

Cut costs with home-made feeds

The cost of poultry feeds has significantly gone up following the introduction of 16% VAT on all animal feeds. The increase which has come when there is a decline in the price of poultry products such as eggs that has forced many farmers to abandon poultry keeping. We show farmers how to make their own feeds. Page 2



Photo: TOF

Biogas can give farmers energy and fertilizer

TOF-Kenya faces an energy crisis. With the increasing population, more trees are being cut down for firewood and charcoal. Despite the reforestation efforts, the numbers of trees being planted are far less than those being cut down to provide energy and building materials. More than 70 per cent of the rural population use firewood. Similarly, the urban poor and the informal sector use charcoal for cooking and the situation is likely to get worse in the coming years if no concrete measures are taken to tap into alternative sources of energy.

Biogas has many uses

Biogas is a renewable and clean source of energy, but it has not

been fully exploited to reduce the use of wood fuel in rural areas where the demand for firewood and charcoal now stands at 90 per cent. Close to 2 million rural families in the country own cows. The cow dung can be easily converted into biogas to provide energy for cooking and lighting while giving the families high quality fertilizer for use to grow crops in the farm.

Cost

It costs about Ksh 75,000 to install a fixed dome biogas unit. The Kenya Federation of Agricultural Producers (KENFAP) is already assisting farmers to put up biogas systems across the country under the Kenya National Domestic Biogas Programme (KENBIP). They give a small subsidy of Ksh18, 750 and the farmer is expected to meet the balance of Ksh 56,250. So far, more than 10,000 farmers across the country have benefited from the programme, but many others are unable to instal the system for lack of funds.

A few years ago, we featured the Plastic Tube Digester (PTDs) system promoted by KARI, which cost only Ksh 5000 to instal; a follow-up shows that most of the units are no longer working due to negligence by farmers. Most of the digesters got trampled by animals and scorched by the sun making them unusable. However, new technologies are now emerging that can improve the lifespan of the plastic tube digesters (see page 5). The low-income farmers will in future be able to benefit from biogas through such low cost technologies.

The government has not given much attention to promotion of biogas as one way of reducing the destruction of our forests while providing a large section of the rural population with a source clean energy. Most of the biogas projects in the country are supported by NGOs and the private sector. A deliberate policy to promote biogas is urgently needed to support this subsector as it has a direct impact on the environment.

Maize harvest to go down this year

Kenya is faced with the threat of food shortage following reduced maize production this year. According to a report by Egerton University's Tegemeo Institute of Agricultural Policy and Development, the country's maize production is expected to drop from the forecasted 40 to 34 million bags. The report titled *Achieving food supply in Kenya: The role of selected policy instruments*, the institutes predicts the country will have only 12 million bags of maize by January 2014. Farmers should not rush to sell their maize now. Those who store their maize well stand to gain as it is clear that maize prices are going to rise next year. More about the maize crisis will be covered in the December 2013 issue.



Dear farmers

The Kenya government's decision to introduce a 16 per cent Value Added Tax (VAT) on agricultural inputs and basic commodities is already having serious consequences in the agricultural sector.

For the last two months since the VAT Act, 2013 (CAP 476) came into effect farmers have begun to feel the effect; the costs of fertilizer and animal feeds have gone up, making it difficult for farmers to buy inputs. For example, a 70kg bag of chicken feed that was selling for Ksh 1900 has shot up to Ksh 2400, a cost increase of over 26 per cent. While it is in order for the government to increase tax to provide services, the decision to tax agricultural inputs at such high margin goes against its own stated goal of improving food security in the country.

Most poultry farmers will find it difficult to sustain their poultry agribusinesses, unfortunately forcing some to abandon them altogether. In this issue, we demonstrate to farmers how they can make their own feeds; which will not only cut down the cost of poultry production, but also ensure that the farmers use quality raw material and in correct proportions that improve the health of their chickens.

Organic farming is increasingly becoming popular among many small-scale farmers in the country. Since we started producing *The Organic Farmer* thousands of farmers have learned and embraced sustainable farming methods. The many questions we have received from farmers across the country clearly show that many more farmers are eager to know more about organic farming (see page 7). We shall continue to support them with all they need to know on this important farming practice to ensure that as many farmers as possible improve the quality of food they produce while taking care of their environment.

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How to make chicken feeds at home

Chicken feeds account for more than 80 per cent of the cost of poultry production. Making your own feeds cuts down the costs while increasing your profit margin.

