



Photo: oneacrefund.org

Farmers get low beans yields due to lack of proper management of the crop. With good care, bean harvest can increase by up to 11 bags an acre. (Page 5)

Dear farmers,

Many farmers will be harvesting various crops, especially maize and beans planted at the beginning of the long rains in March and April this year. Unfortunately, crop yields won't be as high as expected because rains did not come at the most critical period in May.

The short rains will start in about a month's time. This will give farmers a second opportunity to plant again and perhaps recover the losses they incurred during the long rains season. This requires good planning and farmers have to get good quality seeds of the right type for each climatic zone.

In TOF No. 110, July 2014, we advised on the best maize varieties that can do well in various parts of the country during the short rains. It is our hope that farmers will heed this advice in order to increase yields and reduce the expected food shortage in the country.

The second most important crop to plant in the short rains is beans. In spite of its importance in improving family nutrition and income, bean yields have consistently remained low due to farmers' poor choice of appropriate seeds and management of the crop.

In this issue we show farmers how to plant beans the right way in order to get good yields and income (Page 5).

To many people including farmers, trees are largely ignored. Very few farmers plant trees to replace those they have cut down to meet their household needs.

This is despite the role trees play in environmental conservation, and building construction as well as being a source of energy in almost all rural households. In this issue we continue our series on trees and how farmers can grow them and protect the environment to their benefit. (Page 8).

Poultry keeping: What farmers need to succeed

TOF - Poultry keeping continues to be one of the most popular enterprises among small-scale farmers in Kenya. This is because it is one of the cheapest farming enterprises that require little capital to start. Although many farmers previously preferred hybrid chickens due to their high productivity, there has been a shift towards keeping indigenous chickens. This is because maintaining hybrid chickens is costly as their feeds are too expensive for many small-scale farmers, and moreover do not yield the expected profits.

Do not rush

Kenyan farmers are fond of starting new enterprises if there is the slightest rumour that they can generate good money and in a short time. This was evident with the quail fiasco at the beginning of this year.

Huge demand for KARI chickens

Recently, there has been a rush for improved indigenous chickens from KARI, not to mention Kuroiler and Kuchi breeds of chickens. TOF has established that the demand for KARI chickens is so high that KARI has an eight-month backlog of orders, which they are yet to deliver.

Farmers should understand that KARI is a research institution and not a commercial enterprise. What farmers need most from this institution is training on the breeding and management of chickens. They can then use this knowledge to start their own breeding projects in their respective regions and sell this breed to other farmers. Like most farm animals, the improved indigenous chicken breeds need to be well cared for and vaccinated to yield good returns. They are therefore not 'miracle' breeds that yield profits overnight.

Farmers can breed their own chickens

There are many successful



Photo: TOF

poultry farmers who have good indigenous chicken breeds and sell to other farmers. With proper training, any farmer can become a successful breeder and supplier of improved indigenous chickens, which now fetch good prices in the market.

The cost of feeds is another major constraint that poultry farmers in the country face. Many farmers have abandoned production of hybrid chickens since they cannot afford to buy commercial feeds. In this issue, we again show farmers how to cut their production costs by making their own feeds at home which can cut feed costs by up to 30 percent and improve poultry farmers' income (page 4).

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Why it is important to keep records in a farm

Record keeping helps farmers monitor the performance of their enterprises while enabling them plan and make important decisions for future farm development.

Pauline Mundia | Small-scale farmers are the driving force behind many African economies that rely on agriculture as the backbone. Unfortunately, most of them have nothing to show for the great contribution they are expected to make. This is due to the many challenges they face, one of them being poor financial management. To be a successful farmer in modern farming, one has to be both a good producer and a good manager.

Records are important for decision making

Good record keeping is crucial to making profits. Farm records refer to documentation of farm activities, purchases and sales carried out by a farmer. Keeping these records properly and consistently helps them assess the profitability of their farms. For any farmer who wants to make their subsistence farming more profitable, record keeping is a must.

What is profit? Profit is the



Farmers should allocate some time for record keeping every day.

money obtained from sales made less the money spent on production. Keeping records will let you know whether you have made a profit or loss. Even if you have a very good memory, you may not remember all the expenses and income that you made in the month. It is, therefore, necessary to put it down on paper.

A simple guide to types of record keeping

There are many types of records that a farmer can keep. Deciding which ones to keep depends on an individual farmer and one's goals. But some are a must if

you intend to carry out farming as a business.

The first record a farmer should have is a **farm plan**. This shows the location of the homestead and partitions for the different enterprises.

The other important records are the **purchases** and **sales** records. These can be kept using an ordinary exercise book. On one page, write down all the income from your produce. If it is produce you are selling daily, make an entry every day for the quantity you have sold and cash received. On another page, write down all your costs of production. These include purchase of seeds, manure, pest and disease control products and other farm inputs. Record also other costs such as labour and transport. For all inputs purchased from an agrovet shop, keep the receipts as proof of purchase as well as for refund in case of any problem.

