

Dear reader,

What are your plans this planting season? As we anticipate the short rains remember early planting is beneficial for high yields as it covers the crop from environmental stresses and reduces the pest pressure on the crop.

The quality of the seeds will also determine the yields. If you had not preserved your own seeds for this planting season, ensure to select suitable and genuine seeds when purchasing.

As we have always advised, be vigilant when purchasing seeds, to ensure quality. Of importance to check when buying seeds is the KEPHIS certification of the seeds, which can be verified by sending the concealed number on the packet to the code 1393 via SMS.

Also check out for more information provided on the packet including the expiry date of the seeds, and the germination percentage. Ensure to go for the varieties suitable to your climatic zones; seek guidance on suitable varieties for your region from extensionists within your area, as they may be aware of any new varieties with additional beneficial characteristics.

This edition provides tips on various methods of planting diverse crops. The push-pull method is highly recommendable especially in planting maize. Other methods such as use of double dug technique, Zai pits, and intercropping are featured.

The edition also samples one outstanding shrubby legume-Sunn hemp that has a myriad of benefits in crop production and animal feeding.

Have you ever thought of growing chili? Read on to discover the expanding markets for chili producers and seize the opportunity to diversify your income. Only in this edition of TOF Magazine.



INTERCROPPING

Mixing cereals with legumes and fodder

Intercropping maize with legumes such as desmodium, beans and growing brachiaria grass around the maize field can greatly reduce the damage

By Musdalafa Lyaga, Dr. Paul Van Mele and Marcella Vrolijk

MANY FARM FAMILIES in Kenya grow maize, sorghum, millets among other cereal crops to feed their families and earn some money. However, these cereal crops are often attacked by insect pests, such as fall armyworms and stemborers. In many parts, harvests may also be seriously threatened by the parasitic weed striga, which sucks nutrients from cereal crops, such as maize, sorghum, millet and rice. Striga is especially a problem on poor soils.

“When we plant maize as a single crop, it is attacked by striga and insects. We end up even losing the whole crop. We have learnt that intercropping maize with legumes such as desmodium, beans and growing brachiaria grass around the maize field can greatly reduce the damage”, says Alice Muhonjo, a farmer from Vihiga County in Western Kenya.

Insecticides and herbicides are expensive, ineffective and harmful to people and the environment. Hence the need to utilize approaches that are beneficial to solving these challenges without harming food consumers and the environment.

Farmers have learnt a farming method known as push-pull. The push-pull method, developed by scientists from the International Centre for Insect Physiology and Ecology (ICIPE), is based on the knowledge of how insect pests can perceive from a long distance the smell of different types of plants. Insect pests are attracted or pulled towards plants which release an attractive scent. They move to these plants, where they lay their eggs and while feeding on the plants.

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Using microbes in the farm

Effective microorganisms can be applied to increase the microbial diversity of soil, plant, livestock as well as the ecosystems for sustainable production **PAGE 10**

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How push-pull works

Adult moths of fall armyworms and stemborers prefer laying their eggs on grasses. Cereal crops such as maize and sorghum are a type of grass, and will definitely attract these pests.

To keep them away from these food crops, farmers use the push pull method by planting fodder grasses, such as napier or brachiaria, around or near the cereal crop, and these grasses attract the pests away from the cereal crop, hence reducing the population of pests on the cereal crop. This is called the pull effect.

"I plant napier grass around my maize field as a trap. It attracts stemborer moths to lay their eggs on it. However, stemborer larvae do not survive well on napier grass, which has a glue-like substance that makes the larvae get stuck. So, I have less stemborers in my maize," says farmer Muhonja.

Plants that release a smell disliked by the insect pests create a push effect. The smell of legume crops repels the moths of fall armyworms and stemborers.

Legumes include beans, cowpea, groundnuts and soya bean, but also fodder legumes, such as desmodium.

When legume crops are planted in between the cereal crop, the moths are repelled and do not lay their eggs on the cereal crop. This is the push effect.

Other benefits of legumes

Planted in between the cereal crop, they create a good environment for ants and spiders which feed on the eggs of the moths. They also enrich the soil by fixing nitrogen from the air.

Another benefit is that legumes release a chemical in the soil that stops striga weed from growing. So besides pushing away insect pests, legumes also reduce striga weeds.

How to set up a push-pull field

To set up a push pull field, you need farmyard manure. Farm yard manure provides organic matter and nutrients to grow a healthy crop, while at the same time reducing striga infestation.

- Start by clearing your land just before the rain starts.
- Once the field is ready, establish two to three rows around the field to plant a fodder grass. Make 15 centimetre-wide and 20 centimetre-deep holes, within every 75 centimetres.
- When planting, apply one handful of manure in each planting hole.
- If you use napier grass, place a 3-node cane at a slanting position covering two nodes with the soil and all canes facing the same direction. You can also use root splits by placing them upright in the hole and cover the lower part.

Farmer Alica Muhonja cautions farmers to be careful not to plant napier grass when its leaves are yellowish and very narrow because it could be affected by napier stunt diseases.

