



Edible insects provide a good source of protein, vitamins and amino acids for humans and animals. ICIPE is doing research on how to raise such insects in Africa to help farmers cope with the increasing demand for food and feed for their animals.

ICIPE to promote use of insects in feed and food

TOF - ICIPE has come up with a new initiative to develop insect-based animal feeds for the fish and poultry industry in Kenya and Uganda. The project, INSEED will use insects as a protein substitute in the manufacture of animal feeds due to shortage and increasing cost of producing plant protein and fishmeal.

The research on the use of insects to supplement other protein sources focuses on insects species in the African

continent, which are edible and can be cost effectively and sustainably domesticated and multiplied to provide a cheap source of proteins that is increasingly becoming insufficient to meet the increasing demand of the population.

During an inception workshop held in Nairobi last month, ICIPE Director General Dr. Segenet Kelemu revealed that the project plans to develop an easy-to-adapt, and cost-effective insect rearing, harvesting and post harvest techniques among small-scale poultry and fish farmers in East Africa to reduce the cost of buying animal feeds.



Dr. Segenet Kelemu, ICIPE Director General.

omena, which is the major source of fishmeal are reducing due to overfishing.

Insects have cheap and higher protein content

ICIPE, which has a wide experience in insect science is collaborating in this initiative with the University of Nairobi, Egerton University and Makerere University in Uganda. The project is also working with research institutions and feed manufacturers in Uganda, to conduct research and evaluate the use of insect proteins in feed manufacture and its use by poultry and fish farmers in the future.

The project coordinator, Dr. Komi Fiaboe, said the project will be undertaken in 12 urban sites in Kenya and Uganda. The project that will cost Ksh 180 million is funded by Australian Centre for International Agricultural Research (ACIAR) and International Development Research Centre (IDRC) of Canada.

ICIPE to head research work

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Ingredients for animal and fish feed such as soya beans, fish oil and seed cakes are becoming expensive due to lack of land for production while fish such as

Dear farmers,

Farmers start the year 2015 with a lot of uncertainty due to the low prices offered for crops such as maize, tea, sugar and even potatoes, which they rely on for food and income. However, the support provided by the government and other stakeholders to the farming community such as subsidies to support crop production, crop insurance to cushion farmers in the event of crop failure and affordable credit that enables farmers to earn more from processed farm products, has helped tremendously.

This however does not mean that the government should do everything for the farmer. If only the right policies that create a conducive environment are put in place, farmers will not only increase production, but will also be able to earn more from their produce. This will also enable the government to increase revenue to support other sectors of the economy.

Through the continued support of Biovision Foundation, over 250,000 farmers benefited from over 384,000 copies of magazines which were printed and distributed in 2014. As these are not enough for every farmer who needs information, TOF calls on other partners such as County governments to support some copies for their communities.

Farmers need continuous training and information materials to enable them start new enterprises, improve their crop and livestock yields and make profit from various ventures. They also need access to clean water, good roads, electricity, affordable farm input and functional markets.

As we start the New Year, we appeal to the government and other partners to continue addressing the problems facing the agricultural sector. There are very good policies that have been developed to transform the sector, which contributes significantly to the economy. But the challenge remains their full implementation, which needs strong will by government and key institutions.

We look forward to a fruitful time and wish all our readers a Happy New Year 2015!

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The best way to grow orange-fleshed sweet potatoes

In the last issue of TOF, we gave farmers, the benefits of growing orange-fleshed sweet potatoes, in this issue, we show how to grow and manage this valuable crop for increased production and income.

Josephat Mulindo | The potential for production of orange-fleshed sweet potatoes in Kenya stands at 4.8 tonnes per acre. However, farmers get only 1.12 per acre. Though many causes are to blame for low productivity, unavailability of quality planting material is the most important. To reap the benefits associated with orange-fleshed sweet potatoes, production of clean quality planting material is important. A lot of vines need to be used per unit of land in production of orange-fleshed sweet potatoes. You require about 15 bags of cuttings to plant 1 acre of land.

Kenya Agricultural and Livestock Research Organisation or KALRO [formerly KARI] uses a three-tier system of orange-fleshed sweet potato seed production system; the primary, secondary and tertiary seed production levels. Primary seed multiplication site is located on-station where closer management of the seed is done. Material from the primary seed multiplication site is used to establish secondary seed multiplication sites managed by Non-Governmental Organizations, Community Based Organizations and Ministry of Agriculture staff. Usually, a selected place such as Agricultural Training Centres are used as secondary multiplication sites. Material from secondary multiplication sites are used to setup tertiary seed multiplication sites. These are the commercial seed multiplication sites managed by individual farmers with assistance from extension staff. When you engage in orange-fleshed sweet potato seed multiplication, you are operating at a higher production level.



