

Dear Reader,

It is that time of the year when fields are lush and green. As rain showers come and go, every farmer is optimistic that what they sowed will yield as expected. This month, as you ensure that pests do not cut down your harvest, remember to employ the techniques you have acquired from the previous editions of TOF Magazine including, making plant extracts that kill or repel pests; intercropping and using traps.

Also avoid synthetic chemical use in the farm to provide a thriving environment for natural enemies that help reduce pest populations.

In this edition we feature model farms established by *icipe* in Kirinyaga County demonstrating how farmers can grow tomatoes organically. We have also featured in detail how to identify nutrients deficiency in your crops and how you can mitigate crop stunting by providing them with the

nutrients they lack.

Are you scared that locusts would make a comeback and rob you of your crop yields? Well, worry no more. This month's edition comes with solutions to turn the locust menace into a blessing. Read on to find out how.

If you are at crossroads on which irrigation system to install in your farm, a technical expert answers all the questions you have been struggling with regarding drip irrigation. Enjoy the read!

Farmers embrace safer alternatives in pest management

By Caroline Mwendwa

The desire to produce high yields despite the overwhelming challenge of pests and unhealthy soils that constantly require inputs to produce, has led farmers to engage in chemical overuse, which is raising concerns over human health. As non-communicable disease incidences rise, it is time to rethink the approaches used in food production. Farmers in Makueni have discovered an alternative way of farming. They are using organic products that replace the harmful synthetic farm inputs known for leaving toxic residues on food produce and affecting the health of all consumers.

These organic inputs are foliar fertilizers that not only add nutrients to the crops in all stages of growth but mitigate against pest infestation. The good thing about them is that one can harvest and consume the farm produce immediately after application because they are not toxic.

Irene Mumo, a farmer from Mbooni, Makueni County grows a variety of crops organically on her 25 acres of land including: maize, beans, vegetables, medicinal herbs, fruits, Brachiaria and Napier grass for her dairy cattle. She also keeps goats and poultry, among others. Ms Mumo also practices bee keeping which ensures optimum yields through crop pollination. "I practice integrated farming and grow all my crops organically," says Mumo.



Phyllis Nduva, a farmer in Wote Makueni County harvests organically grown oranges

"For a long time, I had the desire to grow organic produce but I didn't know how to go about it. Through a friend however, I learnt that there are biological farm inputs including biofertilizers, and foliar that not only enrich the soil, without depleting its natural fertility, but also manage pests. I get my organic products from Rue Organics, and for a year now, I have not used synthetic chemicals in my farm, and the crops' yield has not declined," she says.

Before planting seeds, Ms Mumo soaks them in a product known as M-Forte, a liquid bio-stimulant cum foliar fertilizer containing fortified bioactive microbes. It is made by fermentation process which allows multiplication of bacteria and replenishes soil health by replacing lost soil micro-organisms. M-Forte contains all the micro-nutrients that make healthy soil including potassium, magnesium, zinc and calcium. These nutrients protect the plants against pathogens and wilting.

"After soaking the seeds, I then plant them

and after 2-3 days, drench the soil on which they are planted with the same product (M-Forte). "Once the seeds have sprouted, and growth has started, I apply Stop gel another product from Rue Organics, to mitigate against pests' infestation," she says. Stop gel is a popular foliar fertilizer among organic farmers which is rich in essential macro-nutrients and which are easily absorbed by plant leaves while allowing efficient uptake of other micro-nutrients. It controls pests as it suffocates and dehydrates them. The gel component in it blocks the pores of the insects causing them to suffocate and the salt in it kills them by dehydration. It leaves no chemical residue on crops.

"Once the crops have flowered, I apply Rue - Sil Boom, an organic foliar fertilizer containing natural silica and balanced plant nutrients to enhance flower and fruit quality," says Mumo.

Mumo ensures to integrate these inputs, with good agronomical practices.



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She has grown a myriad of trees in her farm. In addition, all her crops are intercropped. For instance, she intercrops spinach with garlic onions, whose strong smell repels pests. Within the same garden, she plants maize, with beans and fruit trees such as avocado trees, and orange trees.

"I also plant a variety of medicinal herbs and plants including rosemary, lavender, sage, cayenne, Tabasco pepper, trichanthera, mint, African marigold, among others. Integrated farming enhances soil health and helps in pest management," says Ms Mumo.