Next step is to sow a fodder legume, such

as desmodium to repel or push stemborers and fall army worms away from the field. To make it easier to evenly sow the fine seeds, mix one part of seeds with 3 parts of fine sand. Keep the first row 1 metre away from the fodder grass and leave 75 centimetres between rows. Then drill narrow rows with a stick and sow the mixture. Then plant one row of maize in the middle between the desmodium rows.

"We leave space in the farm to allow us to work well during weeding and scouting for pests and diseases without disturbing the young crops," says Muhonja.

While planting the maize, keep 30 centimetres between the holes.

After planting maize, plant beans leaving 10 centimetres between plants and 25 centimetres between rows. You can plant two rows of beans in between the maize rows. You can also use other legumes such as cowpeas or soya beans as an intercrop.

When the maize is 3 weeks old, carry out the first weeding. Make sure you do not disturb the young legume plants. Use your hands to remove any weeds between the desmodium plants. Do a second weeding when the maize is 5 weeks old.

Harvesting

After 3 months napier grass is ready for harvesting. Start with the innermost row then continue to the second row. Then maize and beans and thereafter, harvest the fodder legume for forage, or leave it in the field a bit longer until it has set seed for the next planting season.

It is possible to grow healthy crops and increase yields without using any agrochemicals by adapting new technologies. Sustainable farming practices such as the push-pull technique can make this possible. This planting season, try it with whatever legumes and fodder grasses you have at hand.



I plant napier grass around my maize field as a trap. It attracts stemborer moths to lay their eggs on it. However, stemborer larvae do not survive well on napier grass, which has a glue-like substance that makes the larvae get stuck - Alica Muhonja





SEED CONSERVATION

Indigenous seed conservation

Perennial droughts made many realise the importance of indigenous seeds. Some farmers are now cultivating them with great success

By Susan Wanjiru

SEED CONSERVATION HAS been carried out by African farmers for generations. These seeds, known as indigenous or heirloom seeds, are native to a specific region or ecosystem and have been cultivated and adapted by local communities for generations. They are open-pollinated and have adapted to the local climates, soil, pests, and diseases, making them resilient to climate change and shocks.

Some examples include: - African night shade (managu), amaranth(terere), sorghum, finger millet, and cowpeas among others.

“Farmers need these seeds which give good produce when planted with adequate manure and compost. It is important for them to learn how to conserve these local seeds before they disappear completely,” says Mr. Samuel Nderitu, an avid farmer and the founder of GBIAK, an organisation that trains farmers and young women on sustainable agricultural farming models and practices such as agroecology, in Kiandutu village, Thika.

Why is conserving indigenous seeds important?

With the entrance of hybrid seeds, many farmers pushed cultivation using local seeds to the back seat. However, perennial droughts affecting the country, have made many realise the importance of indigenous seeds. Some farmers are now cultivating them with great success. Mr Nderitu encourages farmers to embrace these highly nutritious and tasty indigenous seeds because they are known to be drought and pest-resistant and their seeds can be stored and used in later planting seasons with good yields.

The following are some ways of preserving indigenous seeds:

- Air and sun drying:** Spread the seeds on a clean surface and expose them to natural air and sunlight until they are dry and hard. This reduces their moisture content and prevents fungal growth and insect damage.
- Smoked coating:** Coating your seeds with a mixture of ash and oil and then exposing them to smoke from a fire creates a protective layer that repels pests and diseases. It also enhances the germination rate.
- Ash mixing:** Mix your seeds with wood ash and store in air-tight containers. The ash acts as a repellent and fungicide and provides some nutrients to the seeds.
- Leave seeds in their covers:** Leaving your seeds with their natural covers, such as pods, husks, or shells, and storing them in a dry and cool place protects them from physical damage and moisture loss while maintaining their viability.
- Shading and freezing:** Involves storing seeds in shaded and cold places such as underground pits, caves, or refrigerators. It slows down the metabolic activity and aging of the seeds and prevents sprouting and rotting.

Points to note when storing your seeds:

- After drying your seed, select the best seeds for planting. Choose healthy seeds of the same size to ensure uniform growth.
- After selection, put your seeds in an airtight glass jar and clearly label the variety, date of harvest, and date of storing. Avoid using plastic jars as they are not airtight and the seeds from the farm may have weevil eggs and when put in a plastic jar, the eggs will hatch and destroy your seed, as it is not possible to ensure airtight closure of plastic containers.
- Store your seed in a cool area or a fridge. Mr Nderitu has invested in a solar-powered fridge and freezer where he keeps his special seeds. “They can last for 200 years as long as the conditions remain stable”, he says.

Benefits of indigenous seed conservation

- Seeds harvested from the farm are free, and farmers can plant them whenever they want, eliminating delays in planting caused by lack of money to buy seed.
- It creates stable food supplies by reducing dependence on external sources and increases food security and sovereignty.
- Since indigenous seeds have adapted to

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the climate of the areas they grow in, this enhances resilience and adaptation to climate change and other shocks.

4. The practice preserves cultures by maintaining the diversity and heritage of traditional crops and practices.
5. It involves communities teaching the young about their culture, which fosters social cohesion, cultural identity, and knowledge exchange among communities.
6. It improves biodiversity by conserving native flora and fauna and their ecological interactions.