Once you have made correct entries for all the activities, get the total of all the sales you made, and all the expenses you incurred. Then subtract the expenses from the sales to know your profitability.

Farmers should also keep records of activities and practices that take place on the farm daily. These include dates of

land preparation, weeding, fertilizer application, birth of a kid or calf, vaccination for poultry, among others. Also note the periods of pest and disease infestation and control measures taken. These records are important for reference or future planning of activities. For farmers who are computer-literate, you can use computer software like Microsoft Word and Excel.

Once you have established how much profit you have made, use it well to grow your business. It is usually recommended that you plough back 40% of the profit into business (your farm), save 30% and use the remaining 30% to improve your family livelihood.

For more information on records for specific enterprises, go to <http://www.infonet-biovision.org/default/ct/290/animalKeeping?search=RECORD%20KEEPING>

Advantages of keeping farm records

- It helps one keep track of expenses and sales, thus giving one control over their resources. Farm records give valuable information on what worked and what did not, allowing the farmer to plan effectively for future production.
- For livestock, records improve the value of your animals when you want to sell them. Records such as the breed of the animal, AI bull used, calving history, animal health records and production will be important to any buyer.
- Records help farmers monitor the farm's performance. In this way, one can increase the more profitable enterprises and reduce or eliminate the less profitable ones.
- Records assist farmers to get loans, grants loans, grants and crop insurance. Such information enables the lending institution decide if you are credit worthy or not.

Cash in (sales) (+)			Cash out (expenses) (-)		
Date	Produce sold	Amount	Date	Item purchased	Amount
Total			Total		

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ICIFE helps farmers to cope with climate change

Through four automatic weather stations and a community radio, farmers in Taita Taveta receive information on climatic variability or change and environmentally friendly pest and disease control methods. This has increased their crop yields and reduced conflict.

Trostky Lumiti | Wundanyi is one of Kenya's tourist destinations that is endowed with great biodiversity. The town lies in the Taita hills on the southern part of the country and at one time experienced high rainfall and low temperatures of 15 to 20°C. These climatic conditions enabled the farmers to practice horticultural farming. Farmers grew their crops with no pests, diseases or scarcity of water. The cool conditions made it hard for pests to survive.

The soils in the area were relatively rich, well drained and fairly deep. They were not exhausted of nutrients and could support several types of crops. Some of the crops grown in the area included French beans, peas and macadamia. These were mainly grown for export and fetched good prices in the international markets due to the high demand. The farmers sold their produce and the money obtained supported family needs like school fees.

Increased pests and diseases

The situation has changed as the natural conditions that hindered pests and diseases have gradually been encroached. Farmers are now facing challenges they didn't experience before. These include infestation by crop pests and diseases, some of which are new to the area. Water shortages have worsened and made crops more vulnerable to pests and disease attack. Water shortages have also contributed to inter-communal conflict. These are some of the effects of climate change.

Effects of climatic changes

Wundanyi is now warmer compared to previous years. This is called **climatic variability** - the way climate fluctuates every year above or below normal. It is different from climate change, which is characterized by continuous change (increase



A farmer releases parasitoids in a bean field. Farmers in Werugha received training on pest detection and management. Photo courtesy CHIESA/ICIFE

or decrease) to average weather conditions over a long period of time.

The rise in annual average temperature has enhanced the ability of invasive pest species to survive and reproduce successfully in the area. It has increased the numbers of invasive pest species, which are harmful to French beans that are grown for the export market.

Rainfall patterns have changed and farmers no longer receive rainfall on time or in sufficient amounts. Nahashon Mombo, a farmer from Wundanyi, says due to poor rainfall, it has become difficult for him to grow French beans. Normally, he grows peas during cold season (June) and French beans during warmer season (October). "For the past four years rainfall has been unpredictable. It is often dry and we are forced to irrigate our crops, which makes farming difficult and expensive. But this year, we have received enough rainfall so far," he says.

Mombo also notes that in spite of reduced water levels in rivers, agricultural activities have increased in the area, thus raising the demand for water for irrigation.

Conflict caused by water shortage

Scholar Aeni, a farmer from Mbolombolo area in Wundanyi regrets the losses brought about by conflict in the area. Their French beans were slashed by people from the neighbouring communities, who live downstream. Water in the river was insufficient and could not serve both communities, and the unequal water distribution ignited the conflict in the area.

"The people down-hill came and destroyed our crops. They believed that we had dammed the river thus blocking the

water from reaching them. They slashed down our crops because they thought we had used most of the water from Mbolombolo for irrigation," she adds.

They are, however, happy that the government took control of the situation and no repeated incidents of the conflict have been reported since then.