Near the farm, is a heaped compost pit, where she decomposes manure to use in the farm.

Ms Mumo has exemplified the possibility of growing food organically on a large scale. She sells her produce in all markets, some she transports to markets in Western Kenya and Nairobi others she sells at the local markets of Makueni.

"Farming the organic way is doable, and farmers need to choose to produce safe foods that do not have health repercussions on the consumers, who are not only buyers but their family members as well. Alternatives to toxic chemicals are available, and they work effectively," she says, giving the example that from a 250m² piece of land, she harvests 80-100 Kgs of capsicum weekly.

Phyllis Nduva, a horticulturalist in Wote, Makueni County, growing organic fruits, including mangoes, citrus fruits and paw paws, on a 20-acre piece of land has been using these products for the last two years now.

"As you know, with fruits, pests are always attacking them. Initially, I did not know of these products. I always wanted to grow fruits organically, as I am sure they are free of toxic chemical residues, and that means that we can eat them without the fear that we are introducing diseases into our bodies, and also, that they can fetch good prices in the market," she says. But what discouraged her is the fear that she



Modern Draqual Enterprises Youth Group, undergo training by Joseph Mbithi of BvAT in their organic vegetable garden in Wote Makueni

would not be able to manage pests and other occurring diseases. This changed when she met Mr Joseph Mbithi, of Biovision Africa Trust. Through him, Ms Nduva discovered that there are organic farm inputs that are effective as foliar fertilizers and which also keep off pests.

"Mr Mbithi introduced me to Rue Organics, which is a company dealing with organic inputs and to my delight, they have inputs for all stages of the crops. Since I began using them, I have never desired to go back to conventional farming," says Ms Nduva. Being a fruit grower, it is very important that even after applying the inputs, she can still harvest without having to worry about post-harvest intervals.

Ms Nduva expresses her experience with Stop gel, *"after pruning mango trees, I have been applying Stop gel because it is foliar and due to its effects, pests die in the process and the plant starts producing without attacks,"* she says. *"In maize, as well, once the seeds have sprouted, and two to three shoots are out, I apply Stop gel which has been proven to control Fall Army Worm."*

For all her fruits, especially mangoes, once they have flowered, Ms Nduva, applies Rue - Sil Boom which hardens them and makes the fruits bulky. *"During the cold season, mildew burns leaves and flowers and to manage this, I apply Fungalsol Fungicide, a biological fungicide and foliar fertilizer that assists the plants to synthesize protein boosting its ability to protect itself against viral, bacterial and fungal diseases. Since these products aid in the natural process of synthesizing proteins, the crop can resist diseases on its own, unlike synthetic pesticides which are not absorbed by the plant, and this makes the plants dependent on them for protection against diseases."*

Ms Nduva is a member of Makueni County Fruit Processors, a co-operative for fruit growers. The co-operative used to export their produce to international markets, until their standards were compromised by some of the group members. However, they are now keen to acquire the organic certification to be able to explore international markets which have better returns. To achieve

this, all the members need to comply to the organic standards. *"Since we can now access organic farm inputs, which I have since introduced to the other members of the co-operative, it will be easier to produce organically, and still harvest good yields,"* she says.

"Makueni County is in the process of establishing a federation of co-operatives to link other private co-operatives with markets for their farm produce and establish an aggregation of farm inputs, and this will make it easier for farmers to access these organic farm inputs, which has been a challenge overtime," says Ms Nduva.

A youth group by the name, Modern Draqual Enterprises, comprising of seven members, in Wote, Makueni, have also embraced organic farming. Led by Joshua Musyoka, a computer science graduate, who is pursuing a master's degree in information technology, the group, is growing tomatoes, spinach, dhanias and indigenous vegetables on a two-acre piece of land. The group met our Joseph Mbithi, who has been training them on organic farming, and has already trained them on using biological farm inputs, instead of synthetic ones. Before they learnt of Rue Organics, they farmed conventionally, until, tomato blight and blossom end rot infested their tomatoes, leaving them with nothing to harvest. *"Mbithi introduced two organic products to us, Stop gel and M- Forte. The next round we applied them as guided, and sure enough, the tomatoes were free of blight and blossom end rot,"* says Musyoka, relieved that the group can still grow vegetables organically and harvest optimum yields.

The group is planning to continue producing organically, to produce safe foods and avail their produce to organic produce markets where they can fetch better prices.