Peter Kamau | The increasing cost of feeds is driving many poultry farmers out of business. The problem worsened recently when the government introduced a 16 per cent Value added tax (VAT) on all animal feeds. This has pushed up the cost of a 70kg poultry feed from an average of Ksh 1900 to Ksh 2400 (26% increase) for chick



Photo: TOF

A drum mixer is best in mixing feeds

and layers mash making it very difficult for poultry farmers to break even.

As a result, in the last couple of months we have received many enquiries from poultry farmers in different parts of the country who want to know how they can make their own feeds to cut down costs. Feeds account for more than 80 per cent of production costs. A farmer who manages to bring down this cost to about 50 to 60 per cent stands to make good returns in the poultry business. In the past, the conventional wisdom has been that farmers cannot make their own feeds, and especially to feed exotic breeds of chickens. But we have established that this way of thinking has stifled efforts of the more enterprising farmers who have the needed skills to make feeds.

Some farmers are however already formulating their own high quality feeds on the farm and do not rely on commercial feeds whose cost keeps rising. Besides, the quality of some feeds in the market is poor. Farmers using such feeds incur huge losses unnecessarily. 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 those

doing commercial production.

Below we give farmers some guidance on what they need to formulate their own feeds:

How to prepare layers chick mash (1-4 weeks)

Since they are growing, chicks require feed with Digestible Crude Protein (DCP) of between 18 to 20 per cent. Amino acids are important additives in all feeds in order to make a complete feed for all animals. For hybrid chickens the addition of amino acids is important to maintain a balanced diet for fast growth. The following ingredients can be used to make a 70kg bag of chick mash:

Ingredients

- 32.5kg of whole maize
- 9.1kg of wheat bran
- 7.5kg of wheat pollard
- 16.3kg of sunflower seed cake (or 16.3kg of linseed cake)
- 2.5kg of fishmeal
- 1.75kg of lime
- 30g of salt
- 20g of premix

Additives

- 70g of tryptophan
- 3.0g of lysine
- 10g of methionine



- 70g of threonine
- 50g of enzymes
- 60g of coccidiostat
- 100g of toxin binder

Making a 70kg bag growers feed (4 to 8 weeks)

Pullets or young layers should be provided with feed having a protein content of between 16 and 18 per cent. Such feed makes the pullet to grow fast and prepare for egg laying. Layers' feed should never be fed to chickens younger than 18 weeks as it contains calcium that can damage their body organs such as kidneys (they can develop kidney stones), which

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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 layer will increase egg production (at least 1 egg after every 27 hours).
- Farmers should be very careful with the quality of feed ingredients or raw materials. Chickens are very sensitive to feeds that contain mycotoxins which are present in most of the raw materials. Never use rotten maize (*maozo*) to make chicken feed.
- Buy quality fishmeal from

reputable companies. If omena is used the farmers must be sure of its quality; most of the omena in the open-air markets may be contaminated.

- It is very important to mix all the micronutrients (amino acids) first before mixing with the rest of the feed.
- For mixing, farmers are advised to use a drum mixer (many jua kali artisans can make one). Never use a shovel to mix feed because the ingredients will be unevenly distributed.
- Spoilt maize is the main source of animal feed in Kenya. Such feed is dangerous as it ends up in human food in eggs, meat and even milk from dairy

cows and goats.

- It is easier for small-scale farmers working in groups to buy some of the ingredients such as pre-mixes and amino-acids after which they can share the product according to each one's contribution.

Important: To improve on the feed quality, farmers making their own feeds should always have it tested to ensure the feed is well balanced. The KARI Centre in Naivasha has modern feed testing equipment that can test all nutrients and even the quality of the raw material used. It costs Ksh1000 to test one sample. After preparing your feed, take a 1kg sample; send it

by courier to KARI, Naivasha, Tel. 0726 264 032 or 0738 390 715. If you are on email, the centre can send the results to you within 24 hours

Raw material suppliers

Farmers who need raw materials for feed making including feed additives (pre-mixes and amino acids) can order them from the following companies:

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*

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You can grow tomatoes all year round

Farmers can use rain shelters to produce tomatoes throughout the year and earn good income in a short time.

Caroline Nyakundi | Tomatoes do not do well in cold or rainy weather. Most farmers wait for the June-July cold season to pass before planting the crop. This explains the current increase in supply that has caused a sharp decline in tomato prices in the market.

Tomatoes are delicate to grow and need moderate temperatures of between 18°C to 24°C to grow well. Although the crops can survive in a wide range of temperatures, the plants die in temperatures below 10°C and above 38°C. Fruits do not form below 18°C. Moderate rain is also necessary for growing tomatoes. Long dry periods cause buds and flowers to drop off and the fruits to split. But if rains are too heavy with high humidity, the tomato fruit rots and is prone to fungal and bacterial diseases.

