

If you want a cheap and an easy option to provide quality protein through insects to your chickens, pigs and fish, you can now opt for black soldier fly larvae. They also help break down organic waste to compost for use in agriculture.



Photo: commons.wikimedia.org

Black soldier fly (BSF) larvae make good animal feed and compost

Beritah Mutune | The Black Soldier Fly (*Hermetia illucens*), is one of the most beneficial insects to humans. The larvae are an excellent source of food for many animals like poultry, bait for fish and pigs. At different stages of their life cycle, especially at larvae stage, the following activities are observed; they consume large quantities of food wastes, agricultural waste products are decomposed and eventually converted into manure which restores soil fertility besides the maintenance of

a healthy environment. As an essential decomposer, the black soldier fly reduces the volume and weights of any waste obtained, reduce potential pollutants such as organic chemicals in manure, prevent houseflies from laying eggs in the waste, cause a significant reduction of *E. coli* and *Salmonella enterica* in chicken manure and are not attracted to human habitation and foods. They inhibit flies and houseflies from flying around.

Stages of black soldier fly and their benefits to humans

The larvae are dark, flat grubs and the adults look like tiny wasps, but they do not sting. The adults only live for a few days, their larvae can live for several days and during this time they can consume huge quantities of food waste or manure. Moreover, neither the larvae nor the flies are considered pests or vectors. BSF grubs can eat practically anything except high cellulose items like grasses, leaves and paper.

BSF larvae go through seven stages before pupating. A few days before pupating they turn brown and this is when they are best to feed to animals. When the larvae are ready to pupate, they secrete their digestive system, lose their mouth, and produce an antibiotic coating. There-

fore, unlike house flies, they cannot carry disease between wastes and foods consumed by humans. This also makes them safe to feed to our animals.



Photo: Courtesy of ICIPE

Fig: Breeding cage

Breeding cage for mating process

Black soldier flies require well-lit cages. The best cage made of the mesh is important since it allows proper ventilation and protects the flies from predators. For lighting purposes, two bulbs in lamp holders can be fitted inside the cage.

How do you set a production unit and attract flies?

The appropriate equipment for use in preparation of a production unit are bins, a dark lid with an internal ramp inclined

Continues on page 6

Dear farmer,

The year is now coming to a happy ending. Looking back, we have a reason to celebrate! It has been a successful farming year. Although some parts of the country have experienced some drought; there is hope that crop yields might perform well if the current rains continue. Farmers' food basket regions have silos with enough maize that may save the country from importing food. It is our hope that the government will be able to buy the maize and provide starving families in parts of Northern Kenya, the Coastal region and other regions where the rains failed.

This magazine has remained true to objectives of providing farmers with practical information on ecological sound practices of sustainable agriculture that use on-farm resources to improve soil, crop, environment and human health. The magazine shares information in simple language that farmers can understand and apply. The on-going Systems Comparison Trials (SysCom) in Thika and Chuka released significant findings in June this year, which showed that organic farming is the best method of crop production of improving income for farmers and taking care of the environment (TOF No. 135, August 2016). It is now scientifically proven that organic farming is the best farming system that protects our biodiversity and ecosystems while improving farm productivity.

Seed companies also need to provide improved maize seed to offer quality and quantity to avert scarcity of food, in all regions in Kenya.

The price of maize purchased by the National Cereals and Produce Board (NCPB), is now at KSh 3,000 per 90kg bag. This is great news from the board on stabilizing the prices. Farmers will no longer be exploited by middlemen and millers.

The capping of interest rates charged by banks at 14%; has however impacted negatively on many farmers who obtain credit from financial institutions. This is likely to affect the future growth in the agricultural sector. It is our hope that banks will re-evaluate some of the strict conditions imposed to make credit facilities more accessible to farmers.

Among other informative features, we have featured successful greenhouse farming (page 2) and Organic certification which remains a big hurdle for farmers due to the costs involved (page 3). We hope that more farmers can take the initiative to produce organic products in groups to make certification and marketing possible to benefit from the growing demand for organic produce.

We wish all farmers a merry Christmas and a **Happy New Year!**

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Organic input makes greenhouse farming possible

Farmers can now produce various crops in a greenhouse environment.

Organic produce is in great demand by the market amidst a hurdle in ascertaining certification mark on organic produce.

Peter Kamau and Venter Mwangera | Greenhouse farming is one of the most popular agricultural enterprises in Kenya today. It is a farming activity, attracting many farmers who want to diversify farming to increase their regular sources of income.

Farmers who have a passion for organic farming have, to some extent, used chemicals to control pests and diseases within the greenhouses. Increased interest in organic greenhouse farming has prompted many companies to come up with a range of products for pest and disease control in a greenhouse environment. The African Borehole Initiative (ABI), affiliated to Amiran (K) Ltd, is one such company. Farmers have options to choose from, either use of chemical fertilisers or use of natural plants to control pest and diseases within a greenhouse.

For the last 10 years, ABI has been promoting an organic production kit for use by farmers who want to practise organic production within greenhouses and in the open fields. Once organic farmers enter into a contract with the company, she/he is trained on organic production for greenhouse and in open fields.