Chemical fertilizers damaging soils

Soil fertility is another major problem farmers face in the area. Farmlands have become unproductive and they are forced to purchase chemical fertilizers to improve soil fertility, and this has increased their production costs. Besides being expensive, the fertilizers used are not environmentally friendly. They contribute to soil acidity and subsequent poor crop yields. Mombo, who belongs to Mbaghitiki Self-Help Group, blames it on farmers' lack of information. Farmers often use chemical fertilizers even before doing soil tests to know the soil requirements. Many also do not know how to use organic methods to improve soil fertility.

"We need sources of information like *The Organic Farmer* which gives relevant knowledge to farmers unlike companies and institutions which come only to sell their chemical products," he says.

Help for farmers

ICIFE has collaborated with other institutions in Eastern Africa to help farmers deal with climate change. Farmers have been trained on sustainable agriculture methods through the Climate Impacts on Ecosystem Services and Food Security in Eastern Africa (CHIESA) project, funded by the Government of Finland and coordinated by ICIFE. ICIFE introduced beneficial parasitoids in Wundanyi

to tackle some of the pests and this has helped farmers control a number of pests.

Parasitoids are organisms that live on or within a host. The parasitoids kill the host, which is a harmful pest. This is an environmentally friendly way of dealing with stubborn pests - introducing one beneficial organism to control another harmful organism.

Chemicals caused rejection of exports

Some of the pests controlled by the parasitoids are the leaf miners. These are invasive species that attack French beans and many other leafy crops like beans, blackberries, cabbage, lettuce, tomatoes, potatoes, peas, peppers and citrus fruits (like lemons, oranges and limes). The pests make the produce unsuitable for export.

Controlling the leaf miner was not an easy task for the farmers as the pest lives in the plant leaves (leaving a series of wavy lines on the leaf as they feed). Pesticides cannot, therefore, affect the pest, but they lower the quality of the export crops, which are rejected in international markets because they contain traces of chemicals.

Release of parasitoids

Parasitoids, especially parasitic insects, have been effective in reaching and destroying the leaf miner naturally, when released in sufficient quantities. These include *Opius dissitus*, *Phaeditoma spp.*, *Chrysocharis flacilla*, *Halticoptera arduine*, *Cotesia sesamiae* and *Cotesia flavipes*. But these beneficial insects are killed when a farmer uses broad spectrum pesticides. This is devastating and it is very expensive for a farmer to get one parasitoid. This is why stakeholders to the project like Real IPM are focused on developing environmentally friendly pesticides, which are not harmful to the parasitoids but are effective in controlling harmful pests.

Mr Sebastian Nduva from Real IPM introduced their environmentally pesticide- *Metarhizium anisopliae*-which is an insect-killing fungus that occurs naturally in the soil. The pesticide is effective against adult thrips and white flies. The pesticide is economically packaged which makes it affordable for ordinary farmers.

The best way to make chicken feed at home

Many farmers are now making chicken feeds at home. This should be done the right way, and farmers must use high quality raw materials that help in cutting production costs while ensuring proper growth of chickens.

Peter Kamau | Since TOF published information on chicken feed formulation last year, (TOF No. 102, November 2013) many farmers have managed to make their own feeds at home. Some farmers are, however, yet to understand how to formulate chicken feed in the right way. Following the questions sent in by farmers, it is clear that most farmers need additional information on how to make nutritionally balanced feed for their chickens in each growth phase.

Making feeds at home drastically cuts down production costs especially if farmers can get the raw materials cheaply. The most common ingredients are whole maize, maize germ, cotton seed cake, soya beans, sunflower or fish meal (*omena*). In addition, farmers need to add several feed additives (micronutrients, minerals and vitamins) to make sure their chickens have a balanced feed that meets their daily nutrient requirements.

As we cautioned before, the quality of some feeds in the market is so poor that farmers using them incur huge losses when they buy such feeds feed their chickens. Farmers who formulate and make their own feeds at home save an average of Ksh 840 for every 70kg bag of chicken feed, which is a great saving for commercial producers.

Important tips on feed preparation

- When making home made feed rations, it is important to do experimental trials, by isolating a number of chickens, feeding them and observing their performance. If the feed rations are right, the broilers will grow fast and layers will increase egg production (at least 1 egg after every 27 hours).
- Buy quality fishmeal from reputable companies. If *omena* is used the farmers must be sure of its quality; the *omena*



Feeds made at home reduce costs for the farmer.

Below are feed formulations for each category of chickens during every stage of growth. Farmers can use these simplified formulations to prepare feed for hybrid layers and broilers:

Making a 70 kg chick mash (1 to 4 weeks)

Growing chicks require feed with Digestible Crude Protein (DCP) of between 18 to 20 per cent. The following formulation can be used to make a 70 kg bag of layers chick mash:

Ingredients

- 31.5kg of whole maize
- 9.1kg of wheat bran
- 7.0kg of wheat pollard
- 16.8kg of sunflower (or 16.8 kg of linseed)
- 1.5kg of fishmeal
- 1.75 kg of lime
- 30g of salt
- 20g of premix
- Amino acids*
- 70g of tryptophan
- 3.0g of lysine
- 10g of methionine
- 70 g of Threonine
- 50g of enzymes
- 60g of coccidiostat
- 50g of toxin binder

in the open-air markets may be contaminated. Farmers are advised to go for soya meal if they cannot get *omena* grade 1.