What farmers should know

- Tomatoes need phosphorous for root, stem, and fruit formation, and potassium for flowering and resistance to diseases. Get the soil checked to ascertain the nutrient levels before planting.
- Tomatoes do well less acidic soils (pH 6.2-6.8) with a lot of organic matter. When planting, apply well-composted manure from dairy cows, sheep, poultry manure, which provide phosphorous, potassium, and nitrogen.
- If using fresh manure, dig it into the soil 3-4 weeks before planting. Don't spread it on the surface as nutrients will be lost.
- Make raised beds to prevent water logging. The beds should be 30 cm high, 2.4 m wide with a bed top of 1.5 m. Use hand hoes to straighten the beds.
- Make widely-spaced rows to ensure air flows freely. The tomato seedlings should be transplanted on rows 80 cm apart. Leave a space of 50 cm between plants in each row.
- Regularly check for signs of pests and diseases and act early to prevent them from spreading.



A rain shelter can be used to grow many types of vegetables and fruits
Photo: World Vegetable Centre

In the wet months like April and May, tomatoes become expensive in the local market because of the long rains in March to May which are followed by the cold season in July and August. However, with good timing and proper structures, a farmer can be assured of a bumper harvest and good money during this season.

Invest in a rain shelter

Growing tomatoes need a lot of sun. In warm and rainy days, the plants are susceptible to diseases like Early Blight. Tomato production is difficult during the wet season because the excessive rains make it difficult for seedlings to grow. Low-cost rain shelters can be used to protect crops from excessive rainfall and frequent wet periods when most diseases thrive.

What is a rain shelter? It is a structure that is similar to a green house but less expensive and only partially covered to allow natural ventilation. Since it is open on the sides, the temperature increases by only 2°-4°C, unlike in a green

house where the temperatures keep rising and must be checked regularly. The shed is made of treated steel pipes, wooden or bamboo posts. A rain shelter is cheaper to build as the roof is made of transparent polyethylene of about 200-micron thickness. This special material controls the temperature, relative humidity and ultraviolet (UV) rays light in the shelter.

Rain shelters have been developed by the World Vegetable Centre as a way of producing tomatoes when conditions are unfavourable due to excessive rain and flooding, strong winds and high temperatures, which significantly reduce yields. Shelters keep tomato leaves dry and prevent spores of late blight from germinating and infecting the plants.

The beds in the shelters are raised to minimize flooding and water logging and can provide a protected environment for the production of better quality crops over the rainy season. Plastic films are used to cover the sides of the shelter if it is too



A rain shelter can be opened to regulate temperature
Photo: World Vegetable Centre

windy or cold. Wind spreads fungal diseases in tomatoes. Farmers are therefore advised to reduce chances of disease outbreaks by spacing plants widely (as specified in the box) to reduce humidity between the plants, a condition that causes late season diseases such as early blight and septoria leaf spot, which affect the leaves, stems and fruit of tomatoes.

Natural pest control in tomatoes

Farmers can use natural methods to protect tomatoes from pests. Natural enemies of most pests can be found in all crops; they include predators, parasitoids and pathogens.

Predators: Predators feed on all stages of the pests i.e eggs, larvae, pupae, and adult pests. The main predators found in tomatoes are ladybird beetles, predatory bugs, hoverflies lacewings and predatory mites. The predators mainly feed on aphids, scales, thrips, moths and small caterpillars.

Parasitoids: Parasitoids are immature larvae of some insects that live on their hosts killing them in the process. Parasitic wasps are important natural enemies of leafminers and whiteflies. They attack eggs, and larvae of moths and butterflies. Others such as trichogramma feed on the eggs of moths, butterflies and fruitworms.

Pathogens: Pathogens include fungi, bacteria, and viruses. They attack pests naturally in crop fields. A few of them such as *Bacillus thuringiensis* (Bt) kills caterpillars and are commercially available in local agrovet shops. In tomatoes Bt controls fruitworms, it has the advantage of targeting only caterpillars and not the natural enemies that control other pests. After using Bt, farmers can produce their own homemade pesticides by collecting the dead larvae crushing and mixing them with water. The liquid can be sprayed onto the crop-the pathogen infects other pests in the crop and kills them.

NOTE: Farmers who use chemical pesticides often kill natural (beneficial) insects leading to an increase in pests in their crops. Using natural methods of pest control protects the beneficial insects and reduces pest population leading to increased yields and reduced costs of pest control.