Indigenous seed conservation is a valuable way for farmers to restore productivity in their shambas and create sustainable livelihoods for themselves. GBIAK has taken a step to bring back the lost seeds of Africa, collecting numerous indigenous seeds and storing them while teaching farmers about the proper seed-saving culture that our forefathers embraced.

“Farmers have realised the importance of indigenous seeds. We visit farms across Kenya and collect indigenous seeds that are multiplied and stored to preserve varieties that risk extinction. We partner with farmers whom we have trained on seed multiplication and growing. Through the initiative numerous indigenous seeds are produced, and farmers trained on using indigenous seeds to increase their production and embrace sustainable farming to increase production while combating climate change effects,” he says.

Other organisations that promote sustainable agriculture practices such as indigenous seed conservation include: The Indigenous Peoples of Africa Co-ordinating Committee (IPACC), The African Biodiversity Network (ABN), and The Participatory Ecological Land Use Management (PELUM) Association.



CHILLI FARMING

Red Hot Profits: The lucrative business of chili farming

They can be cooked with food, added straight to meals on the table or dried and blended to produce red powdered chili pepper called paprika

By Vincent Kipyegon

HOT CHILLI PEPPER, commonly called pili pili kali, is a green, yellow or red fruit whose coat and seeds are primarily used as a spice. They can be cooked with food, added straight to meals on the table or dried and blended to produce red powdered chili pepper called paprika. Blended dried chilli pepper can be rehydrated to make chilli sauce.

Chilli is known for its hot burning sensation when it comes into contact with body cell tissue. However, it is this hot spicy taste that makes it a widely consumed fruit in households and eateries throughout the country. The demand for chillies in the market has increased due to the rise of street food vendors (smokies, samosas, mutura and boiled eggs) and vibandas across the country, making pepper a required ingredient for kachumbari.

Kenya produced 9,248 metric tonnes of chilli pepper in 2022 valued at Ksh434 million, compared to 6,174 metric tonnes worth Ksh292 million in 2021, with 96% of the pepper being eaten locally, according to the Agriculture and Food Authority of Kenya (AFA). With the growing market for pepper consumption, small-scale farmers can now make a good living from chilli farming.

The pepper growing regions in Kenya include central and eastern regions, the South Rift Valley, portions of the North Rift region, and western Kenya and the exporting destinations include the United Kingdom, Italy, the Netherlands, Norway, South Korea, Germany, and Sweden.



Health benefits of chili

1. Boosts immune system as it is rich in Vitamin C and Vitamin A responsible for fighting colds and flu, kills mouth bacteria and fungal infections.
2. Has antioxidants that suppress and inhibit formation of cancer cells.
3. Promotes eye health, since the presence of vitamin A boosts vision.
4. Promotes skin health through Vitamin C which revitalizes the skin and reduces acne.
5. Promotes cardiovascular health by lowering the risk of heart diseases and regulating blood pressure.
6. Promotes weight loss by reducing appetite and increasing metabolism to burn more calories.

Varieties

The commonly grown varieties of chili in Kenya include Cayenne F1, African Bird Eye, bullet, Jalapeno F1, and habareno. In 2022, 76% of the chili produced came from Cayenne F1.

Ecological conditions

Chili requires well drained fertile soils rich in organic matter with a pH between 6-6.5. It requires moderate annual rainfall (800mm-1200mm), temperatures between 20°C-30°C and moderate sunshine towards maturity. The altitude of 1200m above sea level is suitable for growing chili.

Nursery formation and land preparation

There are two ways to obtain chili seedlings:

a) Buying ready-made seedlings from seed propagating experts

This is a highly recommended method as the seedlings are grown using seed trays in a controlled environment, utilising a soil-less medium (coco peat and peat moss) that produces maximum and disease free seedlings.

b) Buying certified seeds and preparing seed nursery

This entails establishing a raised seedbed nursery close to the planting area. The nursery is created by digging up soil lumps into a uniform texture. Raise the bed slightly above the ground level to shield the seeds from surface runoff and rain splashes. One week before planting, mix the soil well with decomposed compost manure or animal manure. Make 2 cm furrows 15cm apart. Mix the soil with seed then insert them into furrows followed by watering and mulching with dry grass. The seedlings will be ready for transplanting between 6-8 weeks.

Transplanting & land preparation

1. Plough an open land twice, harrow it to break hard pans to achieve fine tilt and level surface.
2. Broadcast and mix the soil

with manure a few days before planting. Alternatively, manure can be added to the holes during planting.

3. Create 25 cm ditches, each ditch should be separated by 45 cm from each plant and 60 cm between rows to allow spacing during harvesting period
4. Place the chili seedlings into the hole, fill the hole with soil gently. Ideal planting time is early morning or late evening.
5. Irrigate the plants and mulch if necessary.

Irrigation, mulching and weeding

Weeds should be removed frequently by hand or hoe to eliminate competition for nutrients, light and water. Irrigation ensures the chili plant receives adequate water for development of leaves and fruits. Mulching the plants with dry leaves or grass prevents moisture loss on the soil and prevents formation of weed.