- Always mix the micronutrients (amino acids) first before mixing them with the rest of the feed. To mix the ingredients, farmers are advised to use a drum mixer (many jua kali artisans can make one). Do not use a shovel to mix feed because the ingredients will be unevenly distributed.

Making a 70 kg bag of growers' mash (4 to 8 weeks)

Growers (pullets or young layers) should be provided with feed having a protein content of between 16 and 18 per cent. Such feed makes the young layers to grow fast in preparation for egg laying:

- 10kg of whole maize
- 17kg of maize germ
- 13kg of wheat pollard
- 10kg of wheat bran
- 6kg of cotton seed cake
- 5kg of sunflower cake
- 3.4kg of soya meal
- 2.07kg of lime
- 700g of bone meal
- 3kg of fishmeal
- Additives*
- 14g of salt
- 1g of coccidiostat
- 18g of Pre-mix
- 1g of zinc bacitracin
- 7g of mycotoxin binder

Making a 70 kg bag of layers' mash (8 weeks and above)

Ingredients

- 34kg of whole maize
- 12kg of Soya
- 8kg of fishmeal
- 10kg of maize bran, rice germ or wheat bran
- 6kg of lime
- Amino acids*
- 175g premix
- 70g lysine
- 35g methionine
- 70kg Threonine
- 35g tryptophan
- 50g toxin binder

Layer feed should contain a Digestible Crude Protein (DCP) content of between 16-18 per

cent. The feed should contain calcium (lime) for the formation of eggshells (laying hens that do not get enough calcium will use the calcium stored in their own born tissue to produce eggshells). Layer feed should be introduced at 18 weeks.

Formulating a 70 kg bag of broiler feed

Broilers have different feed requirements in terms of energy, proteins and minerals during different stages of their growth. It is important that farmers adapt feed rations to these requirements for maximum production. Young broilers have a high protein requirement for the development of muscles, feathers and other body organs. As the broilers grow, their energy needs for fattening up increase while their protein requirements decrease. They, therefore, require high protein content in their starter rations than in the grower and finisher rations. Broilers should have feed that has between 22 -24 per cent DCP.

The following guidelines can help the farmer to make the right feed at each stage of growth:

Preparing broiler growers feed (70 kg)

- 10kg of whole maize
- 16.7kg of maize germ
- 13.3kg of wheat pollard
- 10kg wheat bran
- 6kg of cotton seed cake
- 4.7kg of sunflower cake
- 3kg of fishmeal
- 2kg of lime
- 3.4kg of soya meal
- 40g of bone meal
- 10g of grower PMX
- 5g of salt
- 5g of coccidiostat
- 5g of Zinc bacitracin

Broiler starter feed (1-4 weeks)

- 40kg of whole maize
- 12kg of fishmeal (or *omena*)
- 14kg of soya bean meal
- 4kg of lime
- 70g of premix
- Amino acids*
- 35g of lysine
- 35g of Threonine

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Farmers can easily increase their beans yield

If managed in the right way, farmers can get more bean yields, improve their soils and income.

The Organic Farmer

Farmers are about to start planting beans for the short rains. If they do it well, they stand to get good yields. Beans are very valuable to Kenyan farmers as they provide the much needed proteins to Kenyan families, especially those in the rural areas where income is low and many people cannot afford to buy animal proteins. Being a legume crop, beans fix nitrogen into the soil, thus improving fertility levels.

Due to shortage of land, most farmers intercrop beans with maize. Intercropping has benefits because the crops gain from nitrogen fixation and essential elements like lysine, which is found less in maize and other cereal crops. Bean yields in many farms are, however, very low averaging 1 to 2 bags per acre. But if grown well farmers can get up to 11 bags. To get good yields farmers have to grow varieties that are suitable to their areas and adopt good management practices. Beans can grow well under the following conditions:

Altitude: Both high and low altitude areas are suitable as long



Good management increases yield in beans.

as there is adequate rain. They, however, tend to grow and mature faster in lower altitude zones.

Rainfall: Medium to high rainfall areas are suitable with an average of 750- 2000mm annually. Too much rain and long spells of drought are not good for beans and reduces their yields.

Soils: Beans grow well in well-drained soil that is high in organic matter and with a pH of between 6 and 7. Growth is poor in water-logged soils.

Land preparation: Land preparation should be done early enough so that the field is free of weeds and ready for planting at the onset of the rains. The seed

bed should contain fine soil.

Seed quality: Farmers are advised to buy certified seed. Local farmers, however, prefer using seed from their own stock. This is acceptable (because beans are self-pollinated), but farmers should carefully select seeds for planting. Ensure all wrinkled, damaged or diseased seeds are removed. Seeds when planted are prone to fungal diseases and pest damage before they germinate. To prevent this, all seeds must be treated with organic fungicides and pesticides a range of which are available in the market.