Why every farmer should have a biogas unit

Biogas is a cheap source of energy that also reduces the destruction of trees while producing high quality organic fertilizer that farmers can use to improve crop yields.

Peter Kamau | Biogas is a gas produced when bacteria break down organic material such as cow dung, farm waste, garbage and even sewage material in the absence of oxygen. The gas is a mixture of methane (60%) and carbon dioxide (40%). Indeed methane is what makes natural gas, which is colourless, odourless and burns in a clean way that does not pollute the environment.

The methane gas produced when organic material decomposes is captured and used in cooking, heating and even lighting in homes. If methane is not captured through biogas production, a lot of it ends up in the atmosphere where it causes great damage to the ozone layer, a shield that protects the earth from harmful ultraviolet (UV) rays of the sun.

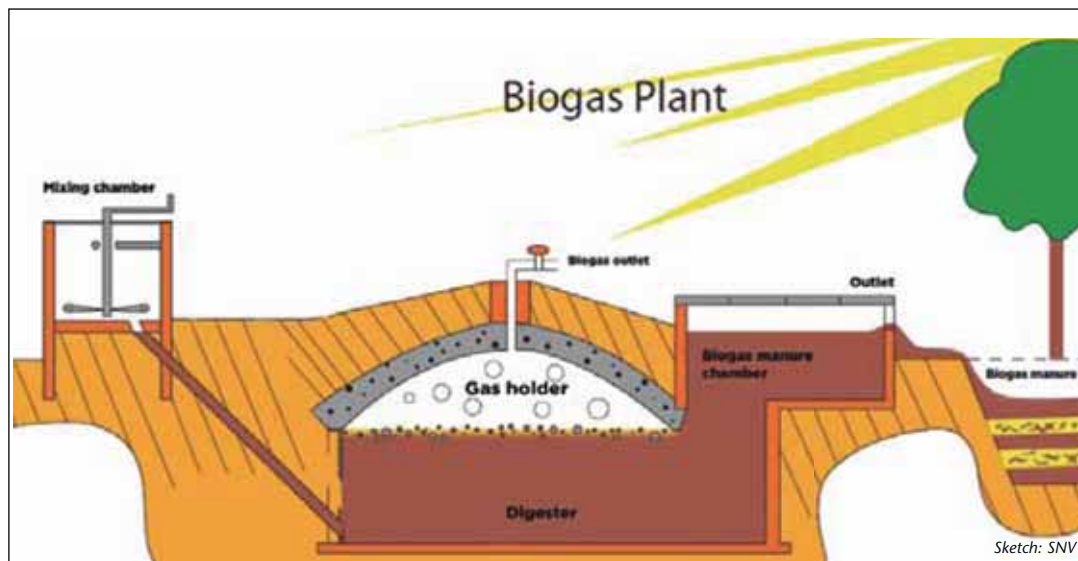
Protects the environment

The damage of the ozone layer is a major cause of global warming and climate change. Therefore by using farmyard manure in biogas production, farmers help to protect the environment.

A lot of farmyard manure produced in farms in Kenya often goes to waste. If the manure was used in the production of biogas, many homes in the country would have a good source of energy for cooking, which would in turn save a lot of trees that are cut down for firewood.

Benefits of biogas

Organic fertilizer: Biogas production has many benefits in organic farming. The main



product of biogas production is slurry, a high quality fertilizer that is higher in nutrients than compost or farmyard manure. The slurry (organic fertilizer or biogas manure) has great potential especially in organic farming systems where crop rotation is practised and nutrients recycled to improve agricultural productivity. Research has shown that the slurry can increase crop yields in organic farms by up to 30 per cent.

Clean energy: The majority of farmers in Kenya as in the rest of Africa uses firewood, charcoal or crop residue for cooking. In Kenya, more than 70 per cent of the population relies on wood fuel for their energy requirements. This has caused a lot of deforestation and even desertification across the country. The increase in population makes it unsustainable to continue with the use of wood fuel as a source of energy. Biogas is therefore the most suitable alternative source of energy that farmers in rural areas need to use to protect their environment and increase crop production.

Human health: The other reason why more people need to use

biogas is the health benefits they stand to gain; the firewood used in most rural households is responsible for air pollution and gases that damage the atmosphere. Indoor air pollution poses great danger to the health of women and young girls who perform most of the household chores such as cooking and even household sanitation.

How does biogas work?

A biogas production system uses a simple technology. The system consists of a large tank (also known as a digester). When organic matter such as cow dung and chicken waste is put into the digester, a number

of bacteria in the material to convert the organic waste into methane gas. This can only take place in an environment where there is no air (anaerobic digestion). Every day the farmer has to feed the bacteria with more cow dung, kitchen waste and other organic material for the digestion process and methane gas production to continue.