Organic production programme

Following a contract with a farmer the company, the company carries out soil tests to make sure the farmers soil is free of common diseases such as bacterial wilt and also assesses nutrient deficiencies. Therefore, the company advises on the suitability of the site for a greenhouse and the type of fertilisers to apply to correct nutrient deficiencies.

Farmers are trained on how to

make Farm Yard Manure (FYM), that is well-composited. Industrial organic fertilisers such as Guanomat®, Phymix® or Neemgold® are also provided for crop nutrition.

Preparation for a high produce

To control early and late blight, Fosphite® is applied a week before planting. This ensures that fungal spores are eliminated before planting takes place. Ami Organic Copper and Bio-SPH are also applied in a rotation as a preventive measure for control of fungal diseases.

For pest control, the programme uses three inputs: Levo®, Saft-cide® and Neem-Rach® to control whiteflies, thrips and other pests that may attack the growing crops. Alternatively, farmers can use PHYTO® which has a knock-down (kills fast) effect on the pests. Blight and fungal spores are the two notorious diseases that attack tomatoes.

The Organic Amiran Farmers Greenhouse Kits have all-inclusive farming units that include some of the following technologies:

- The greenhouse.
- Drip irrigation system.
- Water tank.
- 16-litre knap sack sprayer.
- Bio-organic plant nutrients
- Bio-organic plant protection.
- Nursery set.

Use of natural plants to control pest and diseases within a greenhouse

Nature has a variety of wild plants and fruits that farmers could prepare and spray on their crops within a greenhouse to control pest and diseases. Such a plant is sodom apple (*Calotropis procera*) tree and their fruits.

How to prepare the sodom apple juice

- Identify the areas they majorly grow in.
- Harvest many of the berries depending on the size of the



Cherry tomatoes grown within a greenhouse and sprayed with Sodom apple extract to control pest and disease

- greenhouse or open field.
- Harvest the sodom apple berries from the plant.
- Cut the fruit into two equal parts to ease juice extraction.
- Using a pestle and a mortar, squeeze all the juice content from the sodom apple fruit to form a thick porridge-like solution.
- Put the porridge-like solution in a separate container and leave it for 72 hours cover the container with a lid.

- Sieve the sodom apple shells from the solution.
- Measure 1.5 litres of the solution and dilute it in 15-20 litres of water.
- Pour this solution in the holes before planting the crop. Planting can start a day after.
- The same solution can also be sprayed on the grown crop to control pests and diseases.
- The crop can be consumed the same day.

According to Mr. Simon Nathan, the Lead Expert in Kilimohai, in Njiro Holy Family Parish, Arusha, Tanzania, "Use of sodom apple solution to control pests and diseases before and after planting any crop in a greenhouse is the safest and cheapest pest control method which has no negative impact on the health of human, animals, soil and the environment."

Farmers can opt for either greenhouse farming or open field farming but embrace the above guidelines to arrive at similar positive results.

Contact: Africam Borehole Initiative (ABI), Rumiah Tel: 0716 184 688 or Amdiel Tel: 0715 213 597.



Sodom apple fruits ground to extract juice for spraying within a greenhouse or open field

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.

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Certification boosts sale of organic produce

Buyers only know if organic products are genuine if they see a certification mark on the product. To achieve this, organic farmers need to undergo a prequalification process where the production process is assessed and a farmer is issued with a certification permit.

Samuel Ndungu | In the last decade, there has been an increase in products and market standards valuation geared towards ensuring food safety measures are highly observed. With the realisation of the risks that can cause contamination of food; safety measures are heightened to ensure healthy standards aren't compromised.

Food contamination may occur while in the farm, at processing and packaging levels before it is transported to the market. Adherence to standards measures is geared towards ensuring quality control and to reduce contamination risks. On the farm, contamination may arise out of chemicals sprayed by the farmer or the neighbouring farmers, polluted water and soils among other impurities. After harvesting, contamination may occur if the products are handled using dirty or contaminated surfaces, equipment and storage materials.

Organic standards

Organic standards were developed as a response to consumers' needs for a guarantee on the food safety. Below are some of the needs for the standard certification:

- It guarantees proper environmental management and sustainability measures are in place and are adhered to.
- It ensures that healthy measures are followed to suitably grow natural food with no contamination.
- It ensures that produce taken to the market comply with organic standard requirements; which, is assured through a compliance check using a credible guarantee system.

After the check for compliance, products can be accepted and labelled as organic or rejected if they do not meet the organic standards requirements. The compliance check using a defined guarantee system is normally referred

to as organic certification. There are two ways of certification as defined by International Federation of Agriculture Movements (IFOAM Organics);

a) Third Party Certification: In this case, the certifier who is a certification company checks the system of production, handling and processing of organic produce against the organic standards. Once this level is approved, the certifier confirms that the system conforms to the organic standards; a certificate of compliance is issued and this allows the farmer to use an organic mark authorised by the certifying organisation. The farmers therefore, sell their products with an organic mark. Where a farmer or a group of farmers is selling products in the international market, it is mandatory to go through this type of certification. It is a statutory requirement in the destination countries such as European Union, United States and Japan.