Orange-fleshed sweet potatoes grow quickly and yield upto 20 tonnes per hectare. They are also resistant to major pests and diseases.

Steps in sweet potato seed multiplication

Sweet potato vines, or seed, or cuttings, or slips can be multiplied using conventional (results in a conversion ratio of 1:10, meaning 1 vine gives 10 other vines) or rapid multiplication techniques (this results in a conversion ratio of 1:80, meaning 1 vine gives 80 other vines). The production principles are the same. However, in the rapid multiplication procedure, more vines are realized within a shorter period of time.

Site selection: Select a site close to a water source. Avoid land, which was previously under sweet potato. Distance between the site and the nearest old sweet potato field should be at least 100m. Fence off the site if

damage by animals is anticipated.

Land preparation: Plough land and harrow to a fine tilth and remove all trash. In the conventional seed multiplication procedure, leave the plot flat. In rapid multiplication procedure, raise beds of about 1.5m width and a length based on amount of multiplication material and land available. The area between adjacent beds should be 50cm wide. Use the soil between adjacent beds to raise the beds. The height of beds should be 10-30cm depending on the soil. In sandy soils, it is recommended to plough in manure at a rate of one wheelbarrow load per square metre of bed space or apply farmyard manure at the rate of 2.5kg per square metre before planting.



Preparation of vine cuttings: Select vines from a secondary multiplication site. They should be from plants that are healthy and about 2 to 3 months old. Cut up vines into pieces of two or three nodes. A leaf should be kept on each cutting and the tip maintained on each vine.

Planting: If the soils are dry, water the ground first. In the conventional seed multiplication procedure, the vines are inserted at an angle in the soil at a spacing of 50cm between rows and 30cm from plant to plant cutting. In the rapid multiplication method, the vines are planted on the raised beds. The spacing between rows is 10-20cm and from one cutting to the next within the row is 10cm. The vines should be inserted at an angle too. In both methods, leave one node with the leaf outside the soil.

Field management: Ensure moist soil conditions are maintained at all times (but avoid waterlogging) by irrigation if it is not raining. Ensure weed-free conditions in the first 4-5 weeks by manually removing the weeds. Diseased or infected plants must be removed and burnt away from the field.

Harvesting of vines: This should be done after 2 to 3 months from the planting day. Cut the main stem pieces (25cm long) 5cm above the soil level. Two to three sets of cuttings can be harvested from rationed fields. Each harvest should be followed by an extra application of Farm Yard Manure (FYM).

Vine storage: Planting of sweet potato vines should be done preferably soon after cutting. If not, the vines should be tied in bundles with their bases covered with a wet cloth and kept in a cool area under a shade. Vines can get spoilt if kept for more than two weeks.

Farmers interested in planting material for Orange Fleshy Sweet Potato call 0736 231 949. Farmers from Western region of Kenya can also visit KALRO-Kakamega.

The Organic Farmer is an independent magazine produced monthly for the East African farming community.



icipe

It promotes organic farming and supports discussions on all aspects of sustainable development. The articles in the *The Organic Farmer* do not necessarily reflect the views of ICIPE.

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How to make your own pig feed on the farm

A bag of pig feed costs more than Ksh 3,000 in the market. Feeds take up to 80 per cent of pig production costs. Farmers can make their own feeds and sell surplus feed to other farmers.

Peter Kamau | Pig rearing is once again becoming popular due to increased pork consumption in most of Kenya's urban areas. More farmers are venturing into the business to diversify their farming activities and take advantage of the good prices offered by processing companies due to the shortage of pigs in the country. However, feeding of pigs is a major challenge for most of the pig farmers.

Pig feeds are expensive, taking up to 80 per cent of a farmer's production costs. A bag of pig feed now sells at an average of Ksh 3400. Pig feed should be of high quality to ensure the pigs grow to the desired weight for the market. Due to the huge demand for information on pig feeding TOF provides farmers with information they would require on pig feeding and give more feed formulations that can help them cut the cost of pig production:

Piglets

Young pigs do not take much in terms of solid feed because they get all their nutritional needs from their mothers' milk.



To ensure piglets get enough milk from suckling during the early stages of growth, farmers should give the sows adequate and balanced feed to ensure they produce adequate milk for the piglets. At three weeks after farrowing (birth), the farmer should castrate all male piglets and start to train them to eat solid feeds. Suckling piglets should also have their sharp teeth clipped, three days after farrowing to prevent them causing injury to their mother during suckling.

Assuming a farmer has 10 piglets to feed, they can isolate a creep area (housing for young ones) where their mother cannot



If well fed pigs attain desired weight quickly. Farmers can prepare their own feeds to reduce cost of production.

reach and put in 50g of feed per piglet per day. Observe the feeding daily; if you see the feed reducing, add another 50g for each into their feeding trough to make it 1kg. At 5 weeks (35 to 42 days) add another 50g per piglet to make it 150g. The piglets should always have access to their mother in case they want to suckle. They should also have access to clean water at all times.

