water results in complete evaporation of HCN. Studies report that cyanide levels drop by about 30% after four days of cassava storage at ambient temperature, 50% after boiling, 80% loss when grated and boiled, and 50% when grated and cooked in an earth oven.

b) Fermentation: Yeast can utilize cyanogenic glucoside and their metabolites, thereby reducing toxicity (poisonous compounds). Studies have shown that a combination of yeast and lactic acid bacteria is most effective than using any of the organisms alone in fermentation. Traditional fermentation takes upto 6 days.

c) Grinding and drying: Grinding exposes the linamarase enzyme that converts the toxic compounds in the roots into volatile compounds. Sun-drying

the product to lower moisture content yields a product of low cyanohydrin content. However, prolonged sun-drying alone will not reduce cyanogenic compounds in bitter cassava roots to the safe limit set by FAO. Therefore, combination processing (drying and then grinding) is most effective.

Value addition of cassava

Cassava composite flours: After detoxification, cassava root tubers can be dried under the sun to obtain a low moisture content and then ground or milled to obtain flour. This flour can be used in combination with other flours such as millet, wheat, sorghum and others to make what is called composite flour fortified to improve the nutritional profile of the product. Mixing ratio is determined by an individual's nutritional needs calculated through mass balancing by food processors. Composite cassava flours are used to make bread, pastries, cookies, biscuits, chapati and other flour based products.

Cassava chips: Detoxification is the first step before further processing. Peel the cassava and cut into long strips of 6mm thickness. Boil the cassava for 15 minutes. Deep fry in hot oil until golden brown.

Cassava crisps: Preparation is like that of the chips. However, slice the cassava into very thin slices and cook in hot frying oil until crispy brown. Package in polythene bags.

Dried cassava leaves powder: Boil the cassava leaves for 15 minutes to reduce the cyanide content. Dry under the sun in solar driers for 12 hours depending on the weather conditions or in a hot air oven at commercial scale. Dry until the moisture content is below 7%. Grind the leaves and pack in well-labelled bags.

Animal feeds: Cassava peels can be used as animal feeds or recycled as fertiliser.

For complimentary reading: <http://www.infonet-biovision.org/PlantHealth/Crops/Cassava>

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 BvAT.

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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

Chief Editor Venter Mwangera

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

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How to control fall armyworms using organic methods

The fall armyworm is a heavy feeder that quickly destroys the maize crop. It can destroy an entire crop if it is not controlled on time. It can spread fast, and can fly over 30 kilometres in one night assisted by the wind.

Beritah Mutune | The fall armyworm (*Spodoptera frugiperda*) derives the name from its feeding habits whereby they eat everything in an area until it is over and the entire "army" then moves to the next available food source. This invasive pest is native to North and South America and Argentina. The fall armyworm larval stage burrows into crops, destroys and eventually kills the plants. Recently, it was identified for the first time in West Africa before extensively spreading to Southern Africa. The fall armyworm has also been reported in parts of Togo, Nigeria, Ghana, Malawi, Zambia, Namibia, Mozambique and Zimbabwe where the pest has already destroyed thousands of hectares of crops. The emergence of the fall armyworm in Uganda was reported last month and it may probably have spread to some areas of Western Kenya.

How to identify it

To differentiate this larva from other armyworm species, one needs to look at the head of the insect. The fall armyworm's head has a predominantly white, inverted Y-shaped suture between the eyes. Young larvae are greenish or brownish in colour and smooth-skinned.



The fall has a Y-shaped line between the eye

Mature larvae vary from light tan or green to nearly black. They have three yellow-white hairlines down their backs. On each side and next to the yellow lines is a wider dark stripe. The moths have a wingspan of 32 to 40 mm. They have dark grey, mottled (coloured spots) on the forewings with light and dark splotches (marks), and a noticeable white spot near the extreme end of the worm.