Fertilisers and manure

Maximum production of chili fruits requires maximum application of organic fertilisers in the following stages: mixing manure with soil during seedbed preparation, applying manure or slurry evenly across the land days before transplanting, applying organic foliar fertilisers at 10-day intervals 21 days after the first planting day until the harvesting season.

Pests and diseases

Aphids, thrips, white flies, and termites are among the pests that can attack chili plants. Integrating best farming practices, such as weeding, mulching, crop rotation, cultivating pest-repellent plants (such as Mexican marigold and spring onions) with chili can manage and eliminate pests. For persistent cases, spray the plants with organic insecticides and extracts of neem and garlic. Diseases that can harm chili plants include fruit rot, bacterial wilt, blight powdery and downy mildews. They can be managed locally by spreading ash over the plants and purchasing organic copper based fungicides from the agrovet, affected plants can be uprooted and disposed off the farm.

Harvesting and post harvest handling

Harvesting begins after 65-75 days and continues up to 120 days. The fruits are plucked from the stem while still green or when they have turned red or yellow. The fruits are cleaned by water, sorted by color, graded by size and packed ready for market. They can be sun-dried to make powdered spices or rehydrated to make chili sauce.

Marketing

Fresh chili peppers range in price from Ksh 70 to Ksh 150 per kg, while dried chili peppers cost Ksh 150 to Ksh 300. Chili markets are available in open air markets, mini and super markets as well as high end grocery stores. In conclusion, chili farming is a surprisingly profitable short-term agribusiness venture with minimum production input and enormous return on investment.



SOIL REGENERATION

How to revive soil using locally available materials

Through combining a variety of farm components, farmers can create balanced environments and attain sustained yields

By **Elias Bwott**

To produce sustainably, farmers must build on the fertility of their soils and ensure that they do not rely on external farm inputs to produce, but through combining a variety of farm components they can create balanced environments and attain sustained yields. One major approach for resilience and sustainable production is use of recovery processes for soil health and this is achievable through reducing use of external non-renewable inputs and devising ways to recycle material from the farm back into the soil. This article features technologies farmers can adopt to recycle farm materials and transform them into highly effective soil fertilizers.

Use of bokashi

Bokashi is a form of fertilizer used for soil amendment.

Materials required to make bokashi fertilizer include:

Dry matter:

- i. Dry manure – this can be from cattle and/ or poultry.
- ii. Charcoal dust – provides carbon which increases soil porosity and aeration, while controlling temperatures.
- iii. Ashes- Reduces soil acidity.
- iv. Rock dust (optional)- provides minerals to the soil.
- v. Rice husks – increases silicon content in the soil which strengthens crop cuticle. The stalks of maize, sorghum, millet or even wheat can be used as alternatives to rice husks.
- vi. Molasses – provide energy to microorganisms which help in breaking down organic matter.
- vii. Yeast/ virgin soil.
- viii. Organic kitchen waste.

Procedure:

To prepare bokashi start with farmyard manure in the first layer, then add charcoal dust and bran. The next step is to mix water, molasses and yeast separately and sprinkling this mixture on the heap. The heap should not be too wet or too dry. Repeat this process until the material is exhausted. Once the heap is done, transfer the contents, to an adjacent location using a spade, while turning the mixture



to make a new heap with contents that are evenly mixed. As you add the liquid mixture, ensure to check for desired consistency, by scooping the bokashi and squeezing it in your palm, if it forms a ball, then it has a good consistency, if it doesn't, then it is too dry, and if it oozes liquid, then it is too wet. In the first three days turn the heap twice, transferring the contents in the same way as the previous day. For the next 11 days turn the heap once while reducing the height. When ready, Bokashi is characterized by high temperature which is an indication of the fermentation process. Bokashi is ready for use after the 15th day and should be used within three months of preparation but works best within 30 days.

Application of Bokashi

Use bokashi in planting holes, furrows or by banding. Do not plant seedlings/seeds on open bokashi as it is only partially broken down and can scorch the crops.

Bokashi can also be applied as foliar fertilizer. To use it as foliar fertilizer, on the 2nd to 3rd day, after making the heap, take 2kg of the white top layer from the heap, add 100 to 200gms of molasses in 10 litres water, mix and spray on crops as foliar fertilizer.

Bokashi is also used in seedlings development. For best results mix 80 parts of sifted soil with 20 parts bokashi in seedling trays. Below are planting media ratios for sifted soil to bokashi respectively, for various seedlings:

- i. Fruit tree bagging medium- 60 parts soil to 40 part bokashi
- ii. Leaf vegetables- 50 to 80 grams
- iii. Root vegetables- 100 to 150 grams

- iv. Vegetables that form heads- 200 grams
- v. Tomatoes- 125 to 250 grams
- vi. Onions/chive- 25 to 50 grams
- vii. Beetroot- 100 grams
- viii. Lettuce- 50 to 80 grams
- ix. Maize/maize- 30 to 50 grams
- x. Brassicas- 50 to 80 grams
- xi. Cucumber- 50 to 80 grams

Soil biostimulant

Soil biostimulant are microorganisms applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and crop quality traits regardless of its nutrients content. Farmers can make their own soil biostimulants using readily available material as follows:

Materials required

- i. 25kg cow dung fresh
- ii. 2.5 litres cow/goat/sheep/rabbit urine
- iii. 1/2 kg pulse flour [i.e flour from beans, cowpeas etc..but not soya beans]
- iv. 1/2 litre molasses
- v. Handful forest soil

Procedure:

- i. Mix all and make balls
- ii. Dry in a cool place for 5 days and protected from rain and direct sunlight.