Weaners

At 6 weeks, each piglet should be getting 200g of feed per week. If they finish the feed, keep on adding an extra 50g per piglet daily. During the feeding process, the farmer should weigh the pigs weekly (a healthy pig at this stage should add at least 900g per day). If there is an increase in weight at this rate, it means that the pigs are growing well. Weaners should be given dry feed at all times to prevent scouring or diarrhoea. Give adequate clean water at all times.

Porkers

At 14 weeks, the pigs will require additional feed; the farmer can give 1.4kg of extra feed per pig per day. In addition, the farmer should continue giving the 50g of feed as they were doing before. Divide the pig feed into three equal portions: A wet ration in the morning at 7 am (feed mixed with water), a dry feed at noon (feed with no water) and a final wet feed (feed mixed with water) at 4 pm.

A well-fed porker pig should add an extra 300g of weight per day (weigh them regularly and record their weight to monitor their growth).

Baconers

At 22 weeks, the pigs (now called baconers) require a higher feed ration as they are about to

attain the market liveweight of between 80-90kg. At this stage the farmer should give them 2.5 - 2.75kg of feed per pig per day. From 23 weeks, the feed should be increased to 3kg (1kg of wet feed in the morning, 1kg of dry feed at noon and 1kg of wet feed at 4pm). If well managed at this stage pigs can attain up to 100kg in 5 months.

At this stage the farmers can now do selection of the pigs to determine those that can go to the abattoir for slaughter, young female pigs (gilts) can be served and sold to interested farmers while others can be retained for breeding as sows. The boars (male pigs) can also be sold or retained for breeding purposes (be careful to ensure the pig does not serve its daughters or related pigs to avoid inbreeding). A well-managed baconer should add an extra 900g to 1000g (1 kg) per day.

Sows

Sows need special attention in feeding. A sow's yield can be as high as 16-17 litres of milk per day. To produce this amount of milk, a sow has to be well fed, both for body maintenance and milk production. A sow with piglets that are suckling requires 6 kilogrammes of feed every day or an amount of feed that is

equal to 25 % of her body weight.

The feeding should be divided into 3 rations (2kg of wet feed in the morning, 2kg of dry feed at noon and 2kg of wet feed at 4pm). Like other pigs, sows should be given adequate and clean water at all times.

Gilts

A female pig that is not yet served (gilts) should be given at least 3kg of feed per day. The farmer can supplement this with any other available feed in addition to this ration to keep them in good shape in terms of health and reproduction.

Boars

Male pigs (boars) should not be given a lot of feed. If given more feed, they tend to put more weight and this compromises their fertility. A boar should be given 3 to 4 kg of feed per day. Some farmers give less or even starve them in order to reduce fattening. Give them clean water at all times.

Pig feed formulation

Feed formulation is not easy especially for small-scale farmers due to lack of raw materials and the technical knowledge on how to prepare their own feeds. For farmers keeping a few pigs, we would advise that they buy feeds from reputable companies who are known to make quality feeds. However, such farmers can reduce their feed costs considerably if they can formulate supplementary feeds like sweet potato vines.

However, for farmers who want to keep many pigs, say, between 500 to 1000 pigs, it makes economic sense to make their own feeds as long as they can get the right raw materials for feed formulation. Below we give farmers two methods they can use to make pig feed in order to reduce their feed costs:

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Know the right type of chickens to rear for profit

Many farmers rush to buy new chicken breeds coming into the market without knowing their qualities only to end up with regrets and losses. Below are various breeds in the market and their qualities to enable farmers make informed choices.

Peter Kamau | Poultry keeping is now one of the most popular agribusiness enterprises that many people in Kenya want to go into. However many farmers rush into it without the most basic information on how they can do it the right way, only ending up making serious mistakes that lead to huge losses. The quail fiasco two years ago no doubt left many farmers with empty pockets when they made huge investments in quail rearing leading to glut in the market and a fall in prices.

Many farmers do not seem to have learnt a lesson. Currently there are a lot of rumours, and misguided exaggerations about new chicken breeds that are said to do much better than local indigenous breeds in production, enticing farmers to spend a lot of their money in search of the breeds which they only learnt about in newspaper articles and adverts. In this issue, we would like to shed light on the breeds available in the country and their qualities so that farmers can make informed decisions on the best type of breed they can keep to get good returns by making the best choice from the various breeds in the market:

Improved KARI indigenous chickens

The KARI Improved Indigenous chicken breed is one of the most popular breeds in the country at the moment. The chickens can produce more eggs and meat compared to local indigenous chickens. The breed can also do well in areas with harsh climatic conditions such as the arid and semi-arid regions in Northern Kenya. The chickens can be reared in free-range conditions especially for farmers who want



to produce chickens organically. The chickens require very little supplementary feeding when put under free range.