A maize plant destroyed by fall armyworm larvae

Crops affected

Fall armyworms can feed on almost all types of plants. They prefer to feed on maize but also target wheat, millet, cotton, sorghum, sugarcane, tobacco, potatoes and rice. These are the most common staple food crops grown and consumed in Kenya.

Life cycle

They take approximately 3 to 5 days for the eggs to hatch. Developmental time of the larval stage takes 2 weeks to a month. Pupa-tion occurs in the ground near the plant and usually requires 1 to 2 weeks. The adult female begins

laying eggs after 3 or 4 days and lays about 150 eggs a day for 8 to 10 days and between 1500 and 2000 eggs in a lifetime. Within as little as 10-12 days, the worm changes into a moth and moves in groups (swarming) as a young adult which has the ability to cover several kilometers in search of distant, new regions with other fresh crops to consume.

Damage

The pest is very aggressive because while invading a new area, it has few or no natural enemies. The larval stage of the fall armyworm is the most destructive stage. Larvae feed

on maize leaves and may attack the tassels and/or ears of maize. Their damage appears as tattered edges and holes on leaves, tassels and/or ears. Severe feeding may look like maize crop that has been damaged by hail stones. The first attack of the fall armyworm's invasion often goes unnoticed, because the small larvae that hatch from egg burrow into plant parts hiding inside. It becomes visible only after close observation and as the larvae develops, but by then, it is too late to save the plant.

Control

Synthetic pesticides are mostly used to control the pest. The chemical sprays however contaminate the environment and cause major health risks to humans, livestock and biodiversity especially the non-targeted organisms. Other methods of control include use of pheromone traps and hand picking of adults and caterpillars, use of parasitoids, predators and natural enemies. Cultural control measures also used include management of broad leaf weeds and rapid disposal of crop residues after harvest.

For complimentary reading: http://www.infonet-biovision.org/natural_pest_control

Use organic products to control armyworms in your farm

Farmers in East Africa are currently going through a difficult period with the invasion of the fall armyworm. The worm has spread to the region just when they have planted maize and other crops. The lack of rains and the increased temperatures provide the right conditions for the rapid multiplication of the fall armyworm and other pests.

As usual, many farmers will rush to buy chemicals to control the pests but as we have explained above, most of the pesticides available in the market are not effective against the pest because they will kill the larvae and leave the eggs, which later hatch and continue damaging the maize. This is one reason why the pest is very difficult to control.

However, farmers in Western Kenya have discovered that organic control methods are much more effective in control of the armyworms (page 6).

Below are some of the biopesticides farmers can use to control the fall armyworms and other pests in maize and other crops:



Nimbecidine®- This is a neem-based biopesticide that can control the fall armyworm, aphids, leaf miners, mites, whiteflies, thrips, wireworms and even nematodes in maize, cab-

ages, potatoes, beans and any crop that is under threat from pests. One characteristic of this biopesticide is that it is an anti-feedant meaning that the pest cannot be able to feed on the target crop. Nimbecidine also interferes with the pest's ability to lay eggs.

Pyrethrum: The white flowers in pyrethrum have active ingredients called pyrethrin. Farmers who opt to use pyrethrum can pick the flowers on a warm day when the flowers are open, dry and store them in an airtight container in the dark (light

reduces the effectiveness of the flowers). Later the dried flower can be ground into powder.

Preparation of pyrethrum extract

Mix 20g of pyrethrum powder with 10 litres of water. Add soap as a spreader and sticker and apply immediately especially in the evenings when the armyworms are active.

Like neem, garlic has anti-feedant properties and can also repel most pests.

Preparation

Mix 85g of crushed garlic with 50ml of vegetable oil.

Add 10ml of liquid soap (use bar soap).

Allow the mixture to stand for 24 hours.

Mix 50ml of the garlic and vegetable oil emulsion with 1 litre of water (or make enough fill a 20litre knapsack sprayer by multiplying the same amount by 20) shake thoroughly before spraying preferably in the evening when the armyworms come out to feed. **More reading on page 6**

Tree tomato grafting increases its productive period

The popular tree tomato has a short lifespan, forcing farmers to graft it grafted with *muthakwa*, has a taproot which is absent in the normal tree tomato enabling it to get deeper into the soil to tap water and nutrients.