Application of biostimulant

Use in planting holes or crush and spread in planting holes. One ball per hole/drill. If using furrows for planting, crush the balls and apply on the furrows before planting.

FARMER OUTREACH

Farmers are hungry for information

Biovision Africa Trust has partnered with institutions such as agricultural training institutes to develop demo farms where farmers and students in the agricultural space can gain practical knowledge on tested sustainable farming technologies that have contributed to improved production among farmers

By Caroline Mwendwa

EFFECTS OF CLIMATE change continue to adversely affect farming systems; Consequently farmers are grappling with prolonged drought seasons, which are sometimes alternated by excessive rainfall. These changes necessitate innovation on the part of the farmer to ensure that their farms produce when the weather is favorable and even when it is not.

Biovision Africa Trust through its Outreach project is continually offering training opportunities to farmers on technologies they can adopt to enhance soil moisture retention, especially in dry seasons, naturally enrich soil without using external farm inputs, and control pest occurrence hence improving farm yields. In these efforts, BvAT has partnered with institutions such as the agricultural training institutes, to develop demo farms where farmers and students in the agricultural space can gain practical knowledge on tested sustainable farming technologies that have contributed to improved production among farmers.

BvAT recently partnered with Machakos Agricultural Training Institute, where a small piece of land at the institute was apportioned for demonstration of organic agriculture practices. In 3 months, the field officer at Machakos County had turned the earlier bushy plot, into a thriving cultivated piece of land with more than ten types of crops: all blossoming and organically grown.



BvAT recently partnered with Machakos Agricultural Training Institute, where a small piece of land at the institute was apportioned for demonstration of organic agriculture practices

Technologies employed at the demo farm

While most farmers rush to sow when the season is ready and they have done land preparation, it is advisable to be informed on the various beneficial methods of planting. In conservation agriculture, there are many ways a farmer can innovatively plant, to yield more than the farm would. At the Machakos ATC, BvAT extensionists have demonstrated these technologies, and the results speak for themselves, as shown below:

(a) Use of double-dug beds

To start off, mark the bed with two corner stakes, about 3 feet wide. The length of your bed will depend on the size of the garden, but the width should not exceed 4 feet.

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- i. Hand weed the marked area.
- ii. Spread compost along the marked area (2 to 3 inches layer of compost).
- iii. Start digging from the far end, within the 3 feet area, dig a 12-inch-wide trench, with a depth of your garden spade.
- iv. Keep the dug soil aside, for later use. Push your digging fork at the bottom of your trench forcefully to break any hard soil. Just crack it without heaving out the soil.
- v. Add a layer of compost at the bottom of the trench, do not mix with the bottom soil. Spread it gently on the trench.
- vi. Next to this trench, dig another 12-inch trench, and use the dug soil to fill the first trench without mixing it up. Just level it gently. Break the hard soil and repeat the process until you have a long bed of heaped soil. Use the soil extracted from the first trench to fill the last trench.
- vii. Spread a layer of compost on the bed, and gently mix the compost with the topsoil of the bed using a fork. The bed is now ready for planting.

Benefits of using double-dug beds

Double dug beds are labor intensive at the start but once established they provide the following benefits to the farmer:

- i. They offer long term service to the farmer. Once they are established, they remain fertile for close to four years.
- ii. Improve yields up to four times compared to normal cultivation methods.
- iii. The heaped soil along the bed remains light and soft for a long time enabling easier penetration of roots deeper into the soil.
- iv. The loose soil has higher aeration capacity, good drainage and water holding capacity.

b) Zai pits and intercropping

In addition to double-dug beds, the extensionists have demonstrated the productivity

a farmer can achieve using Zai pits and intercropping. “We decided to intercrop maize with beans, cowpeas, and pumpkins as the beans and cowpeas are nitrogen fixing legumes, while the pumpkins serve as cover crop to reduce moisture loss,” says Musili one of the field officers at Machakos. The crops planted in zai pits have similar high yields as those planted on the double dug beds.

To enhance food diversity, a variety of vegetables have been planted by intercropping. These are amaranth intercropped with eggplants and collard greens with black nightshade. “Intercropping these vegetables gives the crops an opportunity to benefit from each other through pest repelling,” he adds.

c) Planting suitable crop varieties

In the same ¼ an acre piece of land, a fast-maturing variety of sweet potatoes – Irene, suitable for dry areas and whose flesh is orange meaning it is rich in carotene and vitamins; has been planted and is ready for harvest. The tubers are healthy as they are planted on ridges to enable expanded growth on loose soil.

d) Hedgerows

Sometimes a piece of land might be exposed to strong wind due to the belief that only trees can provide a shield from the wind. The demo farm at Machakos ATC has been used to

demonstrate how planting sunflowers around the farm effectively establishes a wind breaker, especially if needed within a short period.

e) Water harvesting technology

It is paramount to prepare to harvest water before the rain starts. There are various technologies farmers can employ to ensure that water is reserved within the farm during rainy season, for use during dry season. At the periphery of the Mahakos ATC demo farm, is a water reservoir, made of a dam liner, where water collects during the rain season. This water is used to water the crops, after the rains have stopped.

