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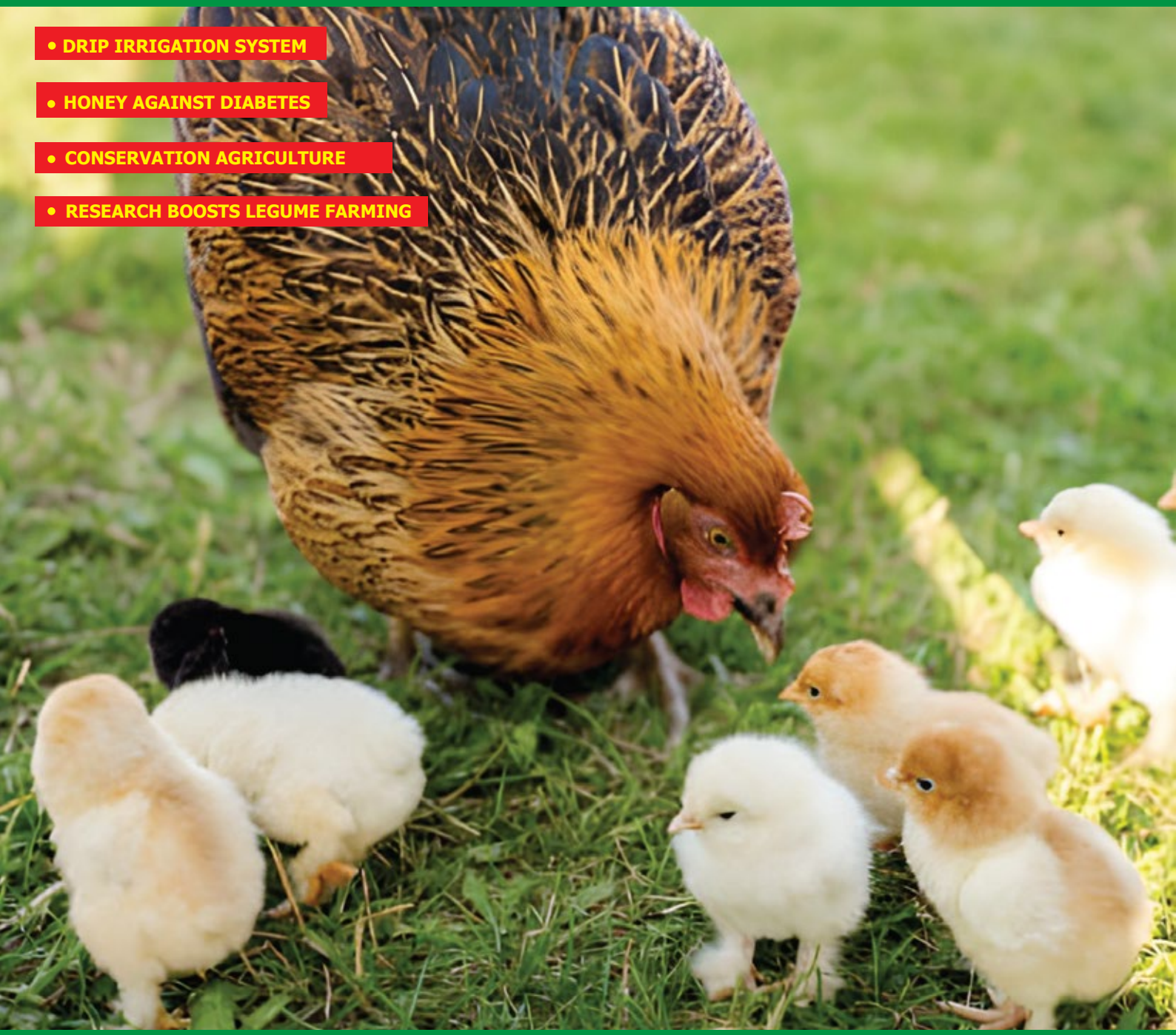
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EDITORIAL

Value Addition: Sure Way to Go

It is an obvious fact that Kenya's economy is agricultural-based where majority of the population derives livelihood. Majority of these farmers are peasants growing food crops and some cash crops. But the sad thing is that the majority are poor because their earnings cannot sustain their daily needs.

When it comes to cash crops, farmers' earnings are below the production cost due to various factors. These factors include mismanagement in cooperative societies and cartels fixing prices to benefit them rather than farmers. These complaints have gone on for a long time with no solution.