Rachael Wangari | David Muriithi, a farmer from Inoi ward, Kirinyaga County has a passion and interest in tree, flower and fruit nurseries. He carries out these activities in the quarter an acre farm he owns where half of which occupied by his homestead. The farmer says that he began a tree nursery for indigenous trees where he would go for the seedlings from Kamuruana Hills forest and Mt Kenya forest which is about 7 Km from his home.

While he was contracted to do landscaping in other people's compounds, he developed interest in flowers and started propagating seedlings through cuttings, layering, suckers and bulbs which he used to develop his flower nursery.

In the year 2009, he ventured into fruit nurseries and taught himself how to graft fruits to develop better varieties of fruit and to improve their quality. He began with the grafting of yellow passion with the purple passion. The root stock would be the yellow passion which would give extensive rooting system and the scion would be the purple passion which enable the new plant to develop resistance to pests and diseases and yield more. He also grafted oranges, avocados and tree tomatoes.

While he was in the process of collecting seedlings, he observed that wild trees such as *Vernonia Auriculifera* (*muthakwa*) tree lasted longer unlike the tree tomato, which had a lifespan of less than 3 years. He therefore made a trial, grafting



David Mureithi tends his tree tomato seedlings

the two trees, with the *Muthakwa* tree being the root stalk cover part of the graft and the scion (upper part of the graft) as the tree tomato. The result was strikingly positive. The grafted trees were not only strong and healthy, but they also produced more fruit that were sweeter in taste.

He started grafting more tree tomatoes which he would inform people about through the word of mouth and through this was able to market the seedlings. In the year 2016, more people had seen the results and the demand for the grafted tree tomato increased where he sold to more than 500 farmers at a price of Ksh 50 per seedling.

Mr Mureithi said that he collects seed for the *Muthakwa* tree and grows them as root stock in the nursery for the seedlings. He knows that the seeds are fully grown when the birds start feeding on them. The tree tomato, which is the scion



David Mureithi inspects a grafted tree tomato

is grafted after three months so as to ensure quick production. If the scion has attained the right size, the grafted plant will start to produce fruits early, unlike when the scion is young.

The farmer explained the benefits of the grafted tree tomato over the other normal tree tomato:

- The *muthakwa* tree contains a taproot and other extensive rooting system absent in the tree tomato which has a shallow rooting system. This enables the plant to absorb water, mineral salts and nutrients hence enabling it to produce more without being affected by scarcity of water and nutrients.
- The grafted tree tomato is drought tolerant. Due to the tap root present in the root stock, the plant is able to extend deep into the soil to absorb water which enables it to sustain itself even when there is a shortage of water.
- The grafted tree tomato is pest and disease resistant. The plant once grafted is not attacked by pest and diseases which make it more productive.
- The grafted tree tomato has higher production compared with the normal tree tomato. The tree has more branches than the normal tree tomato which has few or no branches at all and the fruits produced are bigger in size than the normal tree tomato.

• The grafted tree tomato has a longer production life than the normal tree tomato. Due to the extensive rooting system which enables the plant to absorb water and nutrients. This enables it to produce for a long period of more than five years.

• David Muriithi explained that the main challenge he is facing are moles which feed on the roots of the crops making them dry up but he was advised to plant tephrosia plants around his farm which kills the moles once they feed on its roots. So far, he has not been able to market his new varieties of grafted tree tomato and other fruits, flowers and tree varieties he has to enable him get market for them. So far he has been taking his produce to the market in Kirinyaga Central mostly around Kerugoya and Kagumo region where he hails from.

The farmer has taught two other people how to graft so that they can produce more to meet the increasing demand. Robert Kariuki a neighbour is a farmer who has been taught how to do grafting and has ventured into grafting tree tomato and the



Vernonia Auriculifera (*muthakwa*)

purple and yellow passion.