Conclusion

Farmers need to know that there are alternatives to synthetic chemicals, and these alternatives are effective, available, and affordable as attested by those already using them.



Identifying common nutrient deficiencies in your crops and how to address them

By Charei Munene

Nutrient deficiencies can easily be confused with symptoms of diseases or physical factors. A keen eye on your crops will enable you to identify these common deficiencies and address them before losses are incurred.

1. Maize

Maize has a high requirement for nutrients especially nitrogen (N), phosphorus (P) and potassium (K).

Nitrogen deficiency in maize presents as pale green leaves, stunting and sparse growth.

To correct a nitrogen deficiency, consider planting nitrogen-rich plants like beans and peas nearby. Also practice crop rotation with legumes. Another solution is to do green manuring where you grow a succulent and leafy legume crop and plough the plants into the same field before they form seeds. Such green manure legumes include groundnuts, pigeon peas, sunn hemp, desmodium, soya bean, lima beans, green grams e.t.c.

Phosphorous deficiency presents as dwarfing of the plant with occasional purpling of the stem and leaf surface. Manure from a poultry house has high phosphorous and is a ready remedy.

Potassium deficiency presents as narrowing of the cobs which hardly have grains at the tips. Wood ash and burnt cucumber skins are a good source of potassium.

Calcium deficiency presents as light green spots with characteristic hooking back of the leaf. Add egg shells to your compost to increase calcium content of the soil.

Magnesium deficiency presents as loss of chlorophyll between veins with yellowing along the veins. Adding compost replenishes magnesium in the soil.

Consider using vermicompost for your maize farming. Vermicomposting is where you use earthworms to convert organic wastes into valuable nutrients for crops. This compost is an odorless, clean, organic material containing adequate quantities of Nitrogen, Phosphorous, Potassium and several micronutrients essential for plant growth.

2. Bananas

Like many other plants, the main nutrient requirements for banana plants include nitrogen, phosphorus, and potassium.

Nitrogen deficiency presents as pale green leaves. You can correct nitrogen deficiency by adding compost enriched with manures, tea and coffee grounds, feathers, garden wastes, and kitchen wastes as an excellent long-term source of nitrogen. You can also give the plants a foliar feeding of fish emulsion and a root feeding of rabbit manure and cottonseed meal.

Phosphorous deficiency presents as stunted growth, breaking of the leaf stalks/petioles. Farm yard manure is an adequate source of potassium. Another effective method to raise potassium levels is burying banana peels an inch below the soil's surface.

Potassium deficiency presents as orange yellow colour of old leaves, reduction of leaf size and scorching like appear-



ance on the leaf margins. Correct phosphorous deficiency by adding farm yard manure.

Calcium deficiency presents as sharp edged leaves and splitting of ripe fruits. Crushed eggshells are primarily composed of calcium carbonate and are a good way of adding calcium back to the soil.

3. Leafy Vegetables

The three basic essential macronutrients for leafy vegetables are nitrogen, potassium and phosphorus. Other essential macronutrients include calcium and magnesium.

Nitrogen deficiency in leafy vegetables presents as changing of lower leaves to pale green or bluish then yellow. Good sources for nitrogen include farm yard manure, bone meal, blood meal (dried blood), fish meal, fish emulsion, cotton seed meal, coffee grounds, soybean meal, composted legumes (peas, beans, peanuts).

Phosphorous deficiency presents as turning of lower leaves and stem to reddish or purple. Bone meal is an excellent source of phosphorous. Another good source of phosphorous for your vegetable farm is Coco peat. Coco peat is made of coco pith that is produced from the husk that grows around the hard coconut.

Potassium deficiency presents as curling of leaves while leaf tips turn yellow then brown. A reliable source of potassium for vegetables is wood ash.

Calcium deficiency presents as die back of the growing tip while the tips of new leaves and buds appear yellow, scorched then die. Stems are weakly. A good source of calcium for your vegetables includes addition of eggshells, oyster shells and fish meal to the soil.

Magnesium deficiency presents as yellow patches between green veins of leaves. Brownish or purplish patches may form on leaves, premature leaf fall and stunting of growth.

Organic compost is rich in magnesium and will provide an abundant source for plants.