A family that has a 6 cubic metre biogas system can meet their daily cooking needs, use it for lighting and also for other purposes such as heating chicken brooders or incubators while saving money that they would have used to buy charcoal or even firewood.

Biogas has many advantages

- It is a renewable source of energy (the production of organic matter is continuous and cannot be exhausted as is the case for fossil fuels such as petroleum and other sources of energy).
- It cuts down the cost of importing petroleum products such as kerosene for lighting and energy for cooking.
- The slurry (manure) from biogas is odourless and does not attract flies.
- Biogas manure repels termites and other pests when used in the *shamba*.
- The slurry reduces weed growth by up to 50 per cent.
- Biogas manure has no harmful bacteria. The fermentation process in the digester kills organisms that cause plant diseases.
- Major plant nutrients such as nitrogen, phosphorus and

potassium are preserved during the fermentation process, making them readily available to the plants.

- When mixed with water at a ratio of 1:1, biogas manure can be applied directly to vegetables or fruit crops in the *shamba*.
- When little amounts of natural pesticides (plant extracts) are mixed with biogas manure and applied to crops, pests are eliminated.

How to preserve biogas manure

1. Spread it under shade on the flat surface and dry for 3-4 days depending on the weather.
2. Put the dried manure in bags or drums and store in a dry place for future use.
3. Farmers can also add biogas manure to other material while making compost to enrich further.



A fixed dome biogas system under construction

Photo: KENFAP

Choose the type of biogas system you need

The choice of biogas system depends on its cost, durability and ease of maintenance. Farmers can choose the system that best suits their pockets.

Peter Kamau | Any farmer with one to three dairy cows housed in a zero grazing unit can collect enough cow dung for biogas production. There must also be adequate water for mixing with animal waste, which is fed into the biogas digester to produce the gas. All biogas systems have three main components:

- A mixing chamber (or inlet)
- A digester
- Expulsion chamber (or outlet) where the by products or bio-slurry is ejected from the digester.

There are four main types of biogas systems that farmers can use in their farms for biogas production. Below, we give the details of each system to enable farmers choose the type they would prefer to instal:

a) The Fixed Dome Biogas system

The fixed dome biogas unit has an inlet or mixing chamber where cow dung and water are mixed at a ratio of 1:1. The mixture goes into a dome-shaped digester chamber with a fixed or rigid biogas holder at the top. When the mixture reaches the digester, the material is digested, producing biogas that is stored in the



biogas holder. When biogas production starts, the slurry or biogas manure is pushed into the expulsion chamber where it can be collected and used as organic fertilizer in the *shamba*.

Advantages

Since the unit is constructed underground, it is protected from physical damage. It also

saves space. The fixed dome digester is protected from low or high temperatures during the night and day- as a result, there is not much fluctuation in temperatures making the production of biogas constant. The construction of fixed dome biogas systems is labour intensive, which provides employment to many people. A well-constructed system has a lifespan of 30-50 years.

Due to the rising demand for the fixed dome biogas systems, the Kenya National Federation of Agricultural Producers (KENFAP), under the Kenya National Domestic Biogas Programme (KENDBIP) has been helping farmers in construction of Fixed Dome Biogas Systems across the country. The project pays a subsidy of Ksh 18,750 and the beneficiary farmers are expected to meet the remaining cost of construction (Ksh56,250). The standard size of Fixed Dome Biogas unit has a capacity of 6 cubic metres, which is enough for a farmer with 3 or 4 cows. So far, more than 10,000 Kenyan families have benefited from the programme, which ends this year with a possibility for extension next year.

b) The Floating Drum Biogas system

The floating drum biogas system consists of an underground digester and a moving gas holder. The gas holder floats directly above the digester or in a separate water tank. The average size of a floating drum is between 5-15 cubic metres which can produce adequate gas for use in small and medium size farms. A floating drum made of high density polyethylene material is durable but expensive.

Advantages

The system is simple to operate. The volume of gas produced



Feeding slurry into a floating drum biogas system



Biogas can be used for home lighting (above) and for cooking purposes (below)



is visible through the vertical movement of the gas drum. The gas pressure remains constant because it is maintained by weight of the gas drum.

Disadvantages

The steel and polyethylene material used in making the gas drum is expensive.

If steel is used, corrosion is a problem. Floating drum system has a short lifespan.

c) Plastic Tube Digester Biogas system

The Plastic Tube Digester system is made of an elastic (that can expand and contract) polyethylene tube made of two coats of 300 microns in thickness.