Together they want to develop grafted tree tomato nursery where they will have more than 10,000 seedlings which they will manage jointly and also look for income to also venture into fruit farming. They promised that by March 2017, they will have more seedlings for sale.

David Muriithi 0720798954

For complimentary reading:
<http://www.infonet-biovision.org/EnvironmentalHealth/Trees/Cyphomandra-betacea-Tree-tomato>

Bitter Melon is a good remedy against diabetes

The fruit has also cancer fighting properties, it has anti-bacterial, anti-inflammatory and anti-viral compounds. It is also a good source of vitamin A and C, apart from containing iron and phosphorus.

Dr Peter Mokaya | Bitter melon (*Momordica charantia*) is a type of edible, medicinal fruit that is native to Africa and parts of Asia. The fruit goes by several common names around the world, including bitter melon, thorn melon, bitter gourd, balsam, bitter apple and Karela fruit. It belongs to the cucurbitaceae plant family and it is primarily grown in two varieties because of their medicinal benefits (*M. charantia* var. *charantia* and *M. charantia* var. *muricata*). It can be consumed raw and when cooked, as well as being used to make concentrated extracts from them which contains high levels of anti-inflammatory, antibacterial and antiviral compounds. These include:

- At least 32 active chemicals have been identified in bitter melon, according to the National Bitter Melon Council of the USA.
- What gives the bitter melon plant its characteristic bitter flavour is a type of alkaloid momordicine compound, which is produced in the plant's fruit and leaves.



Bitter melon salad

In immature vegetable form, bitter melon is also a good source of nutrients including Vitamin A which promotes growth, boosts the immune system, reproduction, and improved vision, vitamin C which helps the body to make collagen, an important protein used to make skin, cartilage, tendons, ligaments, and blood vessels. Vitamin C is also needed for healing wounds, and for repairing and maintaining bones and teeth. It also contains iron, which is important in red blood cells (haemoglobin) and muscle cells (myoglobin). Haemoglobin is essential for trans-



Eating bitter melon improves human health

ferring oxygen in blood from the lungs to the tissues and phosphorus is an essential mineral primarily used for growth and repair of body cells and tissues.

Among the most important attributes, *Momordica charantia* contains biologically active phyto nutrients and antioxidants. These include chemical compounds such as phenolic acids that offer protection against various ailments in humans, glycosides, saponins which in the fruit help lower cholesterol and reduce the risk of heart disease, alkaloids which act as lifesaving drugs in some serious disorders like heart-failure, cancer, blood pressure among others. The fruit also contains fixed oils especially baroge oil which regenerates and stimulates the skin. It has triterpenes which helps in breakdown of glucose. It prevents the development of insulin resistance and it makes plasma glucose and insulin to work better. It has other types of anti-inflammatory proteins and steroids.

Studies have identified specific phenolic and flavonoid compounds within bitter melon that are responsible for many of its anti-diabetic and anti-cancer effects. These include gallic acid, tannic acid, catechin, caffeic acid, p-coumaric, genticic acid, chlorogenic acid and epicatechin. Research shows these help to reduce inflammation, balance hormones, regulate appetite, they help prevent obesity and tumor growth and among other ailments.

It has general health benefits

Bitter melon has been the focus

of well over 100 clinical and observational studies. It's best known for its hypoglycemic effects (blood sugar regulation). Research shows that the melon's juice, fruit and dried powder can all be used to mimic insulin's effects and treat diabetes. According to a 2004 review published in the *Journal of Ethnopharmacology*, bitter melon has some of the following benefits:

- Managing blood sugar levels and diabetes.
- Reducing respiratory infections such as pneumonia.
- Lowering inflammation and raising immunity.
- Treating abdominal pain, peptic ulcers, constipation, cramps and fluid retention.
- Increasing cancer-protection
- Reducing fevers and coughs.
- Lowering menstrual irregularity.
- Treating skin conditions including eczema, scabies and psoriasis.
- Antiviral, antibacterial and anthelmintic properties, including those that can be used to prevent or treat parasites, HIV/AIDS, malaria and even leprosy.
- Treating gout, jaundice and kidney stones.
- Managing symptoms of autoimmune disorders including rheumatoid arthritis

How does bitter melon work in reducing blood sugar in diabetics?