International certification expensive

Third party certification is normally expensive since it is conducted by companies which are profit oriented. In some cases, where a farmer wants to export his/her produce, the companies accredited to undertake certification for such markets are from these market countries.

In Kenya, there are several international certifying companies which include; ECOCERT, The Institute for Marketecology (IMO), Soil Association, Control Union, Ceres, The Uganda Organic Certification Ltd (Ugocert) and Africert.

Local certification cheaper

The East Africa Organic Product Standards (EAOPS), may also issue third party certification for domestic or regional markets. Local certification companies undertake certification using EAOPS. These companies are much cheaper than the international companies since they work with local staff. Once they complete the certification process, the farmer is allowed to use the organic mark (Kilimohai Mark). The local companies that undertake certification include Acert, Encert and Nesvax Control.

b) Participatory Guarantee Systems Approach (PGS)

PGS is the better option for farmers groups. Farmers sell their



Organically grown vegetables, on sale in an organic store

products in the domestic market, and within a short supply chain. PGS is an elaborate system that brings together organic farmers, packaging services, transport and all other actors in the chain to guarantee the integrity of organic products and ensure compliance with organic standards. PGS systems incorporate a functioning internal control system integrated with the principles of shared vision, transparency, trust, horizontality (equality), participatory and mentorship.

PGS is affordable

PGS is cheaper compared to third party certification and is best suited for smallholder groups who sell their products locally or in farmers' markets. To develop a PGS, farmers need to;

- Develop internal rules and clear management systems and procedures which comply with East Africa Organic Product Standards.
- Develop a mechanism of verifying compliance of every member with the internal rules and defined consequences for non-compliance with internal rules which are implemented.
- Sign up each member to an undertaking to uphold rules as stipulated in the certification guidelines and actively participate in training.

PGS certification process

Groups willing to develop a PGS can contact Kenya Organic Agriculture Network (KOAN) for training. KOAN is also in charge of assessing and approving PGS which have been developed. For a farmer to be certified or to be in an approved guarantee system, it is required that the farmer:

- Has adequate physical separa-

tion of their organic operation from conventional farming (where chemicals are used).

- Has adequate records to demonstrate compliance with the standards.
- Their farm is inspected/peer reviewed at least once per year.
- Undergoes a conversion period before full organic status.

PGS requires that:

- The farmer is knowledgeable about the organic standards.
- Signs a contract or takes a pledge.
- A farmer needs to be committed to, and capable of, implementing an organic agriculture system.
- A farmer establishes records of their operation.
- A farmer accepts inspection/peer review and certification procedures.

Contacts for local certification bodies:

Nesvax Control Ltd

Contact Person: Sylvester Gule
Address: 14360-00100 Nairobi
Telephone: +25473398550
Email: info@nesvax-control.com
Website: [Http://www.nesvax-control.com](http://www.nesvax-control.com)

Encert Limited

Contact Person: Musa Njoka
Address: P.O. BOX 74510-00200, NAIROBI
Telephone: 254 724 910 240
Email: info@encert.co.ke
Website: www.encert.co.ke

Acert services Limited

Contact Person: Susan Njoroge
Address: P.O. BOX 1175 Thika
Telephone: 0723 857 373
Email: info@acertlimited.net
Website: www.acertservicesltd.net

Improved feed formulation for pigs

“With a professional spark in pig farming, this farming could double as a hobby and a source of livelihoods,” says Mr. Michael Wanyoike, Managing Director, Bell Farm Kenya Ltd

Karitu Njagi | Pig farming is an activity undertaken by a farmer to fetch an income. It can be a reliable farming activity only if the farmer is dedicated to ensuring good choices of breeds selection are made, offer good housing, proper feed formulation, ensures maintenance of high hygienic conditions besides ensuring proper scheduling in quantity and a well-outlined feeding timetable.

Farmers who invest more time into proper management of their pig farming enjoy many returns. “At my farm where I started pig farming six years ago, I ensured adherence to proper feed formulation of my pigs. My pigs have since reproduced from 100 to over 1000 pigs to date.” says Mr. Michael Wanyoike, the Managing Director at Bell Farm Kenya Ltd,

The idea is to get the pig into the market at the shortest time possible when it has attained the 90 to 100 kilogrammes. The standard period is normally six months. But, you can do it within a shorter time frame.

Feed formulation for pigs

Feeding programs for a drift of pig requires modification to optimize nutrition and improved accuracy of determining and meeting all nutrient requirements. Nutrient requirements of pigs depend on many factors. Hence, one set of diets is insufficient to meet the needs of all pigs. The following are best practices to apply in pig feeds formulation and management of pig farming that Mr. Wanyoike applied and he is reaping the benefits today:

a) Ensure quality is assured

For best results, the following are key guidelines to follow to ensure the health of pig is looked into for the expansion of the pig farming activity:

- The ingredients for the feed must be available at all times.
- Pig feed should be fresh



Healthy piglets fed on well formulated feeds mature early

always.