When properly managed, the KARI Improved hens can lay between 220 to 280 eggs a year. A hen from this breed can attain 1.5kg in 5 months. A cock weighs 2kg over the same period if they are well-fed. The breed has a quiet temperament, excellent feathering and is able to adapt fast to the conditions under which it is kept compared to other breeds.

At the moment there is a huge demand for KARI Improved chickens across the country such that KARI is unable to supply farmers who need this breed. But efforts are being made to train farmers who can breed the chickens and sell to other farmers.

Kenbro chickens

The Kenbro breed is a dual-purpose (meant for eggs and



Kenbro

meat production) breed which was specifically developed to serve the western Kenya market that has a high demand for chickens. It was introduced into the country about a decade ago by Kenchic Ltd to meet the demand for farmers who would prefer a breed that requires less intensive management than hybrid chickens.

Kenbro is more resistant to diseases compared to hybrid birds. It can survive on free range. The bird matures faster with proper feeding and starts laying eggs at 5 months. It can

attain up to 4kg with proper feeding. Kenchic produces more than 20,000 birds from this breed in a week but some farmers breed the birds and sell to others, but the quality of birds produced by such farmers is low because it is only the company that has the parent stock that can produce high quality birds. Kenbro is a heavy feeder and this is one reason it is able to put more weight than other indigenous chickens.

Kuroiler chickens

The Kuroiler is a dual-purpose breed that was introduced in Uganda in the year 2009 from Keggs Farms, India. Like Kenbro, Kuroiler can survive on free range, but they need to feed continuously, a reason why they put on weight faster than do indigenous chickens; at 4 months Kuroiler chickens can weigh up to 3kg and 4kg in 6 months. Farmers rearing this breed say it has tastier meat compared to indigenous chickens; their meat is also soft and tender. Its eggs are larger than those of indigenous chickens. A Kuroiler hen can lay between 140-150 eggs in a year. However Kuroiler's quality goes down when they are crossed with indigenous chickens.

Farmers keeping them say Kuroiler birds are scavengers that can live on household food leftovers and related agricultural waste. Like local indigenous chickens, Kuroiler chickens are resistant to most diseases although farmers are advised to vaccinate them in the same way they do other chickens.



Kuroiler

However, one big disadvantage with Kuroiler chickens is that the hens cannot sit on their eggs to hatch. Many farmers discover this fact too late. Kuroiler chickens are therefore suitable only for farmers with incubators. Small-scale farmers in the rural areas who rely on hens to hatch chicks can only order fresh stock of chicks every time they want new stock for breeding. Indeed poultry farmers in rural areas in Uganda are already raising questions on the sustainability of this breed among resource poor communities who cannot manage to buy new stocks every time they want to rear new batches of birds.

"Unless the government sets up hatcheries at the village level, small-scale farmers will be exposed to businessmen with hatcheries, who will increase chicks prices or even charge them more for hatchery services," says Henry Kijanji, a poultry farmer in Mafubira Sub-county, Jinja, Uganda in a telephone interview.

Farmers interested in Kuroiler chicks can contact Joseph Makumi on 0723 687 400, Gilgil.

Rainbow Rooster chickens

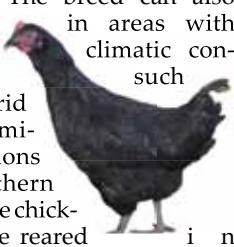
Like the Kuroiler breed, Rainbow Rooster is dual purpose breed meaning that farmers can keep it for both meat and eggs, multi-coloured dual purpose, low input bird which can be put on



Rainbow Rooster

free range. However it is a heavy feeder, which is able to put on weight fast attaining 3kg to 4kg in 6 months. However, like the Kuroiler breed, the Rainbow Rooster hen cannot sit on the eggs to hatch; so farmers who want to keep this breed must have an incubator for hatching. The breed is therefore not suitable for small-scale farmers in the rural areas who cannot be able to buy incubators mainly for lack of electricity supply.

For interested commercial farmers, the Rainbow Rooster is distributed by Kukuchic Ltd Tel 0727 991 303, 0733 840 288 Eldoret.



Proper management improves poultry production

To be successful in rearing indigenous chicken farmers have to exercise a high level of management in housing, feeding and disease control.

Peter Kamau | Many poultry farmers assume that indigenous chickens can fend on their own especially when put on free range. But this is not the case. Chickens require thorough care in feeding, housing, disease control and even protection from predators. Below we look at each of these requirements once more to remind farmers of their importance:

Housing: Housing is a challenge to many farmers who rear chickens. Poor housing exposes chickens to various risks. A good chicken house should protect the chickens from the cold and wind. It should keep away predators such as the mongoose, dogs, wild cats or snakes. The house should be spacious enough to reduce congestion, which causes stress in chickens and even cannibalism and pecking. Ideally, each chicken requires at least 2 square feet of space.