While multiple studies have found that *Momordica charantia* can be beneficial in normalizing blood sugar and managing

diabetes, its effectiveness seems to depend on how it is consumed. A 2013 study published in the *Journal of Agricultural Food Studies* showed that bitter melon consumed in both raw or juice form helps to lower blood glucose levels in healthy and diabetic animals, although other studies have found that responsiveness differs depending on the individual. Bitter lemon can also have side effects.

Pregnant women, those who are trying to become pregnant,



Bitter melon juice

and women who are breastfeeding should not consume bitter melon, since research shows that it has properties that can cause miscarriages, can cause menstrual bleeding, and has certain anti-fertility capabilities.

Note: Bitter melon is meant to be used in conjunction with other preventive measures. This means that diabetic patients should not stop taking medicine prescribed by their doctor. They should also maintain a healthy diet and regular exercise to remain healthy.

Dr. Peter Mokaya, Peter. Mokaya@organicconsumers.co.ke or Mokaypm@gmail.com

TOF changes Mikuyuni farmer's fortunes

My children now attend good boarding schools, I have built a permanent house, bought a motorbike, ploughing bulls, chickens and plan to get more dairy cows.

Venter Mwongera | Mr. Raphael Mbuvi is a farmer from Mikuyuni, Machakos County. He is a member of Muuo Self Help Group (MSHG) which was formed in 2009. As an active member of the group, Mr. Mbuvi's inquisitive nature has helped him to improve his farming methods, reaping great rewards.

"On a monthly basis, I make more than Ksh 97,000 as net profit from the sale of tomatoes, capsicum, spinach and kales which I grow through organic technologies." After learning the importance of organically grown foods; his family has always eaten nutritious food from his farm beside realising improved family income. Organic farming has transformed my life," he says.

Through practising organic farming, his family now enjoys a balanced diet, his three children attend good boarding schools and it has enabled him to put up a permanent house. I own a motorbike, four (4) ploughing bulls, chickens and a dairy cow. All these benefits are derived from improved organic farming methods," he adds.



Mr. Raphael Mbuvi with a capsicum harvest from his farm

Low earnings from employment

Before venturing into farming, Mr. Mbuvi worked as a tour guide for more than 16 years and as a Public Service Vehicle (PSV) driver. Then, his basic salary was Ksh 28,000. "I would work for 12 hours on daily basis. I could neither afford to run a side business to compliment my monthly income nor raise capital for such an activity," he laments.

The relationship with his wife and children was sour since he could not meet all the family's basic needs. "One day, I met my primary school classmate who was doing very well in his farming activities. He ate fresh food from his firm, he was his

own boss and he had amassed much wealth from the sale of his farm produce. Then, I remembered my five (5) acres' land that I inherited from my father," Mr Mbuvi reminisces.

Together with his wife Mrs. Ruth Mbuvi, they decided to take up farming as a full time venture and a source of livelihood. Mr Mbuvi embraced any new ideas that could help him improve their farming. That's how he met and joined MSHG from where he receives *TOF* magazine on a monthly basis.

I have learnt a lot from TOF

"I read *TOF* magazine every month. From the magazine,

I have learnt about compost manure preparation, soil nutrition, post-harvest management, poultry farming, dairy cow management, double digging and Zai pit technologies, which have benefited us a lot in crop and animal production," he confesses.

His crops have a ready market. "Buyers come to buy most of the crops from my farm. Since I ensure proper management, the harvest is always of high quality. My wife too takes some of the produce to the market," he adds.

The couple are now planning to buy two more dairy cows. They attribute all their success to *TOF* magazine and BvAT training, which has enabled them to produce and earn more from farming.