- Any pig feed formulated for the pig should be well processed and packaged.
- The feed should be well balanced with all the nutrients.
- The feed given to pig should be able to support optimum growth and development of the pig.
- The feed should be tasty.
- The feed must be affordable.
- The pig feed should be high in fibre content to allow proper digestion.
- It must be attractive and pleasant to the pig.

b) Balance ingredients for formulation for pig feeds

The following are some of the ingredients that constitute a balanced pig feed for proper growth:

- **Maize meal:** It contains about 2500 kilocalorie (Kcal/kg) count and calorie content in the food. It is a complimentary source of energy.
- **Maize:** The grain forms major constituents of the feed. It is a good source of energy. The metabolizable energy is about 3400 Kcal/kg and it is widely cultivated in almost all parts of Africa in particular. The protein content is about 10%. Yellow maize contains carotene. Maize must be properly dried before it can be used for the formulation to avoid aflatoxin contamination.
- **Sorghum:** It is regularly

grown in most parts of Kenya. The energy level is about 2500 Kcal/kg. If maize is scarce and expensive, sorghum could be used as a substitute.

- **Wheat meal:** It is another complimentary source of energy. It is a by-product of wheat after milling. The energy value is low compared to maize but, the energy content is about 1800 Kcal/kg.
- **Cassava:** Cassava is a good source of energy but with low protein. The by-product includes cassava peel, cassava flour and cassava chaff. Cassava must be properly dried before incorporation with other feed ingredients.
- **Sweet potato:** It is a good source of energy. Boiled sweet potato could be given to pig directly. When formulating a diet for pig, the dry sweet potato could be used to replace maize to a large extent.
- **Yams:** There are various types of yam in Africa. They are grown primarily for human consumption but could also be used to feed the pig. Again, yam tuber or peel could be sun-dried and incorporated with other feeding ingredients during feed formulation.
- **Fish meal:** It is very good source of animal protein. It is rich in both essential and non-essential amino acid. The protein content is between 60% and 72% crude

protein.

- **Groundnut cake:** It is a good source of plant protein. The protein content is about 45% crude proteins. The energy content is about 2600 Kcal/kg. The ground cake must be well dried and stored to avoid moldiness.
- **Soybean meal:** It is another good source of plant protein. The protein content is around 45% crude proteins. Soybean meal could be used to replace groundnut cake but the methionine and lysine content of the former are higher than that of the latter.
- **Bone meal:** It is a good source of calcium and phosphorus which is responsible for bone and skeleton. The calcium content of bone is around 37% and phosphorus content is about 17%.
- **Oyster shell:** It is a good source of calcium. The price of oyster shell is lower than that of bone meal. The calcium content is about 35% and contains no phosphorus.
- **Palm kernel cake:** It forms one of the major ingredients in formulating pig's ration due to low cost compared to other feed ingredients. It contains protein content of about 18% crude protein but the fibre is high, at about 12%. The energy value is about 2000 Kcal/kg. It is a by-product of extraction of palm kernel oil from palm kernel.

What are the health benefits of juicing?

The end of year is here with us and with it, the festive season beckons. The festive season comes with merry making, family reunions and plenty of eating and drinking. Do it in moderation.

Dr. Peter Mokaya | While all the celebrating are acceptable, it comes with some measure of health risks related to overindulgence, which, may manifest in weight gain a precursor to many non-communicable diseases (NCDs) like diabetes, heart and blood vessel diseases, respiratory diseases and cancer, among other chronic conditions.

So, what does juicing have to do with all these?

All consumers, including small scale organic farmers, desire to maintain good health, if they are to achieve their farming and related livelihood objectives. The nutritional and health benefits derived from juicing are;

- Stabilized healthy state of wellness.
- Contributes to weight management and weight loss.
- Provides more energy and vitality by ensuring human body absorbs enough micronutrients.
- Reduces and removes toxins from your body and thereby improving health.
- Lowers cholesterol especially the bad cholesterol, which includes triglycerides.
- Contributes to overall good nutrition and wellness by providing adequate micronutrients.
- Detoxifies and improves the health and functioning of the liver.
- Has been associated with reversing many life threatening diseases, including heart diseases and diabetes.
- Ensures an adequate intake of chlorophyll. Chlorophyll is the green pigment in plants. Chlorophyll can help to strengthen the blood and rebuild red blood cells. The molecular structure of chlorophyll is almost identical to a component of red blood cells called hemin.

Is there any difference between juicing and blending?

While blending is putting all the fiber and proteins from the



Healthy juice extracted from vegetables

vegetables and fruits to form a smoothie, juicing is a process of removing all of the fiber and some of the protein from the vegetables and fruits leaving behind a concentration of micronutrients and sugar in a liquid form and discarding the rest of the remains. The remaining liquid is the stuff that juicing proponents consider as liquid gold, often loaded with chlorophyll and other micronutrients. Smoothies are drinks made from blending whole foods together, usually fruits and veggies. One can add seeds, like chia seeds, flax seeds, pumpkin and nuts for a rich mixture. Liquids like milk (preferably organic milk) or coconut water (an excellent source of nutrients) can also be added to smoothies.

Why juice instead of blending or cooking?