Advantages

The Plastic Tube Digester (PTD) is a cheap and simple method of producing biogas. The tubes are affordable and available locally. However they have a short lifespan of between 2-5 years. Another disadvantage is that the digesters have low gas pressure and are easily damaged by UV rays from the sun. They can also tear easily if people and animals step on them.

Cost

A standard size of PTD with a capacity of 10 to 16 cubic metres that can produce about 2.4 cubic metres of biogas costs Ksh 42,000 (Interested farmers can call Pioneer Technologies Tel. 0722 552 505).

"Biogas has solved my energy problems"

Lucy Wanjiru had for years relied on firewood cut from trees in her 2-acre farm in Muruka village in Kandara, Muranga County. Occasionally she would buy LPG gas to supplement her energy needs.

But last year she visited a neighbour who had installed a fixed dome biogas plant in her homestead. When she observed the way it was working, she was very impressed by the system. Her husband James Mwangi visited Ecosun Investments, a biogas contractor in Thika Town. He made a down payment and within 7 days, the biogas system had been installed in their homestead.

Saved trees

Since then, her energy problems have been solved. The system came complete with a two-burner cooker and gas metre that helps her monitor the gas levels as she cooks, "It has been a great relief to me and my family.

I no longer cut down my trees for firewood and I save a lot of money that I would have spent buying cooking gas. With my 8 cows I have more gas than I need," she says.



Crop yield tripled

Besides the biogas, Wanjiru says the biogas manure is better than the farmyard manure that she used before. "Our banana yields have tripled since we started using biogas manure, and they are also bigger in size. I no longer buy DAP and CAN chemical fertilizers," she adds. Her husband, James Mwangi, says that they intend to go into vegetable and fruit production using the high quality biogas manure.

Contact Ecosun Investments Tel 0724 394 699, Thika for biogas installation. KENFAP KENBIP Programme also has a list of certified biogas contractors throughout the country. To get the list, call 020 600 83 324, 020 6000355 0721 203 344, 0722 360 699. TOF can also email the list to interested farmers.

▶ Continued from page 2 **Preparing chicken feeds**

interfere with egg production and also shorten their lifespan. Grit (sand) should be provided to growers that are not on free range to aid in digestion.

Making a 70kg bag of layers' mash (18 weeks)

Layer feed should contain a Digestible Crude Protein (DCP) content of between 16-18 per cent. The feed should contain calcium for the formation of eggshells (Laying hens that do not get enough calcium will use the calcium stored in their own bone tissue to produce eggshells). Layer feed should be introduced at 18 weeks.

Ingredients

34kg of whole maize
12kg of Soya
8kg of fishmeal
10kg of maize bran, rice germ or wheat bran

Additives

175g premix
70g lysine
35g methionine
70g threonine
35g tryptophan
50g toxin binder



Kepha Maina (right) a poultry farmer buys feed ingredients from a supplier in Nakuru town. Maina makes his own poultry feeds

Formulating a 70kg 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, etc. As

the broilers grow, their energy requirements for the deposit of fat increase and 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:

Broiler starter chick mash (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

Preparing broiler finisher feed (70 kg)

10kg of whole maize
16.7kg of maize germ
13.3kg of wheat pollard
10 kg wheat bran
6 kg 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 Zincbacitrach

In the next issue we show farmers how to feed chickens for optimum production.

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Biogas systems

d) Flexigas Biogas system

Flexigas biogas system is one of the latest Plastic Tube Digesters in the market. The system uses a plastic tube digester housed in a greenhouse to protect it from the effect of the sun's ultra violet (UV) rays that damage the plastic. The greenhouse also reduces the risk of damage from animals or people. Dominic Wanjihia, the director of Biogas International, the company that markets the system says that unlike other biogas systems, the digester is very efficient in utilisation of waste material because the greenhouse helps to maintain the temperatures at between 27°C and 34°C, which speeds up the digestion and biogas production process. "1 cow is enough to produce 1 cubic metre of biogas in a day using the system," he says. A 5 cubic metre tube system costs Ksh 40,000 inclusive of the gas burner, piping and installation while a 7 cubic metre system inclusive of all the accessories and installation costs Ksh 55,000. The system has a lifespan of 10 years. The company is already devel-



The flexi gas biogas (above) system is housed in a greenhouse to protect it from the sun and prolong its lifespan(below)



oping biogas systems that heat chicken brooders and even run machinery such as chaff cutters on the farm. Farmers interested in the system can contact the company Biogas International on 0724 316 992.

