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Dear reader,

Most parts of the country are experiencing rain and farmers have already sowed despite the rise in the costs of farm inputs especially fertilizers. Those who had embraced composting techniques and use of other organic soil fertilizers such as green manures and vermicompost as it has been encouraged in the previous editions of TOF Magazine, remained resilient to these economic shocks.

Even as the country sluggishly recovers from drought, a crop ravaging pest, the African army worm has returned causing devastating effects on maize and sorghum especially in the western and rift valley parts of Kenya. As a result, the country is staring at huge losses approximated to be up to 16 million bags of maize during this year's harvest season if effective control measures are not adopted. In this edition, a scientist from icipe, a renowned research center on insects brings you a detailed feature on tips to manage the armyworm, effectively without wearing out from intense pesticide application.

Are you undecided on the potato variety to grow? This edition details the varieties suitable for various regions in Kenya. For banana growers incurring losses through invasion by unfamiliar pests, read about the common banana weevil that might be the reason, the banana plants in your farm rot away before they can produce.



African Armyworm, a devastating pest for cereal crops in Kenya

By Beritah Mutune

Farmers in Western, Eastern and the Rift Valley regions of Kenya have pleaded with the government to intervene as they stare at huge losses following attacks by the ravaging African armyworm (AAW), on the maize and sorghum fields. This stubborn pest has caused devastating crop loss, that is likely to cause a major food shortage. The army worm attacks mostly during the rainy season after periods of

prolonged droughts as is the case this season.

The African armyworm has a short life cycle, high reproductive capacity, and mobility by migration. Moreover, there is little time to react as infestations frequently go unnoticed, since young caterpillars are difficult to detect. When caterpillars become visible (at the fourth instar), they cause a lot of damage within a very short time.

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Why you should plant lucerne for your livestock

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Identification and biology of African Armyworm

The African armyworm has four stages of development: - the egg, 5-6 caterpillar (larva) stages, pupa and adult.

Egg: Eggs are white when laid, turn yellow and then black before they hatch after 2-4 days. Eggs are laid in masses of 10-600 eggs covered by a black wool-like substance that protects them from dehydration, predators and parasitoids. Eggs are laid on the lower surface of the host plant leaf.

Caterpillar: The caterpillar stage has 5-6 instar stages (14-22 days). In the last 2 instar stages, they change colour depending on whether it is solitary or gregarious. It is black during the gregaria phase and green during the solitary phase. The African armyworm caterpillar in its gregaria phase has a velvety-black upper surface with white lines running along the sides. The caterpillars also have a green or pale-yellow underside and do not have any hairs on the body. The head is shiny black with an inverted V-shaped mark. Mature caterpillars dig (burrow) into the soil 2-3 cm deep to pupate.

Pupa: The pupa is pale green and soft when newly formed but changes colour gradually to red-brown once it hardens, forming a smooth and shiny surface. The pupa measures 10-14 mm long. This stage takes between 7-15 days.

Adult: The adult moth's wingspan is between 20-37 mm, with dull grey-brown forewings and white hindwings with visible veins. The male forewings are grey with lighter patches while the female forewings are uniformly brown. A female moth can lay between 400 and 1300 eggs during her lifetime.

Primary hosts and factors affecting their survival

Some factors such as temperature, rainfall and wind patterns favour the survival and development of the AAW. The primary hosts are maize, sorghum, sugarcane, millet, rice, teff, barley, oats, wheat, ginger, finger millet and pearl millet.

Scouting and monitoring are very important in controlling African Armyworm outbreaks

Field scouting

This is the regular examination of crops and pasture fields in a prescribed and organised manner to confirm the occurrence of the African armyworm and infestation levels.

When scouting, farmers are advised to check for green or black "army like" caterpillars with a velvety-black upper surface and white lines running along the sides.