Charei Munene is a plant pathology expert working with the International Institute of Tropical Agriculture (IITA). Email: charonesh@gmail.com

Laikipia farmers reaping from locusts through value addition projects

By Agnes Aineah

Charles Oino, a resident of Rumuruti in Laikipia County watched helplessly as swarms of locusts landed on trees in his compound some time last year. There had been news all over of the destructive insects that had invaded farms in various parts of the country, leaving farmers with massive losses.

Mr. Oino knew that it was only a matter of time before the insects cleared everything on his one-acre piece of land where a variety of vegetables, tomatoes and maize were thriving.

In the days that followed, Mr. Oino and other farmers in the village were up and about, chasing the insects which, to the amazement of the villagers, preferred to stay in trees.

"We realized that the insects were not as destructive as we had imagined. For some reason, they preferred to stay on trees and didn't eat a lot from our farms. But there were farmers who registered significant losses," Mr. Oino said.

Laikipia is one of the 15 counties that have witnessed the invasion of the desert locusts that swarmed into Kenya from Somalia and Ethiopia in February last year, in what has been described as the worst infestation in 70 years.

It took Mr. Oino and other farmers in Rumuruti a year of fighting the insects before they realized that it was wealth they were chasing away.

In February this year, Oino met officers from the Bug Picture, an organization that had launched a project to turn locusts into a resource for farmers. Among those that the Laikipia farmer met was Scilla Allen who was managing the Bug Picture's value addition project on locusts.

"I was in the company of other farmers when I met Scilla and she told us that from the locusts, we could make some money. We thought that it was a terrible joke because all we wanted was to see the insects gone. We didn't want anything to do with them," says Oino.

With some convincing, and the lessons that the team from the Bug Picture readily offered on collecting the insects, Oino and dozens of other farmers in his village embarked on collecting the desert locusts which they



took in bags to the Bug Picture team in exchange for cash.

"They taught us the best methods/ techniques to use in order to capture the insects. We did it at night and we brought out our family members to capture more kilograms of insects. In just a few days, the insects had become very valuable to us," Oino says, adding that for every kilogram of locusts that was collected, they received Ksh50.

The farmers were taught that the best way to capture the locusts was at night as the insects rested in trees.

At around 8.00 pm or early in the morning around 6.00 am, the farmers would place plastic sheets beneath trees and shake the trees, allowing the insects to fall on the sheets.

"It was easy money," Oino says, and adds, *"There are times I could collect 10 kilos in just a few hours. This was very helpful given that we had missed rains for a long time and we didn't have food. We used the money from the locusts to buy food for our families."*

Scilla says that the locust project is supposed to be the silver lining to the locust infestation.

"Something good has to come out of this situation. Our aim is to empower smallholder farmers with money-making projects from the locusts instead of allowing them to lose everything," she said.

Scilla is the project manager of the Bug Picture's locust colonies in various regions experiencing the plague. She says that the purpose of the project is to monitor the colonies of locusts and to follow them wherever they swarm to with the aim of mobilizing local communities to benefit from the insects rather than to sit and brood over their losses.

The commercial organization purchases the locusts from households and uses them to make organic feeds for poultry and livestock as well as organic fertilizers.

The Bug Picture Organisation which is also working with small-holder farmers in Rwanda has also been raising black soldier flies as animal feed

to bridge the high costs incurred by farmers.

The organization, Scilla says, exists to upscale small-holder farming ventures and to reduce the negative impact of organic waste.

"Our aim is to get smallholder farmers to think about the benefits of insects especially in supplementing the costly plant protein in feeds," says Scilla.

She explains, *"At the moment, kitchen waste is not being efficiently used by households. Instead of being thrown away in ways that degrade the environment, the waste can be fed to black soldier flies. When the insect larvae mature, they are dried and milled or fed fresh to chicken."*

Desert locusts, on the other hand are crushed, dried and ground. Milled locusts are then used for various purposes, including the making of organic fertilizers and feeds.

"The other day, a farmer came to us all the way from Nairobi to buy the milled locusts. He said he was going to make feeds for his birds. We gave him a recipe for the feeds and trained him on how to mix the various ingredients," the official of the Bug Picture says.

She adds that since insects are high in protein, the milled locusts make only 8 percent of the total feed. This means that in every 100 grams of feeds, there is only 8 grams of milled locusts.

The organization has developed an open-sources manual with which it trains groups of farmers to make feeds for their livestock. Oino and a group of other farmers are some of the beneficiaries of the training.