Conclusion

The thriving crops in this demo farm is proof that, even on a quarter an acre piece of land, a farmer can grow various crops, and harvest satisfactorily without application of synthetic farm inputs.

“Within three months maize, beans, vegetables(cow peas, amaranth, collard green, eggplants), sweet potatoes and the sunflower plants are ready for harvesting; only on a quarter piece of land,” says Musili. The produce obtained from this demo farm was made possible due to the smart technologies employed in the cropping system.

This demo farm that has been on for only one season will be resourceful to farmers in Machakos County and beyond who wish to learn new technologies they can employ in their farms to maximize production.

The first field day was conducted in this farm on 8th March 2024, and was attended by over 200 farmers, from the Eastern region of Kenya. This shows that farmers are hungry for knowledge on sustainable farming methods, and the efforts being made by Biovision Africa Trust in partnership with County governments, institutions and likeminded organisations plays a key role in filling this knowledge gap.



The thriving crops in this demo farm is proof that even on a quarter acre piece of land, a farmer can grow various crops, and harvest satisfactorily without application of synthetic farm inputs.

SUNN HEMP

Discover sunn hemp and its benefits for your livestock, crops and income

Intercropping sunn hemp into the cropping systems improves soil fertility, crop and animal fodder productivity

By **Elias Biwott**

As soils become more and more degraded due to chemical overuse, farmers need to adopt new technologies that help them restore soil health while at the same time cutting production costs in the farm. Some crops are highly beneficial to farmers and can help provide solutions to these challenges yet they are little known; one such crop is the sunn hemp (*Crotalaria juncea* L.)

Sunn hemp is a drought-tolerant legume crop, that is heavily tap rooted and is drought tolerant. It is native to India and currently doing well in tropical and subtropical conditions.

The crop grows well in well-drained alluvial soils with sandy loam or loamy texture. It does not withstand waterlogging. A neutral range of pH is preferred but can grow on soils with pH ranging from 5 to 8.4 where phosphorus is available. Sunn hemp has low tolerance to salinity. It is an economical crop under dry land because of its enhanced water and nutrient conservation in the soil and its ability to fix biological nitrogen in the soil.

Establishment

Crotalaria juncea is propagated by seeds under moist and warm conditions. As a green manure, sunn hemp is mainly grown during the short rainy season. Sunn hemp should be preferably sown in a well-prepared, fertilized, weeded, seedbed to a depth of 2-3 cm. Seeds can be broadcast or sown in rows. They germinate within 3 days under favourable conditions. Sunn hemp is a fast growing species that suppresses weeds by shading them out once sufficient height is reached.

Sunn hemp can be used for rotation with many cash crops. Recommended intercrop successions are sunn hemp with wheat, potato, maize, sorghum, sugarcane, rice, beans, tobacco and cotton.



Sunn hemp can be used for rotation with many cash crops. Recommended intercrop successions are sunn hemp with wheat, potato, maize, sorghum, sugarcane, rice, beans, tobacco and cotton

Ecological benefits/Uses

As a soil improver and as a disease breaker in cereal or other crop rotations. Sunn hemp provides numerous benefits. Such include green manure, nitrogen fixation, weed suppression, livestock forage as a protein source to supplement poor quality roughage, and pest control. It has been noted that sunn hemp makes tillage easier in fields where it was grown and incorporated into the soil, due to improved soil texture. Sunn hemp's deep root system aerates the soil and increases water infiltration. The deep roots also retard soil erosion. Nitrogen fixing rhizobium associated with these roots fixes atmospheric nitrogen into the soil and is made available to crops by composting or turning it into the soil in situ. The organic matter added to the soil also improves soil moisture retention and texture. Cut sunn hemp can be used as a mulch to

suppress weed growth and to control erosion. Ultimately the sunn hemp mulch will decompose, adding nitrogen to the soil to benefit succeeding crops. Sunn hemp's low carbon to nitrogen ratio causes it to decompose readily, quickly adding nutrients to the soil. Unlike, most nitrogen fixing legumes, it performs well on poor and acidic soils. For this reason farmers are encouraged to use sunn hemp to revitalize weedy or infertile fields.

How to harvest sunn hemp for various uses

i. Green manure

As green manure, sunn hemp should be ploughed back in 2 months after sowing when the plants begin to flower as it decomposes more rapidly and it will have a positive N balance at this stage.

ii. Forage

Sunn hemp intended for forage can be harvested 4 times, starting 6-8 weeks after

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sowing and then every 4 weeks. Sunn hemp should be cut for hay in the early flowering stage, 1.5-2.5 months after planting. It has been recommended to sun-dry sunn hemp foliage prior to feeding animals as they do not eat fresh sunn hemp. The top portion of the stem is used for fodder or hay after mixing with paddy straw. Raw seeds are toxic and cannot be fed to cattle without prior boiling.