A simple way to control fall armyworm

Fridah Kavetsa is a farmer in Mushiega Village in Vihiga County. After planting maize in her 2-acre farm, she noticed a strange worm that was destroying her maize faster than other armyworms. As she had done before, she went back home and prepared ash and bought chilly powder, which she sprinkled on the maize funnel. After several applications, Ms Kavetsa noticed the pest had disappeared. Other farmers in the village who had resorted to using paraffin and detergents in a desperate attempt to control the pest have emulated her and are now using wood ash and chilli powder with good results.

Apart from Fridah and other farmers, scientists have already confirmed the effectiveness of using ash and chilli powder to control the fall armyworms in maize. The method is better than



How to apply and chili powder

the use of chemicals in controlling the pest including the fall armyworms. Here is how other farmers can do it:

- Buy ripe chilli powder (pepper) from the market or prepare your own using ripe pepper.

- Dry the pepper and make powder by either grinding or pounding, remove the big particles and leave the fine powder.
- Sieve cold wood ash from the fireplace.
- Get 1 tin gorogoro (2kg tin or

plastic) of ash.

- Mix 1 gorogoro of wood ash with 5 teaspoonfuls of chilli powder.
- Mix the chilli and woods properly by shaking them in a container.
- Put the mixture in a used pesticide container that has small holes.
- Apply the mixture from the container by shaking it once into each plant funnel

For good results, apply the mixture immediately you see the worms in the maize and repeat the same if you notice any pests in the maize or pest damage to your crop. (See diagram).

Note: In the case of severe infestation, farmers can use the ash and pepper mix other biopesticides to control the fall armyworm.

Importance of Toxin binders to animal feed

In your December 2016 (TOF No. 139) issue, you promised to feature natural toxin binders and how to use them. Kindly, let me know how they work and where I can buy them. Thank you.

Dear TOF Reader,

As we mentioned in the article published in our December 2016 TOF issue, toxin binders are substances or compounds that reduce poisonous fungal compounds called mycotoxins or aflatoxin in animal feed and even human food. Toxin binders help prevent mycotoxins and aflatoxins from being digested. They bind themselves into the harmful toxins, which later leave the animal's body through the digestive tract without being digested by the animal.

Aflatoxins are the most common fungi in the family of mycotoxins, which grow on cereals such as maize, beans, groundnuts wheat sorghum or millet. The fungi develop when



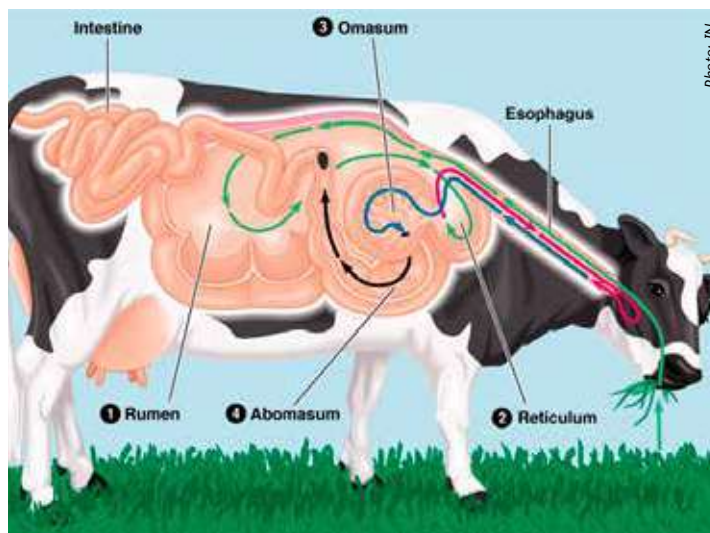
Toxin binders protect feed from aflatoxins

the cereal grains are exposed to high moisture levels or temperature. Aflatoxins can develop on cereal crops during their growth, handling or at storage stages.