Inoculation: Inoculation of beans before planting is very important as it improves

farmers' yields. Inoculation is the process of mixing bean seeds with nitrogen-fixing bacteria called rhizobium, which enables the bean plant to take in more nitrogen during the growth cycle. Inoculated beans produce more than those that are not. Farmers can buy the Rhizobium from seed companies or from agricultural research institutions near them. Taking soil from a field previously planted with beans and mixing this with your seed beans also inoculates the seeds.

Planting: Beans should be planted at the onset of the rains. Delay in planting may cause a reduction in yields or even crop failure.

Spacing: Where beans are planted alone, planting should be done in rows at 50 cm by 10 cm (one seed per hill) if weeding is done using animal drawn implements or tractors, then spacing can be done according to the implement to be used for weeding. For farmers who want to intercrop beans with maize, two rows of beans 15 cm apart can be planted between maize rows. Plant 1 bean seed per hole when using this spacing pattern. The other alternative is to plant 1 bean row and then 2 seeds per hole.

Seed rates: The amount of seed required for a given area will vary from variety to variety and the size of the seed. The bigger the size of seed, the more the quantity of seed required. Beans grown as pure stands take up more seed than when intercropped with maize.

Fertilizer application: The use of farmyard manure or well-made compost is highly recommended for bean growing especially in areas where soils are low in organic matter content. The manure should be applied at least 1 week before planting. Apply 7- 10 tons of farmyard manure for every 1 acre of land.

Weeding: Weeding should be done continuously to ensure all the weeds are controlled. Farmers are advised to weed the crop 2-3 weeks after emergence followed by second weeding 3 weeks later (before flowering) when beans are planted alone. Avoid cultivation at flowering time when the field is wet as this can spread diseases.

Harvesting: This should be done immediately the pods turn brown and hard before they start shattering.

Planting and fertilizer application programme for beans

Stage of growth	Product	Dosage	20-litre knapsack spray	Frequency	Method of Application
Seed treatment	Turbo seed® Trichotech® Vitazyme® Biofix®	2.5 g 2.5g 5mls 300ml per 15 kg of seed	-	1	Make a slurry. Mix the seeds with slurry and dry in the shade
At planting	Rock Phosphate, Black Majik®, Mbolea Mamboleo (Juanco), Fosphite®	50kg per acre 2.5kg per acre	-	1	Mix the two and apply in furrows/holes
Two weeks after planting	Vitazyme® Nimbecidine®	20ml	8 knapsacks per acre	1	Spray mixture to run off
Four weeks after planting	Trichotech®, Biocure®, Plant extracts with EM1	30mls in 20l of water	8, 20-litre Knapsacks per acre	1	Spray mixture to run off
Six weeks after planting	Vitazyme® Maxiboost® Fosphite®	20ml 40ml in 20litres of water	8, 20-litre knapsacks of water	1	Spray mixture to run off
Before Flowering	Biocure®, GC-3®, Organic K	30ml	8, 20-litre knapsacks	1	Spray mixture to run off
At Flowering	Fosphite® (has Organic K and Ca)	200ml 100ml in 20l	8, 20-litre knapsacks	1	Spray the mixture to run off

NOTE: Most Agrovet shops may not have some of the organic products we have recommended above. For Turbo-seed®, Trichotech®, Vitazyme®, Biofix®, Maxiboost® and Black Majik® Call Lachlan (K) on 020 2073 912, 0722 209 474, 0733 209 474. For products such as fosphite, Mbolea Mamboleo fertilizer call Juanco SPS on 0722 269 010. Biofix inoculant is found in all Mea Ltd outlets in the country. For preparation of plant extracts read TOF No. 47 of April 2009.



Photo: Kelah Kature/CHIESA

One of the four automatic weather stations in Taita Hills, set up by the CHIESA Project

Weather stations provide information

ICIPE, through the CHIESA project, also has four functioning weather stations in the area. These provide different meteorological information to the farmers which can be used for planning farm activities and monitoring local climatic change. Farmers now know when and what to grow in different seasons. It is also used to provide timely weather information, which if acted upon may prevent natural calamities such as floods.

This intervention by ICIPE and other stakeholders has proved to be of great benefit to the farmers. Farmers can now effectively control crop pests with little cost to the farmer. This reduces production costs, and increases quality and acceptability of the farmers' produce in foreign markets. It also helps in conserving the environment.

Organic inputs increase pigeon peas harvest

Patrick Kimeu | "My people perish for lack of knowledge," Serah Ndeto recites a popular bible verse as she moves around her well-established pigeon pea farm. Serah has been spraying Pyegar®, an organic pesticide and GC-3®, an organic fungicide on her 2-acre pigeon peas garden, which has greatly improved her yields. Although organically grown pigeon peas are popular in Katoloni, Machakos County, farmers face serious challenges in dealing with pests and diseases. But Sarah discovered the two organic products, which have made all the difference to her production.