iii. Environmental impact

a. N-fixing legume and soil improver

Sunn hemp can fix about 50-60 kg N/ha within 60-90 days of cultivation. It provides 60 kg N/ha to the soil when it is used as green manure. Has the potential to improve soil properties, to build organic matter and sequester carbon in the soil. It can be used for soil reclamation.

b. Nematode control

Sunn hemp is a non-host or poor host for many plant-parasitic nematodes including *Meloidogyne* spp. and *Rotylenchulus reniformis*. Sunn hemp has thus been recommended for rotation with crops prone to nematode infection, such as spinach, potato, tobacco, etc.

c. Weed control

Striga weed control: allelopathic compounds effect involving chemicals associated with the roots, released from sunn hemp stimulates germination of *Striga* seed and it is not a host hence causing suicide germination of the seed. It also achieves this effect by increasing available nitrogen and offering shade to striga, which is a mechanism known control parasitic weeds. Sunn hemp establishes quickly and grows abundantly, and develops a dense canopy. These two elements are unfavorable to weed growth as they cause weed

suppression thus out competing weeds like couch grass and star grass. Weed control achieved through legume cover crops has the potential to reduce early-season herbicide use in agricultural systems.

d. Cover crop and mulch

Sunn hemp has been used as an alternative to other cover crops or harvested and laid as mulch. It can improve soil properties, smoother weeds, reduce soil erosion, conserve soil water, and recycle plant nutrients. Its value as a cover crop is due to its biomass production, N accumulation, reduced pests and pathogen infestation, and weed suppression achieved when planted.

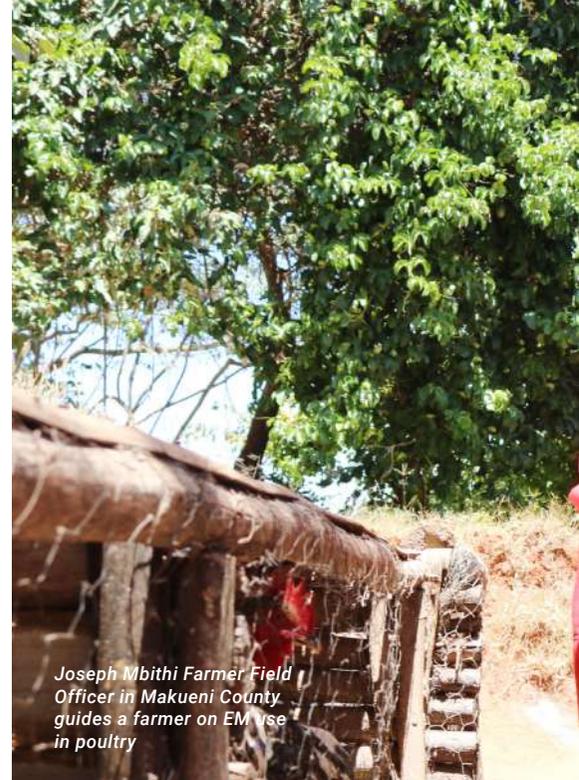
iv. Nutritional attributes as livestock fodder

Sunn hemp is a legume and as such tends to have high protein content both in its forage and seeds. A stand that grows until flowering may lose some of the lower leaves and the leaf: stem ration decreases, resulting in forage of lower quality. As a result, early harvesting is better for forage use because the plants are less mature and they contain a higher proportion of high forage quality leaves.

Potential constraints

Alkaloid poisoning and antinutritional factors

Many *Crotalaria* species contain pyrrolizidine alkaloids which are converted into potent toxins in the liver. The highest alkaloid levels are found in the seeds. Trichodesmine alkaloid is main toxic alkaloid and it is said to be poisonous to cattle, horses and pigs. The seeds are also reported to contain trypsin inhibitors. Raw seeds are toxic and cannot be fed to cattle without prior boiling.



Joseph Mbithi Farmer Field Officer in Makueni County guides a farmer on EM use in poultry

MICROBES

Different uses of effective microbes in the farm and at home

Effective microorganisms can be applied to increase the microbial diversity of soil, plant, livestock as well as the ecosystems for sustainable production

By **Carolyne Anaye**

Sustainable agriculture requires methods that are environmentally friendly in farming which allow the production of crops and livestock without damaging human or natural systems. Effective microorganisms have the capacity to naturally remove harmful toxins and restore nature's microbial balance on plant, animal, environment or human levels.

Contents of Effective Microorganisms

Effective microorganisms is a unique blend of organic microorganisms that act together to create a beneficial effect on the environment they are placed into. They can be applied to increase the microbial diversity of soil, plant, livestock as well as the ecosystems for sustainable production. The main micro-organisms in EM are:

Photosynthetic bacteria- These manufacture food and depend on light to produce useful substances from the secretions of roots and organic matter, by using sunlight and the heat of soil as sources of energy.

Lactic acid bacteria- They produce lactic acid from sugars and other carbohydrates developed by photosynthetic bacteria and yeast. Lactic acid is also a strong sterilizing compound that suppresses harmful micro-organisms.



Yeast- They synthesize anti-microbial and other useful substances required for plant growth from amino acids and sugars produced by photosynthetic bacteria, organic matter and plant roots. These microorganisms are mutually compatible with one another and co-exist in liquid or dried culture.