Farmers in Kenya prefer preparation of animal feed using rotten maize (*maozo*) which is sold at low prices. At a time like now when farmers are experiencing dry weather conditions and reduced pasture, there is widespread use of rotten maize due to the high prices of feed.

The decomposed maize has aflatoxins. So, when the animals are fed on such maize, the aflatoxins are digested and end up in the animals' bloodstream, body tissue and even milk. When people consume the milk, the aflatoxins are transferred into the human body leading to many health complications such as various forms of stunted growth in children, loss of body weight and suppressed immunity in both humans and animals.

When the feed goes to the rumen, it is fermented through



A sketch of a dairy cows digestive system

To reduce aflatoxins poisoning, all feeds given to animals should have toxin binders.

Aflatoxins affect all animals. Poultry and pigs are especially prone to aflatoxin poisoning. It is, therefore, important that farmers look for quality feeds for their animals and ensure that all feed has toxin binders to reduce the chances of aflatoxin poisoning.

For organic farmers, there are many bacteria and fungi that are available in the market in form of yeast. Such bacteria and fungi can control aflatoxins naturally and render them harmless to animals and humans. The most common natural toxin binders are yeast and Lactic Acid Bacteria (LAB).

About one to two kilograms of active yeast can bind and control aflatoxins in one tonne of animal feed. Among the common natural toxin binders in the market are:

Mycosorb A+®

Mycosorb A+® is sold in Kenya by Alltech Company Ltd. It is among the latest generation of natural mycotoxin binders offering superior binding capabilities. Mycosorb A+® works by adsorption- a process where the aflatoxins attach themselves to the surface of the toxin binder making it difficult for them to be digested by the animal and in the processing protecting the animal from aflatoxin poisoning, broader adsorption profile and increased efficacy. Mycosorb A+® reduces mycotoxin adsorption within the animal, thereby negating the damaging effects of mycotoxins on its health.

The unique technology behind Mycosorb A+® preparation makes it one of the most advanced mycotoxin binder on the market.

Mycosorb®

Like Mycosorb A+®, Mycosorb reduces mycotoxin absorption in the animal and contributes to the control of aflatoxins, including all other common mycotoxins.

Mycosorb® has several advantages, including a low effective inclusion rate and broad spectrum reach (ability to control many mycotoxins). The efficacy of Mycosorb® has been verified by world renowned research institutes Mycosorb® is a highly successful technology with proven efficacy as toxin binders.

Farmers who wish to buy these mycotoxin binders can call Alltech Company Ltd on 0722 814 737.

I have seen some farmers fermenting animal feed for their dairy cows (machicha). What benefits does fermentation of animal feed concentrates have on milk production.

To understand why farmers prepare fermented feed for their animals, we need first to understand how animals such as cows, sheep and goats (ruminants) digest their feed. When a cow feeds on any feed, be it grass or concentrates, the feed is converted into proteins carbohydrates or vitamins. Any feed eaten by a dairy for example passes into the reticulum (first stomach), then to the rumen (second stomach), omasum (third stomach) and finally abomasum (fourth stomach).

the action of bacteria and protozoa in the rumen. Any feed

that is not digested goes into the omasum and abomasum but it is later returned (regurgitated) into the mouth for further digestion (this is why the cow chews the cud to digest it further).

By providing the animal with feed that is already digested, farmers only make the digestion process easier for the dairy or beef cow, which improves the efficiency of the whole digestive process for the animal, making it to eat and produce more milk. This is the main reason farmers prepare fermented feed for their animals (*we will feature this in more detail in future issues of TOF*).

For complimentary reading: <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.

Savings scheme helps farmers to get cheap loans

Musdalafa Lyaga | Many farmers in arid and semi arid regions such as Ukambani are vulnerable to unpredictable rains and prolonged droughts. Without adequate resources, the harsh weather conditions make it difficult for them to have a stable income. For farmers to diversify their livelihoods and maintain productive assets, they need to adopt agribusiness approach in the production of crops and livestock for the market as the means for their social and economic development.