Safe organic products

Pyegar® a broad-spectrum organic pesticide and GC-3, an organic fungicide, were recommended to her by Biovision-supported field extension agents based in Katumani Resource Centre in Kola, Machakos. Pyegar® is made from natural pyrethrum. It controls African bollworm, bugs, thrips and aphids. The pesticide does not kill beneficial insects such as bees, which are critical in pollination. The GC-3 Fungicide controls leaf rust, leaf spot, powdery mildew and blights.

Most farmers use harmful chemicals to control these pests, which kill the beneficial insects like bees, thus interfering with



Serah Ndeto showing off her healthy pigeon peas.

pollination and resulting in decreased production.

Unlike her neighbour's pigeon peas, which aborted almost all the flowers, Serah's pigeon peas never aborted. They started bearing in April and the crop was healthier than her neighbours'. She now sells her produce in both Machakos and Makueni Counties, where she has many customers.

More harvest

The harvest last season was so good that she made Ksh 9,700

after sales, and had enough pigeon peas remaining for her family. She expects to continue harvesting the pigeon peas until October when she will plant the next crop. Although she has been intercropping pigeon peas with maize, she plans to plant the next pigeon peas crop alone in order to increase the yield.

Serah has learnt that most of the chemical products she used before for pest and disease control were not genuine. Moreover, they were expensive and unfriendly to the environment. ■



NOTE: For farmers who have more than 500 chickens it is advisable to make 1 tonne of feed at once (there are 14 bags of feed in one tonne). To make 1 tonne of feed, multiply each of the ingredients by 14. Ensure that all the feed you make will last for one month and not longer- this ensures the feed remains fresh and safe for chickens. Any feed that lasts more than one month may deteriorate in quality and can affect your chickens.

Daily feed requirements for each growth stage

Farmers should maintain the right feed quantities for chickens at each stage of growth as shown below:

- An egg-laying chicken requires 130-140g of feed per day.

- A chick requires a minimum of 60g per day- if they finish their daily rations, give them fruit and vegetable cuttings to ensure they feed continuously.

- Young chickens (or pullets) which are about to start laying eggs should be fed 60g for 2 ½ months and then put on layer diet (140g per day). Supplement the feed with vegetables, edible plant leaves and fruit peelings in addition to their feed rations.

- Broiler chicks require 67g per day. Broiler finishers require 67g of feed per day to the day of slaughter.

- Rat-proof all chickens sheds to keep away rats and birds which eat the chickens feed and bring in fleas and even diseases. To do this, ensure the floor is made of concrete and the chicken wire holes are too small for rodents to get in (preferably ½ inch by ½ inch).

- Chickens are sensitive to aflatoxins- never use rotten maize (maozo) while making feeds. ■



Feed raw material suppliers in Kenya

Farmers who need raw materials for feed making including feed additives (pre-mixes and amino acids) can order them from outlets nearest to them. The following outlets sell the ingredients in different towns shown below:

Nairobi

1. Essential Drugs Ltd, E.D.L House, Mombasa Rd, Tel. 020 263 2701/02, 0721 386 604 email: info@essential-drugs.com

2. Tarime suppliers

Tel. 0729 099 550, City stadium, Nairobi, Email: tarimesuppliers@yahoo.com.

Kisumu

Victoria Poultry- Mr Okuku 0713 919 410

Nakuru

Daina Feeds Ltd, Taita Room- Mr. Kimani 0721 627 412 or

Martin 0721 727 423

Eldoret

Telview Ltd Mr Gitau 0722 742 870

Kitale

Moi's Bridge – Call Felix on 0725 908 410

Karatina

Salama Feeds – Call John 0723 777 121

Thika

Falcon Feeds – Call John 0728 655 509

Naivasha

Kabaiku Agencies – 0723 847 526

Embu

Rose Ndirangu – 0714 774 431

Bungoma

Eden Millers – Call Murumba on 0710 642 558

How to build an apiary for honey bees

What factors should be considered when setting up an apiary?

An apiary or a bee house is a place where many beehives are kept for honey production. It is advisable to keep between 20 to 25 beehives in one apiary. Beekeepers should ensure there is adequate forage around the apiary for bees to collect or harvest nectar without having to travel for long distances - preferably within a radius of three to five kilometres.

Spacing apiaries

Should a beekeeper want to keep more hives than those given above, they should identify another site three to five kilometres away from the apiary to set up another one. Plant a good high hedge or live fence using a shrub such as kei apple. As you wait for the fence to grow, you can use offcuts to make a fence around the apiary. The fence separates the bees from the people and animals since African bees are known to be aggressive in nature. Apiary siting is very important in small farms to ensure safety and comfort living with bees.

Selecting a site

Choose a good site to put the apiary. If you choose a poor site, bees may sting people and



Apiaries should be built away from people and animals.