"At the moment, the group is only using crushed locusts to make compost fertilizers which they are using on their organic vegetables and tomatoes," Oino says.

So far, the group has made 100 kilograms of compost manure from the ground locusts that are mixed with grass and maize stalks.

"These are trials and we hope that in a short time, we'll go full scale and even

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start making feeds for sale," Oino says, and adds, "We can't make feeds this time because the government sprayed the locusts with chemicals. We don't think they are safe to be used in feeds. But they are good for compost manure."

When he spoke to us, Oino had noticed a decrease in the locusts in his village. Strangely, but for obvious reasons, he feels sad.

"I am sad because the locusts have flown away and what is remaining is very little. It took us long to realize that they were a blessing in disguise," he says, adding that he plans to start farming the black soldier fly in order to get the rich animal protein for the feeds project he envisions.

Scilla says that the disappearance of the locusts is a blow to the Bug project as well. The team, she says, has made attempts to follow the insects to areas around Lake Turkana but was obstructed by security officials in the area. Back in Rumuruti, the team is keeping an eye on the eggs that the insects lay before they started vacating the region. These eggs will make the next cycle of locust colonies that Scilla says pose a continued risk till August.

The fact that locusts can only be harvested at night and in the wee hours of the morning also makes the project less appealing and difficult to manage for the organization.

The Bug Picture also struggles with the rough terrain including steep valleys and hills, depending on where the locusts land, making the whole activity of chasing the insects an arduous task. Further, when they are roosting high up in thick trees, it becomes difficult to shake them down.

"We had instances where the locusts roosted on private land and the owners didn't want us going there to collect the insects," the project manager says, adding that the organization didn't have enough time to explain the nature of their work to the communities in order to get approval to harvest locusts on their land.

Despite the challenges, the smile on farmers' faces on getting to benefit from the insects keeps Scilla and her team going.

"There is a family that made Sh10,000 in just one night after collecting the insects. The whole family came out to work that night. I can't forget how happy they were because that is an amount casual workers make in a month," she says.

agnesaineah@gmail.com



Why you should install drip irrigation

By Fred Kipng'etich

As climate change effects make rain seasons unpredictable, farmers need to plan on how to conserve and use water wisely, to enable sustainability in food production. There are various irrigation systems available to farmers today.

Deciding on the best irrigation system for your farm will depend on factors such as type of crop, topography, soil type and availability of water and power to drive the system. Though there are many different irrigation solutions in the market today, drip-irrigation remains the most effective system to deliver water and nutrients to crops.

Benefits of drip irrigation

Drip-irrigation consists of dripper lines that deliver precise amounts of water and soil nutrients directly to each plant's root-zone. The result is each plant gets exactly what it needs, when it needs it, to grow optimally.

Farmers can produce higher yields while saving on water, energy and even crop protection products. That means lower input costs and higher returns.

Farmers using drip irrigation method to irrigate their crops can save more than 50 per cent of water and manure compared to other methods such as overhead irrigation. This is because, in drip irrigation, water sips slowly to the root zone of the plants either onto the soil surface or directly into the root zone through a network of valves, pipes and emitting tubing (drip tape). On the other hand, overhead irrigation methods encourage accumulation of moisture in the environment. Moisture creates good microclimate for disease causing germs like fungi to thrive. But drip irrigation limits water supply to the stem base and is absorbed directly to

the soil, without resulting to soil erosion or run off.

At the same time, drip irrigation gives farmers more latitude to control water supply. If there are no plants at given outlets, the farmer can temporarily close those holes with a cello tape, allowing for the water to flow to other areas instead of letting it go to waste.

Consistent amount and rate of flow of water and any other resources included leads to equal supply of nutrients. For this reason, the crop growth rate and final yield is uniform.

Initial setting up of the pipes requires manual input but later application will be easy because a farmer will only require to turn on the water tank tap on. The water trickles onto the root zone as the holes are already fixed, and the farmer does not need to keep moving the sprinklers or use water cans across the plant rows.

Localized release of water also reduces growth of weeds. Drip irrigated crops grow faster than weeds because they have sufficient water and nutrients for growth compared to weeds.

Maintaining the system

To maintain the drip irrigation system, clean the screen filters every day before using the drip system. The flush valve is assembled at the end of sub main pipe and is opened weekly to let the water flow till clear water comes out. Each month, the end caps of every drip tape line should be opened to remove accumulated dirt and particles inside the drip tape.