Monitoring

This includes confirmation of the presence of AAW, population density per unit area and extent of damage caused and crops under threat. Pheromone traps and lures are used as the adult females release a smell the 'so-called pheromone' that attract males for mating.

The males stick on the trap and the farmer can gauge the population level by the number of pests trapped on the pheromone trap to inform early preparedness and rapid response for timely control.

African Armyworm Management Methods:

Physical methods

Farmers can hand-pick the larvae and crush the eggs especially when larval populations are low and scattered.

They can also dig a deep ditch with vertical sides to trap the caterpillars and prevent them from crawling out. In addition, the deep ditch can be filled with water where caterpillars would fall in and drown. This can help prevent caterpillars from moving towards the farm from the adjacent fields.

Cultural Management Methods

Farmers can avoid damage by AAW by keeping their crops free from grass weeds. Weed-free maize crops greater than 30-50cm high are unlikely to become infested by newly hatched AAW caterpillar because the leaves are too tough. However, if crops have been infested, farmers are advised not to weed the fields as this would allow caterpillars to locate the plants

more easily. Farmers are advised to leave the fields with weeds until the caterpillar have pupated or have been controlled.

Use of Biological Agents

1. Natural enemies-

Conserving or maintaining natural habitats around cropped areas helps to conserve and build up populations of natural enemies. Some natural enemies are known to attack AAW at different stages of its life cycle, and these include:

- Parasitoids such as wasps and flies that lay their eggs inside armyworm caterpillars and eggs, therefore, prevent eggs from hatching or caterpillars from developing.
- Predators such as lacewings, wasps, ants, spiders, beetles, birds and bats feed on and may suppress small outbreaks.
- Biopesticides are derived from microbial agents and botanicals/plant extracts can be used to manage AAW.
- Microbial agents - pathogens such as bacterium *Bacillus thuringiensis* (Bt) can kill armyworm caterpillars. Bt products for the AAW in Kenya are sold under the following commercial names: Dipel(r), Javelin(r), Thuricide(r) and Xentari(r).
- Armyworms are attacked in nature by viruses e.g. *Spodoptera exempta nuclear polyhedrosis virus* (SpexNPV).

2. Botanicals/plant extracts such as Neem and Pyrethrum have also been applied to kill the AAW caterpillars-

How to prepare neem solution:

- Grind 500 grams (g) of neem seed kernels in a mill or pound in a mortar.
- Mix crushed neem seed with 10 litres of water. It is necessary to use a lot of water because the active ingredients do not dissolve easily. Stir the mixture well.
- Leave to stand for at least 5 hours in a shady area and spray directly on crops.

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Potato varieties performing well for Kenyan farmers

By Mellen Nyabuto

Potato is the second most-produced food crop in Kenya and it is produced by both large scale and small scale farmers. Potato farming is a major contributor to food and nutrition security and a source of income for most farmers in Kenya. They are also a good source of Vitamin C and can be prepared in a wide range of recipes.

They can be eaten as mashed, fries or crisps. There are close to 60 different varieties of potatoes that are certified and existing in the market. Some of these potato varieties include Unica, Sherehekea, Kenya mpya, Dutch, Arizona, Destiny, Manitou, Markies, Shangi, Nyota Panamera, Purple, Gold, Rodeo, Royal, Rumba e.t.c.

Different potato varieties perform differently depending on the region, climate and planting practices. Below is a list of some of the well-performing potato varieties for the Kenyan farmer, their description and characteristics.

1. Shangi

Shangi an oval-shaped tuber with white flesh, cream skin with medium to deep eyes is one of the best performing varieties. It does really well in areas such as, Meru, Nakuru, Kwale, Nandi, Kisii, Nyandarua, Kiambu, Nyeri, and Taita-Taveta. Upon planting, it takes less than three months to mature.

In the farms, shangi can grow to a height that is slightly less than one meter, with pink profuse flowers and light green leaves.

Shangi has a seed dormancy of one month and is moderately susceptible to late blight. Shangi has a medium yield. It's used as a table variety and making chips.