A bee house apiary.

animals. If the site is insecure, hives and honey may be stolen. If you live in a hot area, your hives will need shade as well as water. But in a cool area such as the highlands, only minimal shade is required otherwise the

bee hive will be damp, making bees less active. Get a good balance between light and shade. A bright apiary without direct sunlight appears to be the best as bees are most active in such environment. Farmers

should consider the following when choosing an apiary site.

- Beehives can be placed on a platform supported by 4 heavy posts, each about 2.5 to 3 metres long. If you want to hang the hive, use two strong and heavy posts each about 2.5 to 3 metres long, dig two holes about ¾ metre deep and 2 metres apart or take two strides; pack soil and stones around the posts.

- Ensure the posts are very firm. If the posts are not strong, the hives may fall over when filled with honey.

- Make sure everything is in order because once the bees enter the hive, it will be difficult to make changes. Use a wire to hang the hives as shown in the pictures (left).

Beehouse apiary more secure

If the apiary is to be put under a shelter or bee house, make sure that the bees have a way of getting in and out their hives. A bee house apiary is better because you can lock it to prevent theft of the honey or people from interfering with the hives. A bee house can be a simple mud hut with holes in the walls for bees to pass through. Make sure there is plenty of light but not strong, direct sunlight.

Fertility requirements in banana production

What is the best way to feed bananas?

Bananas can be very productive if well fed and managed. They tend to do well with frequent application of farmyard manure from cattle, pigs, goats and chickens. Farmers can also use well composted manure. At planting, thoroughly mix 70kg (two debes) of dry manure with the topsoil. The bottom soil can be spread elsewhere in the shamba.

Rock phosphate for root development

Rock phosphate can be added to the soil to provide phosphorus. Mix with the compost and topsoil to enhance soil fertility and promote root development. Put the top soil/manure and fertilizer mixture into the planting hole. If the mixture does not fill the hole, top soil from the surrounding areas should be added. The centre of the hole should be marked



A well-mulched banana mat.

with a peg and left undisturbed for a minimum of two weeks. Rock phosphate should be applied once a year to replenish other essential nutrients to the growing banana plants.

After planting it is important to add organic fertilizers such as slurry (watery mixture made of fresh cow dung and urine) once or twice a month around the banana stool (but not too near the plants).

Desuckering

It is important to monitor the growing banana plants continuously. Each banana stool should have only three plants at different stages of growth - a mother or bearer with a bunch, a daughter that is half the size of the mother and a granddaughter (peeper) which is the smallest or most recent emerging sucker. Any other suckers are unwanted and should be removed continuously as they emerge.

How to check for nutrients in bananas

One year after planting, the stem of the daughter should be larger than the mother stem - this shows that the bananas are

growing well. But if a farmer notices that the daughter stem is the same size as the mother stem, it means that the bananas lack essential soil nutrients - this is an indication that the plants need more organic fertilizer.

Mulching

Continuous addition of mulch is one way of maintaining soil fertility in a banana plantation. Mulching conserves moisture, controls weeds and reduces soil erosion. When the mulch decomposes, it releases nutrients that are taken up by the bananas, in the process promoting their growth. Mulch material can be grass, chopped banana leaves and the stems (also called pseudostems). Crop residue from beans, maize stalks, can be used as mulch. The mulch should be kept away from the base of the plants to prevent development of more roots in the bananas. Mulch should be spread thinly to reduce banana weevils.

TOFRadio answers your questions

TOFRadio is broadcast on KASS FM, Mbaitu FM and Milele FM at 8:30pm on Tuesday, and KBC on Thursday at 8:15pm. Tune in and listen to farmer experiences and expert advice on agribusiness and eco-friendly farming methods. On this page, we respond to some of the issues raised by farmers in their correspondence to the radio program. Send your questions and comments via SMS 0715 916 136.

The importance of trees to the environment

TOF Radio's John Cheburet interviewed KEFRI's Chief Research Scientist/Deputy Director Dr. Jane Wangu Njuguna, who is encouraging farmers to grow trees on their farms.

Q: As a Forest Research Institute what key issues have you experienced emerging from tree husbandry and use of trees by farmers?

A: Most people are yet to understand the benefits of trees and how to plant them in their farms or pieces of land. KEFRI is running a campaign to sensitize farmers to consider tree husbandry. Trees are not only important in conserving the environment, but can provide the farmer multiple benefits as they grow and mature. Farmers, however, need to know which trees are suitable for growing in their areas as not all species are suited for all agro-ecological zones. It is also important to know how to care for each tree type.



Q: Which is the most important tree?

A: There is no tree that is more important than the other because they serve different purposes. Farmers with large farms usually plant trees for timber, posts and poles to sell. We encourage small-scale farmers to integrate tree planting into their farms for improved soil fertility, fruits, fodder for livestock and fuel.

Q: How can farmers access seeds from KEFRI?