Drip-irrigation requires low energy input as gravity plays a big role in the system. This means lower electricity bills, or no bills at all if you install solar power, which is ideally suited to drip-irrigation.

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Safe production of tomatoes: A concept turning into reality in Kirinyaga

Dr Shepard Ndlela

Tomato production is a nightmare in most parts of Kenya's leading tomato producing areas such as Kirinyaga, Taita Taveta and Kajiado. There is so much hope when farmers transplant seedlings into the traditional open field production field system. Sometimes the newly transplanted seedlings establish successfully, offering a glimmer of hope to farmers and their families whose livelihoods centre around tomato production and marketing. However, the smiles fade as pests and diseases take centre stage, decimating the promising crop and leaving a painful trail of destruction marking the end of a promising agricultural venture.

The rebranded *icipe* led and Biovision foundation funded project dubbed "Integrated Sustainable Production of Tomatoes (ISPOT) in Kenya", is responding to this nightmare, and restoring the long gone smiles on the faces of tomato growers in Kirinyaga. "The new approach is holistic in the sense that it addresses issues of soil fertility, the major pest of tomatoes (*Tuta absoluta*) and also a myriad of other insect pests and diseases," explains Dr Samira Mohamed, the lead Scientist in the project. "We want to demonstrate that it is vital for farmers to test their soils before transplanting and use environmentally friendly organic fertilizers to enhance soil nutrition. Furthermore, we are promoting an Integrated Pest Management (IPM) approach aimed at managing the most devastating pest of tomatoes; *Tuta absoluta*, as well as leaf eaters and sap sucking insect pests which transmit viral diseases," she further expounds.

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Frequently asked questions by farmers.

When is the best time to do drip irrigation?
Early morning watering is the best so that the soil warms up during the day.

Which drip tape thickness should I use?
0.4mm thickness and above are well suited for tropical open field crops.

What is the right pressure for drip irrigation?

The pressure of water depends on the topography of the land. The more gravity the greater the pressure. To increase the amount of pressure, use a pipe with less width.

How do I select my emitter spacing?
Emitter spacing is determined by crop spacing. Closer crops have closer emitters.

How long should I drip irrigate?
You should drip irrigate until the soil holds enough water without runoff.

How exactly does drip irrigation work?
By allowing the drip emitters to irrigate until the soil around the root zone has enough moisture. Drip irrigation is done

by opening the main water valve from the main tank/ source. Once the water gets to the farm, the farmer will open the respective valves to each block to irrigate block by block. The time of irrigation will depend on the flow rate and the water needed.

How many emitters can I put on a drip line?
There is no limit to the number of emitters, put them according to the number of trees. Vegetable drip lines are pre-perforated and so one does not add emitters. The number of emitters depends on the emitter spacing on the drip line.

What are the two main types of drip irrigation?
Pre-perforated drip pipes and button drippers.

Irrigation kits design depend on the size, shape and topography of the land. The sizes vary from one acre kit, a half an acre kit, a quarter an acre kit and a sixteenth of an acre kit. If the land is larger than one acre, the farmer can buy one-acre kits that can serve the size of the farm. To install, a technician first surveys the land to determine the design of the system.

What is the estimation of the yields I would make using drip irrigation on an

acre piece of land?

From an acre of onions for example, a farmer can harvest about 16 - 20 tonnes of onions when using 3 driplines bed under good agronomical practices.

From one acre farm of watermelons, a farmer can harvest about 40 tonnes when using one drip line bed, under good agronomical practice.

What are the downsides of using drip irrigation?

It is important to note that the installation process takes time. Also, under extreme weather when the heat is high, tubes can get broken. Thirdly, the tubes can be clogged, by residues, but this can be remedied by using an organic chemical known as super link, to unblock the drip lines.