Good housing is important in poultry management for both hybrid or indigenous chickens.

If space allows, ensure that you leave an open area where the chickens can be released in the evenings (this is called a chicken run) where they can run, pick insects and eat vegetative matter such as grasses and plant vegetables such as *sukumawiki*. These can be picked and hang in the chicken house for them to eat throughout the day after their normal feed.

Direction of chicken house

A chicken house should be constructed facing East to West—this reduces wind or draft that can affect chickens. Make laying nests, which have a darker side where the layers can hide their hind side to prevent exposure to other birds, which can prick and injure them when laying eggs. Spread wood chippings (not saw dust), on the floor of the chicken house and replace them every 4 to 5 days depending on the state of the beddings. Wet beddings can lead to disease outbreaks. Always spray disinfectants every week if possible to keep away any disease pathogens from the house.

Feeding: Feeding is very important if a farmer has to get good returns from their chickens. Chickens can be fed twice a day, in the morning and evening. A laying hen for example requires 122g of feed every day for good production of eggs. Similarly a chick requires at least 30g of feed per day to grow well. A farmer should multiply this ration with the number of birds they keep to determine how much feed they can give per day. Chickens should be provided with clean water at all times. The water helps to transport feed to all parts of the body and to maintain their health. Farmers can also add 2 or 3 teaspoonfuls of EM1 and Aloe Vera solution in the water to improve digestion and provide immunity from diseases.

Disease control: Chickens, whether indigenous or hybrid, are very prone to diseases. For a serious poultry farmer protec-

tion is always the first line of defence against diseases. Ensure that all your chickens are vaccinated against the most common diseases such as fowl pox, Newcastle, Mareks and coccidiosis diseases. Diseases make chickens weak and retard their growth, feed conversion, egg production and eventually reduce the good returns that farmers desire. The poultry farmer should always observe their birds carefully, several times a day for signs of sickness in their flock. Sick birds usually stand half asleep at the corner of the house, with ruffled feathers, heads hidden into their wings and with drooping tails. Isolate any sick bird to prevent the spread of the disease to other birds. Consult a vet as soon as possible to treat the birds on time and avoid loss.



Vaccination against the following diseases is recommended

Type of vaccination	Methods of administration	Schedule
Mareks disease	Injection	Day old
Newcastle disease	Intra nasal (drop)	At 2 or 3 weeks
	In the eye (drop)	At 18 weeks and at 6 months
	Drinking water	Same
Fowl typhoid	In drinking water	
	Intramuscular	At 8 weeks and at 6 months
Fowl pox	Wing web method	At 18 weeks



Intra-ocular (eye drops) vaccination.

Any new birds should be isolated from the rest and observed for any signs of disease before they are mixed with other birds. Spray or dust your birds with acaricides to prevent pests and parasites at all times to ensure the birds are healthy and productive.

Farmer spreads the benefits of FCP training

Despite advancing age, Simon Wamugunda has used the knowledge acquired through FCP training to improve his earnings and that of other farmers in his village.

Peter Murage | Simon Wamugunda, a 67 year-old small-scale farmer from Kianjugu village experienced many challenges as he tried to improve production on his 5.5-acre farm in Kianjugu village, in Kangai location in Kirinyaga County. He had to get water for both domestic and irrigation 5 kilometres away. His earnings from tomatoes, tree and fruit seedlings was inadequate to support his family in terms of paying fees, medical bills and other household needs.

Intervention

Two years ago, Wamugunda and members of Kianjugu Men's Group learnt about Biovision



Simon Wamugunda at work in his shamba.

Farmer Communication Programme (FCP) from a friend and decided to grab the opportunity for his group to receive training. The group identified a number of pressing issues, which needed urgent attention to improve their farming, one of them was diversification of their agricultural enterprises, which could improve food insecurity an income for their members. After the training the Germany Embassy and the Equity Bank,

funded the Mitoo-ini water irrigation project that provided them with water for both domestic use and irrigation.

Improved earnings from diversification

Wamugunda took the opportunity to utilize the skills learnt from FCP on diversification and started a number of enterprises including sweet potato (Bungoma variety), kales, bananas, mangoes, soya beans,

French beans, rearing indigenous chickens, fruit and tree seedling nursery. The organic farming training has enabled him to avoid the risk of crop failure and also boosted soil fertility on his farm. Before, Wamugunda used to earn Ksh 50,000 in a year but he now makes Ksh 150,000 to Ksh 200,000 in a year due to the use of improved farming methods and crop diversification.