- Juicing is the most advisable way of extracting high content juice from the preferred produce. It is invaluable because valuable and sensitive micronutrients become damaged when heated and cooked as foods. Cooking and processing food destroys useful micronutrients especially if overcooked shape and chemical composition is altered.
- Juicing is a more practical way of getting the recommended 6-8 servings of vegetables and fruits per day. Juicing is an easy way to guarantee that you will reach your daily target for vegetables.
- Juicing should be applied

sparingly. If one is overweight, is on diabetes management, blood pressure, high cholesterol, one is advised to limit juicing fruits and instead juice more on vegetables to avoid the sugars in fruits, especially fructose which causes most of the metabolic complications, including weight gain.

- The only fruits, which are an exception are lemons and limes (not oranges!). They have very little sugar and zero fructose. Lemons or limes are also good at eliminating the bitter taste of the dark, green leafy vegetables that provide most of the benefits of juicing.
- Juicing helps in absorption of all the nutrients from the vegetables. This is important especially for the people with impaired digestion as a result of making less-than-optimal food choices. Juicing will help to "pre-digest" and the body will receive most of the nutrients rather than wasting them.
- Juicing allows one to consume an optimal amount of vegetables in an efficient manner. Some people with poor eating habits may take a quick glass of vegetable juice and most of all nutrients are found in one glass of vegetable juice.
- You can add a wider variety of vegetables in the diet. Eating the same vegetable salads every day violates the principle of regular food rotation and increases chances of missing some key micronutrients. However, with juicing one can juice a wide variety of vegetables that wouldn't be enjoyed when eaten whole.

Are there any precautions and concerns with juicing?

- It is important to note that vegetable juice has very little protein and virtually no fat, and, it is not really not a com-

plete food. Regular juicing should be done, in addition to your regular healthy meals. But not as a replacement to meals.

- Unless a person is undergoing some special fasting, weight loss plan or detoxification program, it is unwise to use juicing as a meal replacement. Juices can be consumed with a balanced meal but for maximum absorption, they are best taken in between meals or on their own.
- It is very important to listen to your body when juicing. Your stomach should feel good all morning long. If it is churning or growling or generally making its presence known; you are probably juicing on something you should not be eating!
- To enjoy juicing, you should only start by juicing vegetables that you enjoy eating non-juiced.

What is the way forward?

- Consider taking frequent breaks from consuming normal meals and juice to restore and maintain good health and wellness. Ensure all or most of your vegetables and fruits are from organic sources, preferably from certified organic sources. Participatory guaranteed systems (PGS) certification is acceptable.
- Remember, when juicing, especially organic vegetables and fruits, it is the best step to take to be in control of one's health. This is a form of wealth while at the same time improving the livelihood of small scale organic farmer, whose livelihood and quality of life is improved when one buys organic vegetables for juicing.
- Moreover when you buy organic produce, you are contributing to the achievement of Sustainable Development Goals (SDGs) by promoting ecological organic agricultural practices.

For more information on juicing, health related and nutritional questions and clarifications, feel free to contact the author of the article at the address below:

Dr. Peter Mokaya, Director and CEO, Organic Consumers Alliance(OCA), Website: www.organicconsumers.co.ke Email: Peter.Mokaya@organicconsumers.co.ke or Mokaypm@gmail.com

Restoring ecosystem furthers bumper harvest

"Knowledge is power. For a long time; I suffered the wrath of infertile soil owing to haphazard farming activities. I didn't know what to do until I met Mr. William Buluma. I'm now a happy farmer." Secretary, Umoja Self-Help Group, Mrs. Jane Kweyu says happily.

Venter Mwongera | Land is a natural resource that can generate a high income and improved livelihoods only if practised systematically and in the right way. Farmers in Busia County have practised farming activities over a long period of time to generate an income. Majority of farmers in the county embraced farming with scanty information about land preparation and partitioning, seedlings selection and best crop for each soil type, best and natural soil fertility restoration mechanisms, various mechanisms of restoring the ecosystem to maximise in the refurbishment of soil fertility, increased yields and improved land use for better returns. The majority of farmers in Western part of Kenya now take pride in their vast lowlands which are a source of revenue for their socio-economic activities.

Proper land management for improved returns

"Each year, overuse of chemical fertilisers rendered my land infertile. I had to buy many bags of



Mrs. Jane Kweyu showcasing her overgrown vegetables for seed collection for subsequent planting season

fertiliser during planting seasons and many bags for top dressing to ensure improved harvest. I invested a lot into chemical fertiliser in an acre of land and I could only harvest 12 kilogrammes of beans and four kilogrammes of maize after three months." Says Mrs. Kweyu regrettably.

According to her, continuous use of fertiliser decreases soil fertility in her land. "I'd forego many basic needs like surviving on one meal a day to ensure I saved enough money to buy fertiliser for my land." She reveals adding, "To my disappointment, I would invest all my resources into farming activity but returns was low."

Farmers in Esidede Village in Nambale Sub-County in Busia County, decided to bring the change they dearly needed. They formed a farmers' self-help group whose mission was to find solutions to restore soil fertility in their land and earn a decent live-

lihood from tilling their land. "As women, we believe in looking for solutions to support our families." The Secretary to Umoja Self Help Group states adding, "After many years of poor returns in farming activities, 2012 is a year all women in my group shall live to remember," she says happily.