How to dilute Effective Microorganisms for use

EM can be used immediately by diluting with clean water. It can also be mixed with equal parts of molasses or sugar and then applied as 1 part molasses/sugar, 1 part EM and 100 parts clean water that is 1:1:100 ratio. Sugar boosts the microorganisms and provides immediate food for them.

Effective Microorganisms (EM) have been used successfully in the following ways:

1. Effective microorganisms work naturally by producing substances such as amino acids, nucleic acids, and sugars, which promote plant growth and development.
2. Lactic acid bacteria helps in the decomposition of organic matter by fermenting the materials and removing the unpleasant smells associated with it.
3. Substances produced by Effective microorganisms such as hormones and enzymes promote active cell and root division in growing plants.
4. Effective microorganisms can be applied to cover crops and green manures during growth by adding it into the soil as it assists in the absorption of green manure.
5. Vegetables, fruits and herbs can be sprayed with effective microorganisms standard dilution of 1:500 to enhance their growth. In addition EM can also be added to water used in washing them before consumption.
6. Effective microorganisms can also be used during planting by farmers and vegetable growers by soaking seeds in a solution of EM before planting to increase seed viability. This is done by diluting at a ratio of 1:1000 and seeds soaked for 5-10 minutes, planting can be done immediately or air dried to be planted later.
7. Effective microorganisms can also be added into an irrigation system in order to enhance plant growth, the dilution rate should be approximately 1:10,000.
8. Personal Hygiene can be enhanced by adding effective microorganisms to washing or bathing water at 10ml per use. It can also be used to keep facecloths, sponges or cloths fresh and reduce harmful bacteria, smell as well as dirt.
9. Effective microorganisms are also suitable for the breakdown of undesirable and heavy metals in the environment such as lead,

copper in order to clean polluted sites and reduce lifestyle diseases.

10. The growth and weight of domestic animals such as swine and poultry has been enhanced when effective microorganisms are used as a feed additive in low nutrient diets.
11. Effective microorganisms can also be used in the home by pouring down the sink and drainage to reduce odors, harmful bacteria and bring to freshness.

EM is available in agrovets at Ksh500-1000 for 500ml.

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**World Bee Day
2024**

Kajiado KCB Grounds
18th to 20th May

Theme
Bee engaged in pollinator friendly agricultural production



Tune to Radio Maisha every **Tuesday at 11:00am** through any of these Frequencies to receive Kilimo Hai, TOF Radio Swahili farmer programs. TOF Radio and Radio Maisha partner to bring you these educational programs.

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

Tuko Mbele Pamoja!

ADVISORY

March to May Weather advisory

To keep you informed on weather patterns in this season, this edition features the weather forecast released by the Kenya Meteorological Department, to guide farmers in proper planning, to avoid losses and reap the benefits of early preparation.

By Meteorological Department

AS THE LONG RAINS season begins, most parts of the country are still experiencing heat waves, characterized by scanty showers of rains. This goes to show how much the effects of climate change are impacting farmer activities. To keep you informed on weather patterns in this season, this edition features the weather forecast released by the Kenya Meteorological Department, to guide farmers in proper planning, to avoid losses and reap the benefits of early preparation.

According to the advisory released, early March, for the period March-May 2024, above average rainfall is expected in the Lake Victoria basin, highlands West of the Rift Valley, Central, and South of the Rift Valley (Kisumu, Siaya, Migori, Homabay, Kisii, Nyamira, Baringo, West Pokot, Elgeyo Marakwet, Nandi, Kericho, Bungoma, Kakamega, Busia, Trans Nzoia, Vihiga, Laikipia, Laikipia West, Nakuru, Narok). In these counties, rainfall is expected to continue throughout the season. The expected rainfall is likely to be above the longterm average amounts for the season and will continue from February to June with good distribution.

In Northwestern and North Eastern counties, Turkana and Samburu, Mandera, Marsabit, Wajir, Garissa, Isiolo and parts of Tana River are likely to experience occasional



rainfall that is above the longterm average during the season, with a poor to fair distribution in both time and space. Rainfall in these regions is expected to start in the fourth week of March to first week of April and end in the second to third week of May.

The highlands East of the Rift Valley including Nairobi County that is Nyandarua, Nyeri,

The highlands east of the Rift Valley are likely to receive rainfall above the season's long term average with fair to good distribution

Kirinyaga, Murang'a, Kiambu, Embu, Meru, Tharaka Nithi, Nairobi and Eastern parts of Laikipia, are likely to receive rainfall above the season's long term average with fair to good distribution in time and space. The rains in this region will continue from third to fourth week of March and end in the fourth week of May or first week of June.

Along the coastal strip, Mombasa, Tanariver, Kilifi, Lamu and Kwale counties, the rainfall amounts are likely to be near to above longterm average for the season, with fair to good distribution in both time and space. Rainfall in these areas is expected to begin in the third to fourth weeks of March and continue into June.

Farmers are advised to take note of the rain distribution in their regions and prepare well for the season.

Partner organizations



To contact us on the "tusemezane" platform or ask a question, kindly call or sms +254 715422460. Mail to: feedback@biovisionafrica.org

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