Cut cost of production

He religiously applies the farming tips he acquired through FCP training. He keeps to the right cropping cycles every season, and sustainable agriculture, which has cut down his cost of production and inputs. His income and social status in the community has drastically improved due to the diversification and use of sustainable farming methods.

Other farmers in Kianjugu have learnt a lot from him and members of his group. Most of the farmers have started crop diversification and embraced organic farming methods. Simon has become a farmer trainer with many farmers from the village trooping to his farm to get tips on various areas in sustainable agriculture and organic farming.

Simon Wamugunda can be reached on 0714 428 873.

continued from page 3

Various pig feed formulas

Feed formula 1

Making silage from sweet potato vines

Sweet potato vines are very nutritious pig feed if well prepared and preserved. Here is how to prepare them:

- Cut 60-100kg of sweet potato vines and spread them dry in the sun for about 30 minutes.
- Chop the vines into tiny pieces and mix them with 10 kg of maize germ or pig growers mash.
- Sprinkle $\frac{1}{2}$ kg of mineral salt and mix thoroughly.
- Put the mixture into an airtight 250-litre plastic tank. Compress the vines firmly to remove any air spaces as you do when preparing silage.
- Add some little EM1 solution to improve the quality of the silage.
- Cover the tank airtight. Let it stay for 14 days (two weeks).
- Open the tank to check if the silage is ready- if the silage has a sweet smell and has turned yellow in colour, then it is ready feeding.
- You can feed the sweet potato silage to pigs from four months of age, sows, gilts and boars at any time before or after feeding their usual daily rations.



Pig farmers who incorporate sweet potato silage into the pig diet can cut their feed costs by up to 30 per cent. In addition, the sweet potato tubers can be eaten or sold in the market, a kilogramme of sweet potato tuber retails for between Ksh 60 to Ksh 80.

Other supplementary feeds suitable for pigs include sukumawiki (kales), vegetables, cabbages, lucerne, amaranth (terere), avocados, pawpaws or even bananas. Hotel leftovers (also called sweat) can be given to pigs but farmers must be very careful because food leftovers may be contaminated; the food can be reboiled (cooked again) to ensure all disease-causing organisms are destroyed before the leftover are given to pigs.

Feed formula 2

48kg of maize germ
12kg of pollard
12.5kg of soya cake
7.5kg of fishmeal
0.75kg of lime
1kg of bonemeal
125g of salt
150g of lysine
150g of feed premix
300g of zinc

This pig feed ration has a Digestible Crude Protein (DCP) content of 22.3% and can be given to pigs at all stages of growth. Put all the ingredients in a feed mixer and mix thoroughly to ensure they are evenly distributed. In Nakuru, Nairobi and Thika, there are many feed raw material suppliers.

Feed premix, lysine, bone-meal and lime are also available from selected agrovet shops in most towns.

Feed formula 3

How to prepare 7 bags of pig feed

60kg of whole maize
210kg of maize germ
140kg of pollard
50kg of soya cake
27kg of fishmeal (or first grade

omena)

4kg of bone meal

7kg of lime

1kg of salt

1kg of Premix (grower or sow and weaner)

1kg of lysine

2kg of zinc

Important: Farmers should use clean maize, not rotten one (maozo). If using omena, the quality should be high. The above formular has the following percentages of nutrients:

Protein- 16.83%

Fat - 5.05%

Fibre-4.43%

Lysine-0.89%.

Major raw material suppliers are:

1. Tarime Suppliers Tel. 0729 099 550, Nairobi.

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

Why passion fruit is prone to diseases

The passion fruit in our farm has wilted and dried up after being put on wooden structures for support and easy picking of fruits. Why is it happening yet the fruit has been flourishing when left to grow on its own amidst plants and weeds?

Passion fruits are prone to many fungal and bacterial diseases, which many farmers are unable to control. One reason for the spread of these diseases is that farmers do not practise crop rotation; they plant passion



fruit in the same field every year, leading to a build up of diseases and even pests. Some passion fruits may escape infection when growing with other plants. One explanation for this is that bacteria, viruses and even pests cannot survive near some plants because they release certain chemicals that kill the disease-causing organisms. Any passion fruit plants growing among these wild plants get natural protection and are therefore not affected by diseases and pests.

Organic fertilizer is suitable for sukumawiki

In the absence of manure to plant sukumawiki, what is the alternative that may be combined with DAP? Do you recommend the use of black Majik® fertilizer? Washikanda, 0736 156 720

Black Majik® is a soil conditioner and not a fertilizer. There are organic fertilizers available in the market or in natural form in your shamba, which can be used to grow *sukumawiki* and other crops without necessarily resorting to chemical fertilizers. In organic farming, we would not advise you to use chemical fertilizers like DAP. There are many organic fertilizers that provide crops with nitrogen, phosphorus and potassium (NPK). We provide examples below:

N for nitrogen: Tithonia

This is one of the most important sources of nutrients that does not cost the farmer much. Tithonia is a good source of nutrients including nitrogen for fast growing crops such as *sukumawiki*. You can simply chop tithonia leaves and branches into small pieces and soak them in water at the ratio of 1 part tithonia to 4 parts water. Put them into a container, sealing it tightly to stop nitrogen getting out. Let the mixture stand for 7 days.