2. Manitou

Manitou has an oval or long oval-shaped tuber. It has red smooth skin, shallow eyes and pale yellow flesh. It grows well in almost all potato growing regions in Kenya.

Unlike Shangi, Manitou takes 3-4 months on the farm to mature. It has tall stems with large light green leaves. It flowers robustly with violet flowers. Despite having a medium seed dormancy, Manitou has good resistance to tuber blight, wart disease and is moderately resistant to potato viruses, though, Manitou is susceptible to leaf blight. Its yield can be approximated to 40 tons per hectare and is mainly used in making fries.

3. Sherehekea

Sherehekea characterized with round tubers, smooth red skin with deep eyes and cream flesh is one of the best. It grows in areas such as Kwale, Kericho, Nandi, Nyandarua, Kiambu, Nyeri, Laikipia and Meru. It takes 3-4 months to mature. On the farm, it grows to a height of slightly one meter with small dark green leaves, strong stems and produces light purple flowers.

It has long seed dormancy of 4-5 months and is resistant to late blight and potato virus Y. It is also one of the high yielding varieties.

4. Kenya Mpya

Kenya Mpya has an oval shape, smooth cream skin with creamy flesh. It does well in most potato-growing regions. It has a medium maturity of 3-4 months. Like most of the varieties, on the farm, it grows to a height of one meter with medium-light green leaves.

Unlike other varieties Kenya Mpya rarely flowers and when it does it produces white flowers. It is resistant to late blight with a tuber dormancy of 3 months. Kenya Mpya has a medium yield and is mainly best in making fries.

5. Unica

Unica has oblong tubers with red skin, shallow eyes and creamy skin. It does well in both lowlands and highland regions of Kenya. It is characterized by an early maturity rate of fewer than 3 months. It grows to a medium height in the farm with strong stems, dark green medium-sized leaves and produces pink flowers. It is moderately resistant to late blight and highly resistant to potato leafroll virus and potato virus X. It can be used for chips, crisps, and as table variety with high vitamin C, iron, and Zinc.

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<https://infonet-biovision.org/PlantHealth/Crops/Potato>

Youth in permaculture

By Priscah Muiruri

“ *Permaculture is not just a set of practical techniques but it is a way of thinking and of adapting...* ”

Many youths tend to move away from agriculture despite the sector's importance to food security and to the Kenyan economy. To shift this trend children and youths can be inspired to shift their perspectives towards agroecological practices through education, due to their eagerness and motivation to learn. The outcome would be their ability to link the food they are consuming to the processes it passes through to get to their table. It would also be an opportunity to interact with nature and understand the importance of taking care of the environment. Moreover, since children choose careers that will provide high returns, they can realize that agriculture is among the options. Shaping children's minds to view agriculture in a positive light is bound to have long term benefits as they are the leaders of tomorrow.

Thika Rescue center is on the forefront of training children and youths on permaculture and other agroecological practices. The center which occupies a total of 5 hectares (12.35 acres) and is located at the outskirts of Thika town is home to 105 boys. The center also have twelve staff members who are dedicated to the teaching of agroecological farming practices such as garden layout and design, soil fertility management using green manure, permaculture, garden management, growing systems, mulching, water management, extraction and growing of indigenous seeds and rearing of small animals, among others.

This has enabled the school to provide 40% of the food they consume from a small portion of the land. This small portion is an up and coming food/garden forest.

Permaculture, which is one of the practices being taught at the center is a method of growing that was invented in the 1970's. 'Perma' comes from the word 'permanent' which means 'lasting forever'. 'Culture' means a way of life. Permaculture is a design system for planning how to use the environmental resources efficiently so that people can live in our environment sustainably without damaging it.



To use our soil, water and air without wasting energy or causing pollution we need to intergrate the traditional skills of our ancestors with modern scientific knowledge and technologies.