Farmers can domesticate stingless bees

Following our articles on stingless bees, 12 farmers have called TOF requesting to know if it is possible for *icipi* to help them acquire stingless bees for stingless bee honey production. We would like to advise that it is possible to domesticate stingless bees in their own farms if they acquire the right management skills.

Stingless bees live in their natural habitats; these include forests, grasslands, termite hills and homesteads as long as they can get the right forage and environment. According to Dr. Kiatoko Nkoba of *icipi*'s Commercial Insect Programme (CIP), stingless bees can be domesticated anywhere in the tropics. For example *icipi* has been able to keep a number of stingless bees at the Duduville campus in Nairobi for experimental purposes. Although the bees are fed at the CIP laboratories, they still forage in the vegetation around the campus to collect pollen for honey production.

Although some of the species are difficult to domesticate, others such as *Meliponula ferruginea* (reddish brown) are cos-



Joshua Kimwele harvests stingless bee honey in Mwingi

mopolitan in nature and can be domesticated in many parts of the country. The CIP programme has stingless beekeepers in Mwingi and Kakamega forest who can train any farmer interested in stingless beekeeping. The farmers are trained on colony division, which means that they can assist others to divide a colony and transfer it anywhere in the country. Farmers can get in touch with the following two stingless beekeepers:

Mark Livaha 0703 693 245 (Kakamega forest), Joshua Kimwele 0713 872 014.

Organic farming a healthy way of food production

Isn't organic farming just an old-fashioned way of doing things?

Organic farming may appear as an old-fashioned production system within the local context. A closer examination however reveals a deeply scientific based production system based on an appreciation of natural systems and processes. To appreciate the beauty of organic farming in the modern highly intensive agriculture, one must be converted both in mind, soul and heart to appreciate the role of organic farming. An increased individual awareness and consciousness on what one eats and how the food is produced, brings a general appreciation of organic agriculture.

Organic produce is higher in quality

Is organic produce better than conventional produce?

Work done in Egypt by Sekem Group, a leading organic exporter indicates that organic food is of higher quality than conventional food. Organic food has on average a higher nutritional value, containing especially vitamins C, magnesium, iron and phosphorous. Also organic crops have more phytonutrients, which occur naturally in plants and protect them from disease and pests.

No harmful substances

Organic food contains fewer food additives. Certain additives and food ingredients have been linked to certain disorders like heart diseases, osteoporosis, asthma, and neurological disorders. These are prohibited in organic processing. Only around 30 additives are permitted in organic produce (and only where most necessary) compared to more than 500 in conventionally produced foods.

Organic foods contain fewer nitrates (common in chemical fertilizers). Nitrates can be converted into more harmful substances that have been linked to cancer in animals. Mineral fertilization practices are known to result in much higher nitrate levels in non-organic vegetables.

Organic standards ensure food is safe

Does organic food carry greater risks of food poisoning?

The likelihood of food poisoning through organic food is highly eliminated or not possible at all.



Photo: TOF

The organic production process is very rigorous and is based on total fulfilment of specific standards. The standards stipulate in detail what should be done and what should not be done in the production, processing, preservation and packaging of organic products. The standards indicate what food additives to use, preservatives and packaging materials. The organic farmer is required to demonstrate compliance with each step. A third party not involved with the either the organic operator or the certification body that sets the standards inspects the compliance system to gain acceptance. Such due diligence in the system will eliminate any contamination of the system.

KOAN coordinates organic agriculture

Is there an organic "watchdog" in Kenya?

The Kenya Organic Agriculture Network (KOAN) is the Organic watchdog in Kenya. KOAN is the National coordinating body for the organic agriculture in Kenya. KOAN's mandate is to coordinate, facilitate and provide leadership and profes-

sional advisory services to all members and stakeholders in the areas of production, technical training, marketing, certification, lobbying, advocacy and the entire organic agriculture value chain. It seeks to promote the organic agriculture movement in Kenya to evolve and become a highly beneficial and integrated industry with direct impacts on the environment, poverty reduction, employment and wealth creation.

Do not mix organic and conventional produce

Do I have to store organic food differently?

The organic standards stipulate in detail how to store organic products or food. Organic food should be stored separately from other non-organic food to avoid contamination and maintain the integrity of organic production, either in the store, during transportation and processing. This is especially important where parallel production (this refers to where both organic and non organic production operations are taking place at the same time) is taking place. In such a

situation, organic produce has to be kept separately.

Organic food clearly labelled

There has to be a distinction between the organic and non-organic produce. It is important to refer to the standard for the stipulated distance. There must be a clear sign showing where the organic produce corner is. If the produce is stored in some form of a package (sack or container), the package must also bear the words "organic product."