She vividly remembers this year, 2012, because it is during this year when her farmers' group met with Mr. William Buluma, an Extension Officer from Biovision Africa Trust (BvAT).

"Mr. Buluma taught us how to prepare compost manure, nursery beds, the preparation and the importance of double digging, heave a key-hole, a facility trench and partitioning land into segments," Mrs. Kweyu reveals.

Four years later, all the 15 members in this farmers group are a happy lot. "Our health has improved, our children go to

school, and family fights have been abolished. Food is plenty for domestic use and commercial purposes. With a monthly income from the sale of farm produce, our lives have been positively changed." Mrs. Kweyu says cheerfully.

Ready market for organic produce

"The demand for naturally grown vegetables overwhelms me. I'm in my farm throughout the day. I have supplies to make on a weekly basis. I supply Simbembe and Munami Secondary Schools with naturally grown vegetables of between 60 to 120 kilogrammes besides 5 litres of home-made yoghurt," she testifies joyfully.

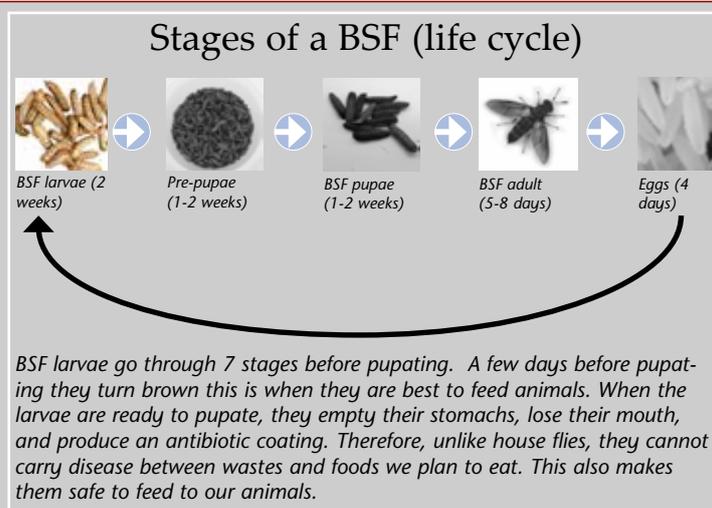
Mrs. Kweyu makes over KSh 60,000, as net profit, from the sale of her vegetables on a monthly basis. She has managed to buy a Friesian cow, pay school fees for her three children in secondary school, clothe, feed and maintain her three children in primary school. "I struggled to educate my first born child. I frequently quarrelled my husband due to lack of school fees for my child. After I learnt the new and reliable farming lessons; I never bothered my husband to provide school fees. One of my children has now completed her college education," she says happily.

Mrs. Kweyu traverses Busia County with an empowerment message to fellow farmers. "I'm grateful to Mr. Buluma and BvAT for teaching me sustainable agriculture." She says thankfully. ■

cont'd frm pg... 1 Black soldier larvae makes good quality animal feed

plane at an angle of 30 degrees (this is to ensure the larvae remains caged). To ensure the black soldier flies are trapped in the bins, the following simple guidelines can help.

- Leave the bin with the lid open to attract the black soldier flies especially the female ones.
- Keep vigil until female soldier flies are drawn in the bin.
- Then close the lid immediately the female black soldier flies are inside the bin.
- Ensure coffee powder waste is poured around and within the bins since they are attracted to coffee powder.
- Afterwards, supplement the waste by adding kitchen waste.
- Add more coffee grounds, or



rotten fruit or vegetables.

- Fruit flies and house flies will be drawn to the bin first. Their eggs hatch faster than those of soldier flies. But, once the BSF larvae are estab-

lished, they dominate their competitors.

- The ideal size of the bin can be approximately two meters long, one meter wide and one meter high.

How do you self-harvest the larvae?

The adult BSF lays its eggs in rotting fruits, vegetables, manure or other agricultural waste. Within two weeks, the eggs hatch and turn into mature larvae. Once the larvae have developed completely, through the six stages, they enter a stage called the prepupa. While this stage, they stop to eat, empty their stomachs and their mouth parts change to an attachment that helps in climbing. During this period, they prefer dry sheltered area to pupate. More often, such dry places are in compost bins where self-harvest of the mature larvae can be done. These containers have holes on the sides to allow the prepupae to climb out of the



Front side of the bin



Back side (collection area) of the bin

More about toxin binders and how to use them

I am a cattle breeder in Trans-Nzoia County. Please enlighten us on how toxin binders work and also give us information on where we can buy them.

Toxin binders are substances that reduce poisonous fungal compounds called mycotoxins or aflatoxins. Some of the aflatoxins are found in animal feeds and human food; preventing them from being digested, in process reducing their toxic effect. Aflatoxins are the most common fungi or mould which form when cereals such as maize, groundnuts, beans, wheat, sorghum and related cereals are exposed to high moisture levels or temperature. Aflatoxins can also develop in any of these cereal crops at the growth stage, during handling, harvesting or storage.