Fred Kipng'etich is an agronomist and agricultural technician at ABI Organic Agriculture, Amiran Kenya. Email: fred-sito486@gmail.com

<https://infonet-biovision.org/EnvironmentalHealth/Water-irrigation>



Mr James Muriuki a tomato farmer in one of the demonstration sites in Kirinyaga

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The current project realized that among many other limitations to tomato production; soil infertility, *Tuta absoluta* and diseases ranked high in affecting yield quality and quantity every year. Against this background, Safi Organics were roped in to provide expert services on soil testing and provision of cost effective naturally derived organic fertilizers which are friendly to the environment. Real IPM, a science based organization specializing in biological control of insect pests, mites and diseases was also brought on board to provide expert services to farmers. The county of Kirinyaga, has been supportive of the cause to produce clean safe tomatoes, and continues to involve extension officers in training and awareness campaigns. Thus *icipe*, the county government of Kirinyaga, Safi Organics and Real IPM are working with tomato farmers in the five sub counties of Kirinyaga and dedicated technical personnel based in the county are available to provide support services whenever required.

The project has trained agricultural extension officers and model farmers who are championing on farm demonstrations to show that production of tomatoes is possible without the application of broad spectrum synthetic pesticides. The pesticides are often not registered with the Pest Control Products Board (PCPB) and are generally not friendly to the user, the environment and frequently leave high levels of chemical residues on tomatoes sold in the market.

For successful tomato production, a farmer must seek for soil testing services to appreciate the level of fertility in his farm. This will guide on quantities of fertilizer to be added, instead of wild estimations which can result in less or more fertilizer being added. In the current project, Safi Organics provide soil testing and recommendations services at nominal fee. Organic fertilizers have the advantage of encouraging development of soil micro organisms which help break down organic matter in the soil and also

lead to improved soil aeration.

The IPM package being promoted uses traps, attractants (lures), field sanitation, use of biopesticides, and also natural enemies. The wide range of products by our partner Real IPM, control whiteflies, aphids, African bollworm, thrips, *Tuta absoluta* and other leaf miners, red spider mites, nematodes, bacterial wilt, bacterial canker, early blight, late blight, and powdery mildew among many others.

Regarding *Tuta absoluta*, we always emphasize that control begins in the nursery and continues into the field where traps are laid at least one week before transplanting. Ordinary basins with water and suspended attractant can be used to achieve the same results. Farmers in our demonstration farms can attest to the importance of prevention than curative measures of controlling pests. *“The more we see the damaging moths in the water basins, the more confidence we gather of the effectiveness of these technologies you are bringing to us,”* remarked David Mukaru, of Mutitu in Kirinyaga central, during our monitoring visits to his farm.

Farmers have also welcomed the natural enemy (wasp) released by *icipe* in Kirinyaga which controls *Tuta absoluta* by targeting the maggots developing in tomatoes. *“It is our desire to see icipe continue releasing the wasp in Kirinyaga in order to reduce Tuta absoluta populations,”* remarked Mr David Irungu of Murinduko in Mwea East. The wasp was released in Kenya for the first time outside its native range of South America, and *icipe* is currently multiplying the wasp for release in Kenya and East Africa.

“Our hope is that our interventions impact meaningful change in how tomatoes are produced in Kenya. Both yield quantity and quality must increase, and people have confidence in the tomatoes they eat, either cooked or raw. We want to change the narrative that the tomato production venture is not profitable and tomatoes produced in Kirinyaga and elsewhere contain high levels of pesticides,” stated Dr Samira Mohamed. Time will tell, but indications are that tomato growers are embracing the environmentally friendly ways of producing tomatoes, thanks to the Biovision Foundation funded project.

Dr Shepard Ndlela is the Project Manager, of the icipe-led and Biovision Funded project “Integrated Sustainable Production of Tomatoes (ISPOT) in Kenya”. He can be reached on +254719052274 or email sndlela@icipe.org

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

Plants and animal diseases to watch out for during the rainy season

Charles Kimani

The onset of rains marks the beginning of a busy calendar for farmers and this year is no exception despite the poor rainfall distribution. For maximum yields, farmers should remain vigilant and practise good agronomy practices for both plant and animals. In this issue of TOF, we feature some of the common challenges that farmers are likely to face in the coming month.

Disease outbreaks are common after the rainy season as rains are a blessing but also present a conducive environment for the multiplication of insect vectors. The following are the common diseases affecting cattle, poultry, and crops during and after wet seasons.

Cattle Diseases

Lumpy Skin Disease

Lumpy Skin Disease is an infectious viral disease that is spread by biting insects and ticks. The key symptom for the disease is bumps on the skin of infected animals and loss of appetite. The disease can be confused with sheep and goat pox and farmers should not under any circumstance self-diagnose the animal. To control the disease farmers should maintain a high standard of cleanliness to deter biting flies. As a viral disease, it has no cure and as a preventive measure, farmers should engage veterinary officers to advise them on vaccination.