Process organic food separately

A wire mesh can be used to show the separation between the different products. An organic product should not be transported with a non-organic product. In organic language this is referred to as 'separation in space'. When processing, organic produce is either processed before the conventional produce. If organic food has to be processed after processing the non-organic food, then the machinery should be washed clean before the organic processing is done. This is known as 'separation in terms of time'.

No GMO material

Can organic food contain genetically modified (GM) elements?

Organic standards do not allow the presence of Genetically Modified Organisms (GMOs) in production, processing and preservation of organic food. All GMO material or elements are prohibited in organic agriculture.

No chemicals

Can organic farmers use pesticides and other chemicals?

Organic standards do not allow the use of synthetic fertilizers, pesticides, herbicides in crop and livestock production. In case an organic farmer for one reason or another 'breaks' the rules or circumstances calls for the use of the chemicals (such as in major disease or pests outbreak because no other control mechanism was available), then the farmer is required to withdraw the animals from the organic certification scheme for a stipulated period of time.

The different organic certification schemes have clear rules governing what chemicals to use and what not to use. TOF



Photo: TOF

Women group members harvest indigeneous organic vegetables

Good storage practices that protect cereals from pest damage

Farmers are currently harvesting maize across the country. Much of the harvest is likely to go waste due to poor storage methods. Therefore farmers need to know how they can protect their harvest. Below we provide some measure the farmers can put in place to preserve their cereals without using chemicals.

JBM Kangethe | Farmers can take various measures to protect their grain from being destroyed by pests. One way is to ensure both the store and grain are clean and dry. Other important ways are:

Use the right varieties and harvest early: Plant early maturing maize varieties in dry areas and late maturing types in areas with good supply of rainfall. This ensures that harvesting is done during the dry season. Crops should be harvested early to prevent infestation of the grain in the field.

Good site selection: Build your grain store in a well-drained ground so that the building does not get flooded by runoff water during heavy rains or take in too much moisture from the ground.

Sorting grains: Farmers can reduce losses if they store clean grain. Insects can be removed by hand when present. It is an accurate method but time consuming. The store should be clean as insects are always there together with moulds and spores. Take care of broken grains, pieces of straw and dirt as they increase chances of grain insect damage.

Unthreshed products: Husks or pods offer some protection against insect attack. Shelling maize and other grains reduces pest infestation.

Control the moisture content: The moisture content of the kernels inside the unhusked cob should not be high when put into the storage store. If the unhusked cobs are too moist, they will get mould quickly. The husks provide favourable conditions for mould growth. Dry the grain well before storing.



Photo: TOF
Most farmers incur huge losses due to lack of proper maize storage

Maintain hygiene: To prevent damage to stored products, keep the stores and the surrounding areas clean. Before storing the grain, check for leaks, splits, cracks and repair them. Also ensure that the floor and the walls are easy to clean as insects hide in small holes found in walls. Do not mix the previous harvest with the new harvest.

Proper drying of grain: This prevents germination of the seed, growth of bacteria and mould. Grain that is not properly dried has a high risk of developing mycotoxins like aflatoxins which are dangerous to humans and animals. The moisture condition of the store is influenced by the relative humidity of the air outside.

Regulation of temperature: A big difference between day and night temperatures can result in dew formation over the stored grain every morning, making the grain wet. The grain becomes caked and mouldy. Minimize the temperature fluctuation through shading and insulation of the grain store.

Insects multiply faster in high temperatures. Hot spots develop inside the grain encouraging moulds and insect activity. This encourages mould growth.

The use of air tight storage: Air tight storage containers include oil drums, plastic bags, gourds and woven baskets lined up with clay underground pits. Air tight containers limit the amount of air available to insects, which die due to lack of oxygen.

Use of non-chemical control methods: There are other methods that can be used to

control pests in grain without use of chemicals.

Use of local plant extracts: There are many plant extracts that can be used to control insect pests in stored grains. Farmers can make use of local leaves and twigs of neem or African marigold (have insecticidal properties), which can control insect pests when



A metal silo for grain storage

mixed with grain.

Minerals: Fine sand, lime, charcoal and ash have been used to protect stored grain from insect damage. The minerals are mixed with the threshed grain. In Kenya, some farmers mix wood ash with grain to preserve it. Every four months the sacks should be opened and new ash added as more ash sinks to the bottom of the sack. Maize and beans can be stored this way for a period of up to five years. (Read TOF No. 101, October 2013 for more information on grain storage)



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