Farmers use decomposed maize as feed

It is a common practice in Kenya for farmers to sort maize after a harvest. The decayed maize is put aside and milled or fed to livestock while the good maize is stored for use as human food. What farmers do not know is that the decomposed maize (also known as *maozo*) contains aflatoxins. When the animal feeds on the decomposed maize, the aflatoxins are digested, going into the bloodstream where they are deposited into the tissues and even milk, hence contaminating the milk.

compost bin and drop into a collection area.

How many bins does a farmer need to make enough feed?

The number of bins required depends on the availability of waste and the demand of the larvae. One square foot of larvae bin can produce more than 30 pounds of protein a year.

How many tonnes of compost can one bin produce?

The quantity of compost in one bin depends on the availability of waste and size of the composting bin. On average, a household will produce less than a kilogramme of food waste per day. BSF larvae decomposes food waste faster than worms can do it. Research has proved that 1 meter square of larvae can eat about 15 kilogrammes in a day.

When people consume the milk, the aflatoxins get into the body causing many complications as explained later in this article. Some of the health problems facing people are directly associated with aflatoxins. The only way farmers can reduce aflatoxin poisoning is to avoid feeding animals with decayed maize. The only other alternative is to use aflatoxin binders which degrade aflatoxins in the feed and reduce their toxic effect in animals and people who consume animal products. For maximum effectiveness toxin binders should be used together with other control measures. Some of the measures are; sorting the maize to minimize the amount of toxins and removing other impurities in the feed such as small particles and dust.

Effect of aflatoxins

Aflatoxins can cause;

- Cancer in humans.
- Stunted growth in both animals and humans.
- Decreased appetite for feeds by animals.
- Poor feed conversion in animals.
- Diminished body weight.
- Suppressed immunity in humans and animals.

How can we prevent mycotoxins

Control of mycotoxins devel-

How do you establish a larval colony in a homestead?

- The easy route to establishing a colony is to buy a bin which can allow BSF, to fly with ease.
- Ensure all the waste is put in rotting fruits and vegetables and with an inclined plane that allows the larvae to crawl out into a collection container.
- Add food waste to the bin and then take the larvae as feed for your poultry, fish and pigs.

How do you manage the production unit?

- The bins can be maintained by sterilising after two weeks with any detergent.
- Clean the breeding cage using cotton wool and water.

opment during growth, harvest and distribution is the most effective way of control. Farmers can reduce the development of aflatoxins through the following practices;

- Use of high quality seeds.
- Controlling insect pests which transmit the fungi from grain to grain.
- Suitable management practices of crop residue.
- Careful handling of cereals including timely harvest of cereal crops and cleaning of harvesting equipment.
- Sorting of damaged cereal crops to ensure broken grains or infected ones are removed.
- Proper drying of all grains to reduce moisture levels- All grains should be dried to moisture levels of below 13.5 per cent.
- Storage facilities should not be humid and the temperature in such facilities should be low.
- Controlling of all storage pests is also very important.

How does toxin binders work?

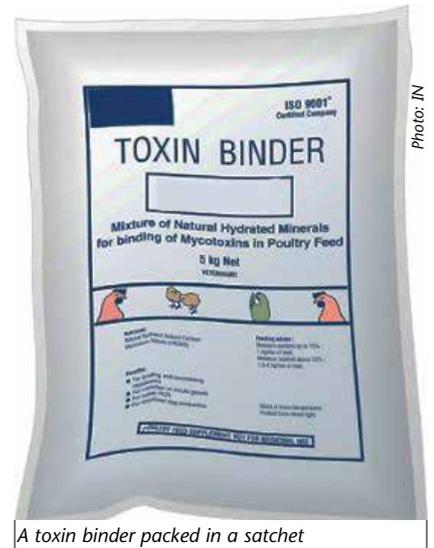
Toxin binders are compounds (adsorbents) that are mixed with animal feed.

- They bind themselves with aflatoxins by sticking themselves on the surface of aflatoxins and stopping them from being digested with the feed in an animal's intestines.
- The binders and the aflatoxins, later pass through animal's gut and are removed from the animal's body as animal waste (cow dung). This saves the animal from aflatoxin poisoning.

Types of aflatoxin binders

Some of the toxin binders are more effective than others depending on their chemical composition and ability to bind themselves with aflatoxins. Natural aflatoxin binders are more preferred to chemical binders because they are biodegradable and do not accumulate in the environment after an excretion together with animal waste (such as cow dung).

They contain living microorganisms capable of binding



A toxin binder packed in a satchet

themselves with aflatoxins in a way that makes aflatoxins harmless to humans and animals. However it is not possible for toxin binder to remove mycotoxins completely because some of them cannot be eliminated by the use of toxin binders alone. (There are over 300 different types of mycotoxins present in contaminated feed and aflatoxin or *Aspergillus flavus* is just one of them). The measures we have mentioned here are just meant for the control of aflatoxin alone as it is the most common in Kenya.

Use organic toxin binders

Researchers have managed to identify many species of bacteria and fungi that can make aflatoxins harmless to animals and humans. The most common natural toxin binders are yeast and Lactic Acid Bacteria (LAB).