This is key in permaculture where a system is established to copy the beneficial relationships of a natural woodland ecosystem. The food forest has vegetables like kales, spinach, cabbages, amaranth and managu. There are also several fruit trees, nuts, shrubs, herbs and leguminous plants. This fulfills one key goal of permaculture, production of food in abundance in quantity, quality and in wide variety.

During class breaks, boys work in the school garden, planting, weeding, irrigating and harvesting the crops when they are due. They are very proud of their work when they are served healthy, nutritious and chemical-free food from their shamba.

Children holding bunches of local vegetables from their nutritional garden.

One of the boys got so interested in Agriculture from that experience and decided to enroll for an Agroecology course at GBIACK (Grow Biointensive Agriculture Center of Kenya) after completing secondary education. After graduating, he has been applying his newly acquired knowledge and skills in managing the school's garden.

Permaculture is not just a set of practical techniques but it is a way of thinking and adapting to a particular relationship between living things and their habitats. Should our children grow up being surrounded by such mindsets, caring for others and our environment, the effect will be felt on a much bigger scale across generations.

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<https://infonet-biovision.org/Environmental-Health/What-Organic-Agriculture>

Banana weevil, a hidden pest causing great damage

By Charei Munene

The banana weevil is the most important pest of bananas. The banana weevil is among the principal limiting factors of banana production in East Africa. This pest is mainly spread through infested plant material which has eggs and worm like stages of the weevils. Adult banana weevils are initially reddish-brown before eventually turning black with a hard shell.

They hide during the day and rarely fly. Their damage is done by the tunneling at the base of the banana. This weakens the plant and the banana easily falls when blown by the wind. The adult can live for long periods without food and has been recorded to live for over two years.

The complete life cycle is from 30 to 40 days. Eggs are laid in the base of the banana, which then hatch approximately eight days later. Upon hatching the worm like stage burrows into the below ground part of the banana creating tunnels and causing damage to the banana stem.

Symptoms:

- *Reduced plant growth*
- *Yellowing of the leaves*
- *Weak or dying suckers*
- *Weakened plants which fall easily under windy conditions*
- *Smaller bunch size and small fruits*
- *Shortened plantation life*

Prevention:

- Use of clean certified planting material especially tissue culture bananas.*
- Plant banana varieties that are resistant to banana weevils.*
- Remove all underground remains of the old banana crop after harvesting.*
- If possible, leave land that you had planted bananas fallow for at least six months.*
- Eliminate weeds from the fields.*
- Use spotless and solid suckers for establishing a new plantation.*
- Uncover the inner soil layers for exposure to the sun before planting.*
- Cut old stems into stripes for mulching.*
- Do sufficient manuring, strong bananas can withstand weevil attack for some time.*

Control:

- Ensure good hygiene to reduce breeding sites for the weevils.*
- Traps can be made by placing sliced sections of the below ground part of banana or sections of the stems on the ground. Place the traps at the base of the bananas. Weevils will be attracted to them. Adults trapped should be destroyed.*
- Set up pheromone traps to trap adult weevils.*
- Regularly monitor banana weevil activity by placing baits and assessing for damage.*
- Dip your suckers in neem solution or hot water (55°C) for 25 minutes before planting to kill weevil eggs.*
- Cut old stems at ground level and cover with soil to prevent egg laying.*

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Finding happiness in farming after retirement

By Jean Paul Mackio



Mr Hashford S. Kinyua, a former police officer from Embu County is a main source of inspiration to all retirees. Having served for over twenty years in the police force, Mr Kinyua left the service on 1st July 2019. Before retiring he already had ideas of what to do after leaving active service. In his mind, he could not just come back home to be given food, sit and sleep. "That would be inviting early death", Mr Kinyua suggests. He, therefore, sat down with his daughter and son for a brainstorming session on possible opportunities he could pursue. They came up with the idea of rearing cattle and embarked on the practice.