A good example is coffee production in Kenya. In the early 1980s, coffee was top cash crop earner. The industry thrived where farmers enjoyed handsome earnings and our coffee was sought in the international market. Political interference ruined this once-thriving sector which was later invaded by cartels.

Having realized the past mistakes, the government is currently spearheading revival of coffee production with a new variety. This is a welcome move which we hope will bear fruit to benefit farmers. Recently, farmers were happy with recent producer price payout which was the best for decades. This is the way to go.

While we appreciate the significant steps the government is taking to promote agricultural production, it should now focus on critical area - value addition. Kenya's produce attracts low international market prices because they buy in raw form. Take Kenyan coffee sold as cherry at the auction in Mombasa, shipped to Europe, roasted, branded and later sold back to us at premium prices beyond reach of majority consumers.

There are many other cash crops which should be processed, branded and be marketed as Kenyan products overseas. The value addition will attract better prices in the world market where Kenyan products are mostly sought like coffee, tea, avocados among others.

Recently, the government promoted production of pyrethrum. It will be recalled that Kenya produced 80 per cent of world pyrethrum before the world market collapsed. This is the time for the country to take advantage and fully revive the crop.

The factory in Nakuru which burned down some years ago and the abandoned pyrethrum research station should be operationalized. Indeed, the government should direct its effort towards manufacturing products out of the crop. This value addition will earn the farmer better prices in addition to earning the country foreign exchange through export of finished products.

The current world requires us to think beyond production. We are aware that there may be resistance from those who prefer buying in raw form, but time has come for us to manufacture, brand and market our finished products.

On food crops, especially horticulture, farmers lose a large percentage of their produce due to either lack of market or cannot reach due to poor infrastructure. Their hard work goes to waste and make loss unrecoverable.

Given the situation, which has persisted for decades, it is time the national government in collaboration with the counties should consider setting up factories to process this produce. In case of fruits, make juices, butter and other products.

It is unfortunate that a county like Nyandarua which feeds Nairobi with vegetables and other towns like Mombasa cannot reach the market during rainy seasons. The produce ends up rotting in farms whereas neighbouring counties maybe experiencing food shortage.

As the country enters into new phase of development, it should focus on how to empower the farmer in the countryside.

We thus propose that this value addition, through processing and manufacturing our agricultural produce, be enforced by enacting a legislation to make it mandatory where necessary.

The onus lies on the two levels of government to add value to farmers' produce. The government research institutions in the crop and livestock industry have done commendable jobs by developing high-yielding crops and animal genetic for maximizing production.

For this to succeed, the government should therefore work with private sector to ensure that there is value addition to what we produce. That is the way forward for the country to earn better prices of our products.

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Indigenous Chicks In Big Demand



An indigenous hen with chicks in free range

A Kenyan company has excelled in hatching and managing indigenous chicks which are big in demand. It is also training farmers training farmers on good rearing practices as the demand for local chicks have reached unprecedented highs.

Out of the country's millions of birds, 80 per cent are free range and are reared in both rural and urban areas according to a Household and Livestock census. But even with the tremendous uptake, poultry farmers still have to grapple with constraints to access to healthy breeds, feed management, access to potent vaccinations and markets.

Daluc Poultry Limited, sources parent stock of the free range chicken from the Kenya Agricultural and Livestock Research Organization (KALRO) and breeds them in their hatchery before selling them to farmers as day old chicks, one week, two weeks three weeks or four weeks chicks.

Through use of modern hatchery, the company is able to hatch between 1,000 and 1200 eggs each week. "But demand is very high and though our hatchery is good, we have our eyes trained on better ones to match up the demand," said the director at Daluc Poultry Limited.

The chicken from KALRO, christened super chicken, are free range, matures faster than the traditional free range and exotic breeds and can withstand common chicken diseases like Newcastle.

Another line of focus has been taming the Newcastle disease whichaffects over 80 to 100 percent of free ranging chicken annually. The chicken upon maturity also lays on average 250 eggs compared to traditional ones that on average lays 160 eggs. Upon hatching, the chicks are at their most vulnerable state in the first 28 days, or 4 weeks, and require constant and meticulous care from feeding, vaccination to round the clock monitoring of their general well being.

"This comes with huge costs. But we hatch and keep the chick to cater for the needs of various customers. There are those who prefer the day old chick, but there are those who may prefer, or who we advise on taking the chick after the four weeks to ensure they are strong enough for the environment they will be

exposed to," the Director added.
The company is now particularly targeting smallholder farmers in the rural areas where the rearing of the free range chicken has traditionally been practised and where the potential and space for chicken to free range is limitless.