About 1-2kg of active yeast extract can bind up to 1 tonne of animal feed. When buying toxin binders, farmers should insist on buying organic or natural toxin binders which are safe and reliable.

If they are not available, farmers can still use chemical toxins binders since the aflatoxin control is very important at this stage to stop the entry of the poisonous fungi into the livestock feed and eventually into the human food body (in the next issue we will feature natural aflatoxin binders and a detailed way on how to use them).

Farmers interested in aflatoxin binders can contact the dealers on the contact given below:

Essential Drugs Ltd Tel. 0721 386 604, Nairobi.

Answer by Elkanah Isaboke

TOF Radio 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.

Farmers can salvage kitchen waste into compost

Proper waste management in urban residential areas can provide rich compost manure for not only kitchen gardening but also provide manure for application on the home garden flowers beds

Joyce Mahui | Many farmers in the urban areas dispose of the kitchen waste into a communal central place for weekly collection by agencies responsible for dirt collection in urban setups.

Whilst the kitchen garbage would be managed well to form compost manure, which, provide necessary nutrients much needed into the soil; most urban farmers haven't benefited on this.

Waste management in urban settings can be a major challenge in the rapidly growing urban towns. Proper waste management practices would be best, for proper recycling, to restore vital nutrients into the soil, ensure a clean environment and improved hygienic conditions maintained for improved human health.

Importance of recycling kitchen waste to form compost manure

- The organic matter contained in compost provides food for microorganisms, which keep the soil in a healthy, balanced condition rich in nutrients such as nitrogen, potassium and phosphorus. These nutrients are essential for plant growth and health.
- It is a natural way of feeding the soil at a low cost and it is environmentally friendly. Compost manure improves soil structure, texture, aeration and increases the soil's water-holding capacity.
- It is a better way of controlling air pollution and breeding of mosquitoes which results after decomposing of waste.
- Composting is a natural process (bio-degradation) of turning organic matter into valuable soil food called humus. The bio-degraded kitchen waste, if properly used, can be used to grow kitchen vegetables without



Kitchen waste being recycled into compost manure

- incurring unnecessary costs of buying chemical fertilisers.
- It is cheap to form compost manure from food waste such as peels from various readily available foods due to everyday use, at household level.
- An urban farmer can compost all unusable vegetables, fruits and spices waste including rinds and cores, uncooked waste grains, coffee grounds, filter fruits and vegetable pulp from juicing, egg shells (crush well), corn cobs and husks (cobs breakdown very slowly) to easily form compost manure which matures over a short period of time.
- Sort and separate the materials into biodegradables such as fruit and vegetable waste and non-biodegradable including glass, plastic, metal, batteries, and put them into different kitchen waste buckets.
- Empty your containers daily or every few days depending on how much waste you generate. This ensures that no smell starts permeating into the kitchen.
- Always cover the food waste inside the container with a newspaper to reduce on filthy smell.
- Every time a bin is emptied, wash the bin thoroughly with clean water or detergent to get rid of the awful smell.

Composting structures

Composting structures don't have to be commercially procured. An urban farmer can use locally available materials to make a composting bin, a polytube or dig a small composting ditch where all kitchen wastes are thrown apart from polythene and plastic waste.

How to store compostable household food wastes

- Chop or shred waste during meal preparation to reduce volume.
- Store in a securely covered and washable kitchen waste bucket with a handle.

Composting method

To achieve best compost manure, sprinkle a handful of topsoil every time additional waste materials are added. The importance of soil is to hasten decomposition process as a result of micro-organisms found in soil. To ensure maximum benefits are accrued from kitchen waste management and to form quality compost manure;

- Identify a location for the outdoor bin, preferably in raised position.
- Empty the biodegradable



0717 551 129 / 0738 390 715

Chickens on sale: 2½ months old KARI chickens. Price negotiable. Contact 0710 247 281, Nairobi.

Organic produce for sale: We are offering organic vegetables, fruit and spices for sale. We have *sukumawiki*, spinach amaranth, chia seeds, rocket black, Chamomile, Fenugreek, basil, mint, asparagus, parsley, beetroot, lemongrass, Taragon, tree tomato and Pepino fruit and seedlings. Contact Wanjiru's Park Farm and Resource Centre, Limuru Tel. 0723 158 680.



WhatsApp

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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.

kitchen waste bucket into the compost bin.

- Add dry materials (small twigs, tree leaves, and shredded biodegradable paper) to the green materials at a ratio of 4:1 to prevent bad smell and sogginess.
 - Sprinkle with wood ash to incorporate potash.
 - Ensure the compost is moist but not wet by sprinkling a little water.
 - Keep the temperature range between 40 – 50 degrees Celsius by turning and sprinkling water. The temperature of your compost is important because it kills the micro-organisms if too high and decomposition is hampered if it is too low.
 - In the absence of a thermometer, the temperature can be monitored by feeling with the hand.
 - Keep the compost aerobically active by turning it using a shovel or by rolling the bin 1-2 times a week.
 - The compost should be ready for use in 6-8 weeks.
- The original materials that were put into the compost bin should not be recognisable. Compost is ready for use when it's dark, crumbly and mostly, broken down with a pleasant, earthy, soil-like smell.