However, in 2019, there was an outbreak of foot and mouth disease which killed two of his best cows. He then switched to the rearing of goats but it was not easy for him. He finally settled on the rearing of pigs which has tremendously improved his livelihood.

Mr Kinyua began his enterprise with a total of six pigs. Initially, he settled on the Artificial Insemination procedure as the basis for reproduction. However, the AI procedure was costly and also led to miscarriages which prompted him to buy a boar to enhance reproduction. He was quick to note that boars could not be kept for a long time. After two years of pig farming, he currently has over sixty-five healthy pigs.

Mr Kinyua went into the intensive keeping of pigs after realizing the increased preference for pork. This trend which has been prompted by the general population moving towards healthier white meat created a niche that Mr Kinyua rushed to fill. In addition, he stated that the demand for pork will continue to grow leading to increased pig keeping, not only around his area but across the whole country. Despite the increased demand, he mentioned that the only challenge he had was financing.

Mr Kinyua has come up with a thorough feeding routine for his pigs which makes them healthy. He feeds them 2.5 kgs of food daily before they attain two months.

After two months, he adds more rations. By the time the pigs are mature, he gives them as much as 6 kgs per day. Once a pig has given birth, he increases the rations by multiplying 0.5 kgs by the number of piglets which he then adds to the initial 6 kgs the pig was consuming. He also noted that he feeds his pigs while ensuring that they are not overfed to avoid too much fat in the pork which most people do not like.

"Starting with the basic standards while constructing the pigsty has been key in ensuring that the pigs are healthy and clean," Mr Kinyua suggests while pointing at one of his clean and well-maintained pigsties.

He also managed to create a self-sustaining system that encompasses the Black Soldier Flies, a manure collection system and a farm which benefits from both the manure from the BSF and the animals he keeps.

"Starting with the basic standards while constructing the pigsty has been key in ensuring that the pigs are healthy and clean,"

Mr Kinyua currently keeps cows, goats, and black soldier flies aside from cultivating various crops such as bananas and maize. Through farming, he can provide food for his family and sell the surplus to organizations as well as individuals. He is also very particular about retirees depending on others advising them to mind themselves and take part in activities that can allow them to be physically and mentally active while creating income. The overall result of this he suggests is a healthy and happy life, a feature which he embodies.



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Farmer rescues tree tomato orchard after reading TOF magazine

By Vincent Kipyegon

Mr Richard Rono who grows tree tomato and passion fruits on one acre piece of land in Kericho enjoyed proceeds from his enterprise especially during the peak season between August and October, until pests and a viral disease hit his farm, scorching the leaves and stems of the fruit trees.

"I found out the leaves and stems in some plants were beginning to dry up and initially I thought it was due to heavy rains and hailstones from a while back that had adversely affected the farm," says Mr. Rono.

A routine visit by local agricultural officers armed with the The Organic Farmer Magazine, was the opportunity he needed to salvage his fruit farm. On close monitoring the officers noticed that the plants were infested by whiteflies and aphids and had a viral disease which they said was a result of improper inter-cropping patterns and poor farm hygiene practices.

The officers pointed out that the rapid spread of the disease occurred as a result of poor spacing of the plants and inter-cropping tamarillo plants with maize which belong to the same family. For more information on this, the officers handed him the August edition of TOF Magazine, which featured detailed information on growing tree tomato fruits and tips to manage pests and diseases affecting their growth.