"We are glad the rural farmers are realizing the benefit of buying our free range chicken due to their superior quality. The beauty with having as many farmers take up this in the rural areas is because the chicken are free to scavenge for food and they at least get a good mix of nutrients from the food they hunt," he said.

The company hopes to establish and work with selected chicken brooders and hatcheries, through an outgrower scheme and to ensure that farmers grow their chicks in uniformity to attract the market.

Besides working with farmers and training them on animal husbandry, the company also connects farmers who buy from them to ready and competitive markets like hotels. "The beauty with this model is that sometimes farmers don,t need to rear their chicken for long since hotels prefer chicken that are mature up to a certain extent. For example, hotels prefer a cock that is four to five months old, some hotels are ready to buy up to 100 chicken per day. The onus is on the farmers to supply," the director added.

The biggest hurdle for farmers especially when dealing with supply to hotels is how the chicken are slaughtered. Hotels are very particular about how the slaughtered chicken are delivered. The company through its professional slaughter men trains farmer on such slaughtering
modalities.

There is a growing interest in indigenious chicken rearing as markets for poultry shifts from exotic breeds to indigenious poultry meat and eggs from a Kenyan middle class that is keen on their health. It is estimated that there are currently over 30 million indigenious chicken being reared in the country.



KALRO improved kienyeji chicks

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Ornamental Fish Farming Is Profitable Business



Some of the ornamental fish in aquarium

Beautifying offices and common areas has been a common trend in urban areas. Ornamental fish as become one major item people are using to enhance beauty.

Some of farmers in Kenya have capitalized on this. Such a farmer is Francis Kirima from Zimmerman estate of Destiny farm, in Nairobi.

He opted for ornamental fish farming a few years ago when the government started promoting fish rearing and encouraged communities who were never used to eating fish to start eating through the economic stimulus programme.

He learned more through workshops organised by the ministry of agriculture at Sagana Aquaculture Centre. Kirima ventured into aquaculture by keeping catfish, tilapia and breeds of ornamental fish.

"I dug two small earthen ponds and put in over 3,000 tilapia and catfish fingerlings. After eight months the fish were ready for harvest. I sold them to my neigh bours at Sh300 each," says the farmer who has so far put Sh600,000 in fish farming.

The farm is christened Destiny and is surrounded by tall trees which supply oxygen. He now has 19 fish ponds. Kirima's interest is in ornamental fish which he says has good prospects. He notes the business is not saturated and this is what he wants to concentrate on because it has good returns.

The beauty is that the price for the aquarium fish is set in inches unlike tilapia and catfish whose prices are pegged on their age and weight, according to Peter Mwan gangi, the manager of Destiny farm.

One pond holds about 3,700 fish. The farm has ornamental fish that include Goldfish, Orandas and Black Molly.

"One-inch gold fish fingerlings sell at Sh150 and Orandas at Sh500 an inch and Black Molly at Sh400. A mature ornamental fish can cost up to Sh12,000," Mwangangi says.

He started with 60 ornamental fish, which they purchased at a pet shop in Kirinyaga in October last year. For feeding, he uses chicken droppings and rabbit urine to fertilise the fish ponds as the two encourage growth of planktons which are vital feeds for fish.

"These varieties of fish are quite sensitive and thus tend to have high mortality rate especially when not carefully managed."

A curator at the National Museums of Kenya, says care should be taken not to over feed them. They fish should be fed on flakes and pellets.

"The aquarium water needs to be changed after about a month. Twenty per cent of the water is removed and a fresh supply added to reduce ammonium level,"she says, explaining that excess feeds will contaminate the aquarium water.

Kirima earns at least Sh30,000 a month from the coloured fish. This is apart from the returns the farm generates from making

aquarium boxes. One-and-half square feet aquarium goes for Sh8,000. They sell their fish to pet shops in Sarit Centre and Yaya malls in Nairobi.
Ornamental fish farming has become one of the most profitable business ventures in the world. The world's consumption of ornamental fishes has significantly developed over time, making the trade to be one of the most profitable in the sector. The practice has also become a popular hobby for many people.

What is Ornamental fish farming?
You may need to know what ornamental fish farming is all about before we continue. This is a kind of small-scale fish farming that can be done in a backyard and still make some good bucks out of it. The ornamental fish business covers cold-water fish such as koi carp, goldfish as well as many of the tropical fish species traditionally reared in heated door aquariums.