Rift Valley Fever (RVF)

Rift Valley fever is a zoonotic disease, which affects humans, ruminants and camels. It is transmitted from sick to healthy animals and humans through mosquito bites. The disease is prevalent in the months succeeding the rainy season as stagnant water provides a

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Location	Frequency
Nairobi	102.7
Kakamega	91.5
Bungoma	
Busia	
Malindi	106.3
Location	Frequency
Webuye	95.9
Garissa	88.7

Location	Frequency
Taita	107.4
Narok	102.3
Nyeri	105.7
Machakos	93.8
Makueni	
Kitui	
Meru	105.1
Marsabit	88.3

Location	Frequency
Nakuru	104.5
Gilgil	
Kisii	91.3
Kisumu	105.3
Mombasa	105.1
Kericho	90.5
Eldoret	91.1

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breeding ground for mosquitoes. The disease is controlled by management of mosquitoes by draining stagnant water and clearing bushes around animal pens.

<https://infonet-biovision.org/AnimalHealth/Skin-problems>

Poultry Diseases

Newcastle Disease

In this season, there is a likelihood that poultry farmers will deal with the dreaded Newcastle disease. Farmers need to look out for the following signs: Gasping, coughing, sneezing, nervous signs, depression, lack of appetite, muscular tremors, drooping wings, twisting of head and neck, circling, swelling of the tissues around the eyes and neck, paralysis of wings and legs, greenish and watery diarrhea. Birds may also look tired and dull. The disease spreads through direct contact with infected birds, droppings, nasal discharge, contaminated food, water, feeding equipment and even human clothing. The disease has no cure and vaccinating your birds against it when chicks are 2-3 weeks old and then after every 6 weeks is key to its control. Vaccines are available in agrovets. You also need to take other precautionary measures; isolate those birds with such symptoms from the healthy ones as quickly as possible, clean and disinfect your poultry house and all feeding and water equipment, isolate and vaccinate new birds before mixing with the old flock. If the problem had just set in and affected most of your flock, kill all the sick birds and leave the house empty for four months to give it time for the viruses to die. For more information contact your nearest agricultural officer.

<https://infonet-biovision.org/AnimalHealth/New-Castle-disease>

Plant Diseases

Fall Armyworm

Fall Armyworm (*Spodoptera frugiperda*) is an insect pest that attacks more than eighty varieties of crops but primarily attacks maize. Fall armyworm larvae attack maize plants at all stages. When the larvae feed on young maize plants, they can kill the growing plant and as a result, no new leaves or cobs will develop. In older maize plants, the larvae cre-

ate tunnels into the cob and feed on developing seeds. Fall armyworm can be physically identified by spotting its egg masses, larvae, pupae, or moths, or it can be identified by the damage caused by the larvae.

There are various ways that farmers can control the pest. For small scale farmers, the following are simple mechanical ways that they can use to control the pest.

- *Crushing egg masses.*
- *Handpicking and crushing larvae, handpicking and drowning larvae in soapy water, or handpicking and feeding larvae to chicken.*
- *Pouring wood ash, soil, sand or chilli pepper down the maize whorl to kill larvae.*
- *Use of sugary sprays, oil or lard, 'fish soup' or other material to attract ants and wasps to the maize plants, which also find and eat the Fall armyworm larvae.*
- *Some biopesticides such as Stop gel have been proven to reduce Fall armyworm populations significantly.*

Hygiene and vigilance are key

As you can tell from some of the diseases we have just mentioned, farmers need to maintain a high level of cleanliness and sanitation. Dirty and moist habitats are breeding grounds for pests and by ensuring simple hygiene farmers can avoid a lot of losses brought by pests. We urge farmers to remain vigilant and monitor their crops and livestock for any slight change that may affect production.

<https://infonet-biovision.org/Publications/integrated-management-Fall-Armyworm-Maize>

FARMERS' FORUM

To get more information on the inquiries below, call **0715 422 460**

Raphael Otieno Kudundu from **Butula, Busia** is selling **rabbits**

Masia William, from **Subukia, Nakuru** is selling **avocados**

Joseph Munene from **Nakuru** is looking for **Toggenburg goats**



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