Sieve the mixture using a piece of clothing if you intend to use a knapsack sprayer to stop particles from blocking the nozzles. Spray within 5 days at the root of the *sukumawiki* plants. This can be repeated after every two weeks. Tithonia can give you the same crop yield as you would get when using chemical fertilizers.

You can also chop young tithonia shoots and work this



material into the soil one week before transplanting. Use 2 to 4 kg tithonia per square metre. A good layer of chopped tithonia can be added as mulch to established plants regularly. Tithonia decays quickly and releases its nutrients within a short time. In contrast to synthetic fertilizers, tithonia mulch increases soil organic matter and generally improves soil fertility.

P for phosphorus:

Minjingu rock phosphate
Minjingu rock phosphate is a slow release organic fertilizer; this means that it releases phosphorus slowly. One way to improve phosphorus supply is to incorporate humic acid which is available in most agrovet shops. Another good option is mixing generous amounts of rock phosphate into the compost heap if you prepare compost.

If you apply rock phosphate together with organic matter such as maize and bean residues to your crops regularly, this will produce natural humic acids. They make phosphorus available to all plants including heavy feeders like kales. *Mavuno fertilizer* is also suitable where *Minjingu fertilizer*® is not available but it is compound of organic and chemical elements, therefore it is not fully organic.

K for Potassium: Wood ash can be obtained from the kitchen hearth or *jiko*. Ensure that any

wood ash disposed from the kitchen or *jikos* is stored somewhere in a pit or dump. It should then be mixed with compost or applied on the shamba directly.

HUMAX®

Humax is a liquid humic acid that helps crops take up minerals from the soil. A 500g package which costs Ksh 1500 can be mixed with 200 litres of water, enough for 300 plants.

Apply after every 3 weeks: Mix with EM and plant extracts as frequently as possible (after every 3 weeks).

Synergizer®

This is a foliar feed containing nitrogen, phosphorus and

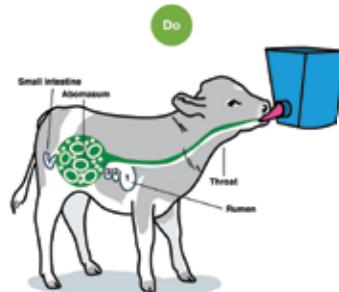
potassium at the ratio of 8:32:4. It can be used when the crop is at its critical stage of growth. It can be obtained from agrovet shops.

Black Majik®

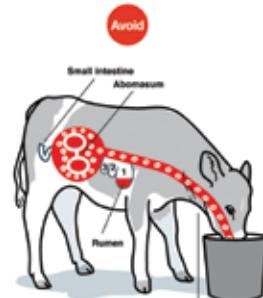
Black Majik is an organic soil conditioner and not a fertilizer. It can be mixed with chemical fertilizers such as DAP to reduce the acidifying effect of this chemical fertilizer on the soil. It is very unfortunate that farmers have to use chemical fertilizers which cause soil acidity and then try to reduce the same acidity when there are cheap alternatives such as organic fertilizers that help build fertility and which do not make the soil acidic.

Farming Tip

The right to feed your calf



Source: DeLaval calf management



Most farmers do not feed their calves in the right way. The most common practice farmers prefer is the use of the bucket. This method has its shortcomings because some of the milk goes through the nose and into the lungs where it can easily cause diseases such as calf pneumonia.

The milk can also end up in the first stomach (also called rumen). While feeding, the milk should go directly into

the second stomach (also called the abomasum); for the milk to flow into the second stomach where it can be digested properly, the bucket should be well placed as shown in the sketch (above). Farmers can put milk into a bucket and insert a flexible hosepipe with one end attached to a nipple and train the calf to feed using the nipple. Calf Nipples are available in some agrovet shops.

TOFRadio answers your questions

TOFRadio is broadcast on 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.

Record keeping is key in dairy farming enterprise

Musdalafa Lyaga | As dairy farmers take stock of the previous year and prepare for the year 2015, top on their wish list is the desire to increase family income by milking more productive dairy cows than the current ones in the herd. One farm activity that is often ignored by many farmers but key to successful dairy farming is record keeping.