Tips applicable when choosing
Tropical ornamental fish are of various categories. To start with, there are those known as the staples of 'community tank'. These are the species from diverse geographical regions but very peaceful such that they can be kept together in a single tank. They include the live-bearers; these are the fish that give birth to free swimming live and young fish after retaining their eggs inside the body rather than laying them as eggs.There are other kinds of or namental fishes that are more specialized. They include Catfish and Cichlids, with a majority of them originating from South America and Africa. These species are harder to rear and breed. It is therefore highly recommended that you consider raising live breeders for production of high-quality fish.

Tips for the Best Culture Facilities
The most popular culture facilities for this kind of fish farming are earthen pots, cement cisterns, earthen ponds and glass aquaria. Four or three cement cisterns are adequate for a small scale fish rearing unit. To ensure easy drainage, you should build them above the ground. All glass aquaria are the most preferable for the purposes of breeding because aerators and heaters can be used with ease.
The best source of water in the ornamental fish culture is the rainwater. If the rainwater is unavailable, other sources of clean water may be used after the water is aerated for many days to ensure de-chlorination.
The rearing water should have an average temperature of 15-28 Degrees Celsius and slightly alkaline pH. Majority of the cultured species prefer medium to soft, hard water.
Food and Feeding Tips include:

- Chopped earthworms
- Water fleas
- Mosquito larvae
- Sludge worm or Tubifex

Various kinds of homemade feed such as rice, whole-wheat bread and vegetable peelings are also fed.
You should dispense the feed once in each and every day. It is vital to note that overfeeding is more dangerous than underfeeding because the excess feed cause destruction of water quality.

Preventive Health Management Tips
The primary health preven tive measure in ornamental fish culture and breeding is proper management of water quality because these fish are highly sensitive to pH and temperature. This is done by regular change of water together with good aeration.

The most common diseases in these fishes are known to be fin rot, white spot and mouth fungus. Some of the economic chemicals and medicines that are readily available can be applied for preventive measures.
These compounds include common salt which is used as a disinfectant in bath treatment and methylene blue that is used for water purification in the aquarium water.

Ornamental fish farming is a highly promising venture especially to the unemployed youth. It requires less initial investment and little space. Requiring less manpower, this activity can uplift and improve your social and economic status without much to lose.

The growing interest in aquarium fishes has resulted in steady increase in aquarium fish trade globally. The fishes reach the marketable size in around 4 to 6 months and they include different species such as Siames Fighter Fish, Molly Fish Gold fish, Fan tail Platies among others.



Ornamental Fish In Pond

Animal Feeds Require Protection From Contamination



Some manufactured animal feeds are often contaminated with bacteria.

Optimum nutrition is one of the basic requirements for the high productivity of livestock. Besides a sufficient supply of all vital nutrients it means strict avoidance of microbial feed contamination which may impair health and performance. For that, high hygienic standards are indispensable.

Feedstuffs are naturally contaminated with bacteria, moulds and yeasts. At sufficient levels of humidity and temperature during storage the micro-organisms can use the feed as an ideal nutrient medium for their rapid growth and multiplication. This way, harmful germs and their toxic metabolic products such as aflatoxins are accumulated in the feed with a negative effect on the animal's health and performance. Progressive spoilage causes further economic damage by loss of nutrients and dry matter. Treatment with organic acids effectively prevents microbial activity and maintains high feed quality during storage. Due to their distinct anti-microbial effects, propionic and formic acid were selected from the broad variety of organic acids as the basis of BASF preservation products. Combinations of both acids show favourable synergetic effects, providing appropriate solutions to particular problems.

Adds to feed, BASF acid products are completely safe and can be fully metabolised in the animal's organism. The treated feedstuffs are highly palatable and well accepted by the livestock, ensuring optimum health and performance by high feed hygiene.

The vicious circle of spoilage

Moulds frequently initiate feed spoilage because of their relatively low requirements in humidity and temperature. The degradation of nutrients by moulds liberates water and heat, thus creating favourable conditions for a further multiplication of moulds, but also for the growth of bacteria and yeasts.

Serious damage initiated by mould

The negative effects of microbial activity are well known in practice feeding: caking and lumping make feed handling more difficult. Rising temperatures in the feed stock destroy nutrients and involve the risk of spontaneous combustion. Feed intake

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decreases due to changes in texture and flavour, and harmful metabolic products (mycotoxins) endanger the health of animals, but also of humans.