Mr Ronoh was further advised to uproot the infected plants and burn them to stop the spread. The officers also advised him to do the following:

1.) *Direct smoke from burnt neem tree (mwarobaini) leaves to the tree tomato leaves and stems plantation to prevent the viral disease from spreading.*

2.) *Prepare organic extracts by crushing and extracting a mixture from neem leaves, pepper and aloe vera and spraying it on the plants to rid them of whiteflies and aphids.*

3.) *Maintain proper hygiene on the farm by ensuring the farm is weed free and removing the infected plants.*

4.) *Ensure proper application of organic manure, by applying the compost/animal manure within a circumference of 3 feet of the plant to ease nutrient absorption by the plants' feeder roots.*

5.) *Intercrop the tamarillo plants with vegetables and repellent plants such as spring onions, spinach and black night shade (managu).*

6.) *Follow the required spacing of 1metre by 5 metres to prevent viral transmission and boost the production of tree tomato plants.*

7.) *Practice crop rotation on crops intercropped with tamarillo.*

With the information obtained from the extension officers and The Organic Farmer magazine, Mr Ronoh is now better prepared to grow tamarillo fruits and make profits just as he used to. He opted to use the remaining tamarillo trees as supporting plants for the passion fruit trees that he had already established in the farm.

With healthy crops, Mr Rono supplies tamarillo fruits to the local market selling 24 fruits at Ksh100. He says that the orchard is the source of livelihood for his family.



Local agricultural officers visit Mr. Ronoh armed with the The Organic Farmer Magazine

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<https://infonet-biovision.org/Environmental-Health/Trees/Cyphomandra-betacea-Tree-tomato>

Why you should plant lucerne for your livestock

Livestock keepers know what it means when there is inadequate fodder for their animals. Buying animal fodder can be expensive hence farmers are advised to prepare for sources of fodder early before the need for it arises. The main options of this preparation are conserving fodder through silage making or making hay and planting forage crops.

Forage crops are cultivated plants or plant parts, aside from separated grain, produced to be grazed or harvested for use as feed for animals. Forage crops are climate-friendly and apart from providing a ready feed for livestock, they help renew degraded land among other benefits, such as cleaning air through carbon reduction. There are various types of forage crops. This article focuses on the benefits of growing lucerne as a forage crop.

Lucerne or alfalfa (*Medicago sativa*) is a type of forage with numerous benefits to livestock. It is a deep-rooted, perennial legume that is adapted to mixed farming systems.



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Tuko Mbele Pamoja!

Continued from Page 7

Physical characteristics of lucerne

The growth characteristic of lucerne is dependent on climate, soil and its maintenance. The plant is hairless with several stems coming from its crown.

Each of its leaves has three thin leaflets. Lucerne is a perennial crop and after grazing, new stems sprout, making it a reliable source of fodder. The plant has purple flowers and spirally coiled pods with two to five kidney-shaped brown or yellow seeds.

Climate – Soil Adaptation

Lucerne is a delicate plant that requires an annual rainfall of above 325mm to thrive and does well in well drained loam soil. If planted on acidic soil (above 6.5 pH) it stunts. In case the soil has higher than 6.5 pH, it is advisable to apply lime a month after the plant has begun seeding to reduce acidity.

Lucerne has a low tolerance to waterlogged soils as well as aluminium. When the plant is successfully established, it will be productive throughout its life cycle. Attention to detail is vital during the planting process to enhance lucernes' density.

The following are favourable conditions for lucerne:

- *Mid and upper slopes.*
- *Well-drained duplex soils.*
- *Areas with a high potential for groundwater rise.*



- *Loamy sands, coloured sands and fine-textured soils.*
- *Areas with low weed population.*

Plant lucerne after weeding as its seedlings develop slowly making it perform poorly if surrounded by weeds. The best period to sow is from 15th September to the end of October or 15th March till the end of April.

The seeds should be soaked throughout the night before seeding. Irrigation can be done a month after sowing and subsequently at intervals of 15 to 30 days. It is important to ensure that water does not stagnate during the rainy period.

Benefits of lucerne

- *Provision of high-quality feed that enhances animal health.*
 - *Alleviates the effects of salinity while minimizing groundwater recharge.*
 - *Lucerne improves soil structure and fertility.*
- Reduces weed burden.*

<https://infonet-biovision.org/AnimalHealth/Fodder-production>

<https://advantaseeds.com/crops/forages/>

FARMERS' FORUM

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