A: Even though KEFRI headquarters is in Muguga, Nairobi, it has regional centres spread

in the country. We have six regional centres - Maseno, Londiani, Muguga, Karura (forest products), Kitui (dry lands), and Gede. We also have sub-centers in Lodwar, Garissa, Nyeri and Narok. KEFRI collaborates

with Kenya Forestry Service (KFS) and enquiries can also be made from there.

Q: What is KEFRI doing to deal with the threat of climate change?

A: We are investing in technologies and innovations that will address farmers' diverse needs for trees. We hope to achieve this by extending linkages with various collaborating partners and stakeholders to ensure that we conduct relevant research to identify and rear tree species that not only remove carbon dioxide in the atmosphere but also provide farmers with fuel, timber and poles on maturity. ■

Know your grasses: Nandi Setaria

John Cheburet | *Nandi setaria* has the greatest range of adaptability of all tropical grasses (altitude 0-3,000m above sea level). It performs well in high rainfall areas with 900-1825 mm per year. The grass can also be grown in transitional zones and arid areas through irrigation. It withstands considerable periods of drought but also longer flooding. The grass prefers medium-textured, fertile soils, such as loam soil, with pH of 5.5-6.5. It does not tolerate alkalinity or salinity.

Plant characteristics: *Nandi setaria* is a moderate to tall, bunch grass. The flowering heads are spike-like, and generally have good seed production. The base of vegetative tillers is flattened (fan-shaped), while the leaves are generally broad and mostly hairless. It can grow up to a height of about 2 metres.

Planting: *Nandi setaria* can be propagated by seed or cuttings. A well-ploughed and manured field is preferred for establishment by seed. Use seed rates of 2 kg per acre of good quality seed. The grass can be broad-

casted or sown not more than 15mm deep. When planting by cuttings, use a spacing of 50 cm within and 80 cm between rows. It is slower to establish, harder to eradicate and less useful in the dry season compared with Rhodes grass.

Companion legumes: *Nandi setaria* can be grown in pure stands or mixed with legumes such as siratro, green and silver-leaf desmodium.

Management: Do not graze until the plants are fully attached onto the soil. If the soil is soft, animals might pull the grass out of the ground. Fertilize the grass field after every harvest so that subsequent re-growth is healthy and robust. Farmers are advised to cut and feed the grass to animals rather than letting the animals graze directly. The grass can, however, still withstand light grazing. Regular cutting help maintain vegetative growth and palatability. Young leafy regrowth has good digestibility, but this decreases rapidly as the plant matures, so regular rotational grazing is required.

Uses: The grass gives dry matter yields of 4,000-6,000 kg per acre



A stand of *Nandi setaria* at KARI-Kakamega in Western Kenya.

per year. *Setaria* is often used for hay and silage. Crude protein content ranges from 5-14% depending on age of material and nitrogen fertilization. Dry matter digestibility is highest when grass is harvested at 3 weeks of re-growth. The grass is highly palatable and accepted by cattle, but has low sodium, and contains oxalate content. Therefore, it should not be fed alone to animals but mixed with other grasses. It is advisable to supplement the grass using protein-rich forages and concentrates. ■

farmers forum

0717 551 129 / 0738 390 715

Silage tubes for sale: We have silage tubes for sale. We also conduct farmers' training. Interested farmers' groups can Call Star Rays Education Centre. Tel 0721 245 443.

Goose eggs wanted: I need fertilized goose eggs. If you have them "SMS" goose eggs to 0722 878 635.

Fleckvieh cows wanted: I need a Fleckvieh Heifer and bull calf email: joeloutaya@gmail.com

Chicken cages wanted: I wish to buy cages for 5,000 layers phase 1 and then double eventually. If you can get them, get in touch with me. Call Albert 256 772 500 520 Kampala.

Organic cabbages wanted: I would like to buy organic cabbages from organic farmers growing them. Contact Oscar by email: making_a_life-inchrist@yahoo.com Nairobi.

Organic foliar fertilizer: We sell imported organic foliar fertilizer (KEPHIS certified). Call 0726 754 014 (office hours, week days).

Fleckvieh bull for sale: I have a 9-month Fleckvieh bull for sale. Interested farmers can contact me on 0726 434 521.

Sangi potatoes: I have 3 acres of certified sangi potatoes for sale to interested farmers to be ready in October 2014. Godffrey Ndirangu. Call 0722 892 510.

Metal silo for sale: We make metal silos for cereal storage. Call 0720 409 161.

Apple seedlings: I have 3 varieties of apples for sale to interested farmers. Call 0722 638 937, Kinangop.

Trees seedlings for sale: Indigenous tree seedlings, *Prunus Africana*. Call 0722 849 919.

Groundnut seeds wanted: We need groundnuts seeds, runner and bunch varieties. Call Ivan 0722 264 835.

Breeding buck for sale: A five way cross Toggenburg, indigenous Nubian and German Alpine, 5 month-old. Call Carboytto 0722 943 214.

Chicks for sale: Quality day old chicks for sale. Call 0719 808 222

Chicks for sale: Month-old chicks from Kenchic. Call 0729 358 593, Narok.