Permanent protection with propionic

Propionic acid shows a high efficacy particularly against moulds. Thus, BASF products based on propionic acid like Luprosil® or Lupro-Grain® are appropriate tools for the targeted control of mould. They protect crops and compound feed from spoilage and prohibit mycotoxin formation during storage, even at a high moisture content of the material and for prolonged storage times.

Microbial danger to the animal's health

Bacteria and yeasts are ubiquitous in feed. As soon as they find suitable conditions for their explosion like multiplication they cause severe stress on the animal's health.Harmful micro-organisms like **coliforms**, **salmonella** and **campylobacter** frequently cause digestive disorders and hazardous infections. Particularly young weaning animals and animals in stressful situations like weaning or transport are affected and respond with low performance.

The outstanding effects of formic acid

Formic acid decreases the pH-level of the feed to an unfavourable range for microbial growth. The lowered pH-value in the feed supports the acidification of the stomach content which is a natural defense mechanism of the animal against harmful micro-organisms. Additionally, the acid anion shows a bactericidal and bacteriostatic effect in the digestive tract. This effect largely contributes to a stable digestion process and improves nutrient utilization by diminishing the number of intestinal bacteria.

Thus, BASF products based on formic acid like Lupro-Cide are particularly effective in the improvement and maintenance of feed hygiene and show favourable side effects on the animal's performance and health.

" Feedstuffs are naturally contaminated with bacteria, moulds and yeasts. At sufficient levels of humidity and temperature during storage the microorganisms can use the feed as an ideal nutrient medium for their rapid growth and multiplication "



Manufactured animal feeds

Butterfly Farming Conserves Coastal Natural Forest



Some of species at Sokoke forest

A government project to promote buttery farming as a way of conserving the country's coastal forest has turned into a major earner, from sales of butteries' pupae to over 14 markets in the US and UK.

The Kipepeo project, in the Arabuko-Sokoke forest, which now spans over 900 butterfly farmers was created to encourage conservation of the 40,000 hectares forest, which is the largest single block of natural coastal forest remaining in East Africa and home to many endangered flora and fauna. Nine of the buttery species found in the forest are found nowhere else in the world.

The project has created nature-based businesses by linking buttery farmers to international markets. On the ground, farmers catch a few female butteries from the wild and put them in shade net cages with the right host plants. Each species of buttery lays eggs on a different species of plant. Once the eggs hatch, farmers put the small caterpillars on host plants that they grow in nurseries, until the caterpillars create protective cocoons for themselves. At this pupa stage, they are packaged for export.

"A farmer needs only two butterflies to get a thousand pupae and that will be over Sh40,000 in a month."

Farmers depend on the forest as a source for the adult butteries to start the process and for a continuing source of seeds for the host plant nurseries. Most retain some buttery pupae from each farmed generation so they have no need to catch more female butteries from the wild after they have begun a captive population. However, they do need to capture more male butteries from the wild to maintain genetic diversity in the captive populations.

For Fatma Abdikadir, beating the air with her homemade net is therefore far from an idle pastime as she chases a swirling black and turquoise buttery. The mother of two earns crucial family income from her buttery farming for the Kipepeo project.

She previously relied on the forest for firewood which she used to sell commercially, often in a cat and mouse fight with officers from the Kenya Forestry Services after the government had banned logging from the forest. "It's funny that the same trees I felled indiscriminately are the same ones I guard jealously since they form the habitats for the butteries and therefore my source of livelihood," she says.
Fatma enjoys every stage of the process and her dedication to butteries has paid off. She now

employs six youth and leads a larger nature group aliated to the Kipepeo project.

Ken Opiyo a committee member at the Kipepeo project explains how the farming has now turned into a money spinner for most the farmers.

"A farmer needs only two butterflies to get a thousand pupae and that will be over Sh40,000 in a month much more money than one can earn from the chicken or egg selling business," he says. Buttery farming has also emerged as a less expensive venture to enter than other types of agriculture, since the forests provide a natural habitat where the butteries feed and reproduce.

At the same time, the market is expanding, with butteries increasingly valued for their beauty and uniqueness. Over the past two decades, the number of live buttery exhibitions and centres has grown sharply around the world, with farmers in tropical countries benetting from their access to many exotic species.

The Kenyan butteries are exported live, as pupae, or dead, as top-quality collector specimens for research institutions."Flying handkerchiefs," "Emperor Swallowtails" and "African Blue Tigers" are among the nine buttery species collected at the Arabuko Sokoke forest that are not found anywhere else in the world.