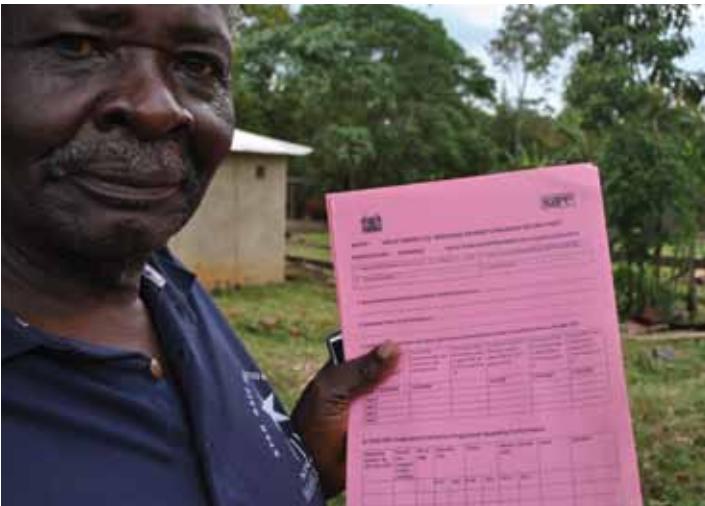
For herd recording to be of benefit to the dairy farmer, it should revolve around the production of milk, cow calendar board, heifer rearing board, insemination book, animal health, and daily diary among other relevant economic demands of dairy farming.

Dates when each cow is on heat

Heat dates should be recorded immediately after calving. This is very important in managing artificial insemination (AI) programs as well as predicting expected dates of calving. If you do not see a cow in heat within 50 days after calving, a veterinarian should examine her to be sure she is cycling properly and does not have an infection or other reproductive disorder. All heat dates should be reported so that the cycle length can be estimated.

Calving dates

The calving date is one of the most important records because it starts the next reproductive cycle of the herd. Establishing reproductive momentum is



Joab Marrow a farmer in Nzoia scheme, Kakamega County shows a farm record card in which he keeps his farm records.

extremely important in heifers because their interval between calving and their first heat after calving is much longer, usually 80 to 100 days for heifers in good body condition.

Daily milk yields

Good milk production records can assist to raise milk production from an individual cow through specific management for individual animals. It is a very powerful management tool for the small-scale dairy farmer.

Daily herd milk yields

Milk production records help a dairy farmer to determine which animals are performing well and those below the expected production level, therefore affecting the income from the herd. Once there is knowledge about milk production for every cow in terms of the basis of payment for milk then the amount of feed allocated per animal and its cost can be used to determine the viability of maintaining such an animal in the long term.

Milk intake by young calves

Record on milk intakes by young calves helps in the planning of weaning and calculating total rearing costs. The aim of having such records should be to plan for the switch of young calves to cheaper feeds as early as possible so that more milk can be available for sale. However, the diet must be able to promote

health and growth.

Routine monitoring of feeds

According to the Dairy's Farmer Training Manual by (Prof. Charles Karuku Gachuiro, Ms. Margaret Nyawira Lukuyu, Mr. Camillus Ahuya and others), the aim of feeding dairy cows is to maximize milk yield by meeting cow's feed requirements and to maintain the cow in good health. Too little or poor-quality feed results in thin animals that cannot resist disease while giving too much feed is wasteful and does not make economic sense. A dairy cow, like all other animals requires energy, protein, minerals and vitamins which must be provided in the diet. Thus, records are crucial in monitoring feed consumption.

Routine Vaccination

These records are essential in taking the necessary steps to protect the health of the animals. Maintaining records of the vaccination regime helps in maintaining good health, which is important in ensuring maximum productivity of the herd.

Animal sickness, veterinary visits and drug treatment

Calling in a veterinarian to examine animals once they show a health problem is a more common approach than regular veterinary visits. With



farmers forum

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Grafted avocado seedlings: We have grafted avocado seedlings, selling at Ksh 70 per seedling. We can supply any quantity. Call 0716 795 253, Nairobi and Muranga.

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KARI kienyeji chicks for sale: Healthy and vibrant Kienyeji chicks for sale. 3-day old, 1 week old and 3 week. Place your order on 0787 312 623 or email: antonville@outlook.com.

the use of records, veterinarians can get additional information about the probable causes of ill health in an individual animal. Information concerning milk yields, quality of milk, and other general information is of value in addition to the personal observations of the cow's owner.

The other benefit of having access to this information is that health treatment information is also recorded for individual cows on-farm. Such on-farm recording about the various vaccinations, treatments and other veterinary interventions forms an individual cow history which increases the probability of future treatments being effective.

Stock death and probable cause

These records not only help in updating livestock inventory or monitoring general herd health but also information on the main diseases affecting a farmer's dairy cows, including notifiable diseases, which must be reported, and zoonoses (diseases that are transferred from animals to humans).

When a herd recording programme is being established, it is important for the farmer to keep it simple and relevant to his/her needs, which will enable the farmer to easily identify the benefits of the programme.