Farmers groups are now creating institutions within the community to mobilize financial resources in the form of members' savings and redistributing the same to members as loans, which has greatly improved the farmers' social-economic conditions. There are currently five other such units known as Solidarity Fund for Development, located in Machakos, Kitui and Makueni Counties. They bring farmers together to access soft loans. Mwala Solidarity Fund for Development (SOFDEV), Mbiuni SOFDEV and Kathama SOFDEV are found in Machakos County, Kauma SOFDEV and Musengo SOFDEV in Kitui County and Ngaamba SOFDEV in Makueni County.

Since its introduction, the alternative financial model has continued to have a tremendous impact on the social-economic lives of the people in the lower Eastern region of Kenya where the units are in operation.

Mwala SOFDEV was started in 2005 by a group of farmers and has since grown into a SACCO.

Mwala SOFDEV Chairman, Mr. Nelson Mung'ala says, "By December 2016, the number of our active members had risen to 1,050 people. Members deposit their cash and get loans to improve their farming activities." According to Mr. Mung'ala, the first loans the group disbursed to members were experimental and the highest amount which each member was awarded was Ksh.



Some of the SOFDEV members have invested in mango farming

5,000 with a two percent (2%) interest rate per month.

"The Sacco now gives its members loans of up to Ksh. 150,000 with a one percent (1%) interest rate per month. Loans issued from 2005 to date amount to Ksh18m. "The Sacco Chairman revealed adding, "The group members have also benefited from training on financial literacy, especially how to manage the funds."

Mr. Mung'ala further stated that the main challenge that made the farmers to come together was to have a collective saving and act as their securities for title deeds to secure loans from commercial financial institutions and banks.

SOFDEV Sacco's products include current, savings accounts and agricultural, business, educational and emergency loans which have greatly improved farmers' livelihoods and resilience.

Ms Rhoda Mumbua, a 76-year-old member of Mwala SOFDEV Sacco depends on small loans she borrows from the Sacco to help continue with her farming activities and to successfully plan household expenses.

"I am a mango farmer and save my earnings with SOFDEV Sacco which has really changed my life. Before, I used to waste a lot of money when I bought items that I did not need. I have

received training sessions on how best to invest my savings, which has enabled me to diversify to other projects like poultry rearing. I have benefited a lot through poultry and egg sales," Ms. Mumbua happily confessed.

Ms. Mumbua counts many achievements made since she joined the Farmers Group Savings and Loans Scheme. She used her first SOFDEV loan to increase her mango production, her second loan to set up poultry enterprise and she is now reaping benefits from the sale of eggs to feed and to diversify her family's nutrition and the additional income is saved to the sacco to increase her shares.

SOFDEV Sacco is providing small-holder farmers with the opportunity to save and borrow often as opposed to other commercial financial institutions.

This alternative financing system has enabled the farmers to build more resilient communities and provide social safety nets for the members. Farmers use the loans to purchase farm inputs, diversify into other income generating activities, attend to immediate household needs and a fall back plan in case of natural disasters such as drought, sudden death and related emergencies. Such diverse financial services have empowered farmers and helped them keep away from exploitative money lenders.

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.

Avocado seedlings for sale: I have Hass variety of avocado seedlings at Ksh 150. Interested farmers can get in touch with me on 0720 031 754, 0722 608 855, Eldoret.

Liquid organic fertilizer: Seaweed extract with over 60 nutrients. Ideal for all crops *sukumawiki*, wheat, tomatoes, chillies, potatoes, fruit trees, Napier grass, tea, coffee, beans and others. Quantity 1-4 liters. Contact 0721 96 09 49 or 0734 020 982. Email: bweru@gmail.com

Tree seedlings for sale: We have indigenous and exotic varieties of trees, Contact Mr. Zachary Mwangi on Tel. 0716319097, Kinangop.

Fruit and fruit seedlings: We have tree tomato fruits, pepino melon fruits and their seedlings. Contact Mr. Waweru Ngundo 0728657941, Kinangop



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