More common butteries are also collected for decorative uses, with designers from Europe also using the butteries to come up with pattern designs. The live insects are also hatched and displayed in insect parks globally.

"Buttery specimens here are very beautiful. Big hotels and tourists come to buy them. Rich businessmen are beginning to buy them too for beauty in the house at occasions like weddings and for education for their children," Opiyo said.

However the buttery farming is still in its infancy in Kenya, in only Mombasa's Arabuko Sokoke forest and Kakamega forest, and competing with established



markets in Valencia, Papua New Guinea and also the South Americas, where the farming has existed for close to three decades.

There, farmers and marketers have been able to come up with systems that are more cost-eective, and are therefore selling at lower prices than Kenya. However, the potential remains great, with the Kenyan project managers now looking into marketing other invertebrates, such as moths, scorpions and spiders. The value of the international buttery trade now stands at between $100m and $150m a year.

" Butterfly specimens here are very beautiful. Big hotels sare tourists come to buy them"



Butterflies are collected for decorative uses.

The Carrot Trail Shines On Its Own



Freshly harvested carrots ready for the market

Nutrition gurus recommend we choose a colourful diet, the more colourful the better. Strongly pigmented fruits and vegetables are low in fat, high in fibre and rich in vitamins and the phytochemicals that reinforce our immune systems and protect us against disease and illness.

And what's more colourful than a carrot? Or more convenient? Most supermarket produce departments now offer a cornucopia of carrot choices from fresh carrots with the tops attached to tiny packets of carrot sticks ready for lunch boxes. Buy preshredded carrots to dump into slaw or a kettle of simmering vegetable soup. Or peeled baby ear rots to stir fry in orange juice (or marmalade), butter, and ginger (tiny flecks of crystallized ginger if you're a real ginger fan).

Buy firm, smooth, bright orange carrots. If you buy them with feathery tops attached, remove greens so they don't dry out roots and feed to guinea pigs, sheep, or even, as Jane Brody recommends, to swallowtail butterfly caterpillars to keep them off the parsley in your garden.

Carrot relatives include the pars nip, celery, cilantro, dill, fennel, cumin, anise, caraway, and that beautiful roadside weed, Queen Anne's lace.

Carrots originated in Afghanistan and were cultivated in English gardens by about 1600. Greeks and Romans used them for medicinal purposes. What carrots rarely get today is a chance to shine on their own.



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Kenya Benefits From Research To Boost Legume Production



A maturing beans variety plantation

Kenya, alongside other 13 African countries benefiting from research and development initiative meant to boost production of legumes in Africa.

The initiative dubbed 'Tropical Legumes Project' is spearheaded by Generation Challenge Programme (GCP) with US$30 million funding from Belinda Gates Foundation.

The project is producing and distribute improved seeds to farmers in close collaboration with national research programmes. Launched in Arusha, Tanzania the initiative develop improved varieties of selected legumes more resilient against drought, pests and disease.

Beans is one of the major legumes in focus. Others include groundnut, cowpea and chickpea which are essential staples in the diets of millions of Africans. Increasing their yields can greatly improve health and wealth creation in sub-Saharan Africa. The project came at a better time given that most legume crops lack genomic resources due to their relative neglect by the research community. This laxity has presented a major problem in the application of enabling biotechnologies for legume improvement.

Kenya's legume of choice in the undertaking is beans.According to Professor Paul Kimani of the University of Nairobi's Department of Crop Science, Kenya is participating in the project on bean production.

Kenya chose to work on the legume because; among other factors the country has continually suffered a shortage of 200,000 tonnes in production for the past 10 years.

"The consumption of bean has clearly outdone production, leading to this huge deficit in dry beans,", Prof Kimani.

Prof Kimani added that the current shortfall has been caused by pests and diseases especially attack from nematodes. "Kenya's current average bean yield stands at 300kg/ha when the crop is inter-cropped against a potential of 1000 tonnes/ha," he says.

Grown alone, beans in Kenya can give an average yield of even 2000kg/ha against the current 500kg/ha.

Experts say that 98 per cent of the total acreage under beans are inter-cropped making it the most preferred method of growing beans.

A study carried out in Kisii found out that the high market prices of the legume had driven farmers into selling dry beans rather than consume it for dietary reasons.

"Unless something is dramatically done, we fear that the average yield may continue to tumble down hence causing a serious crisis," Prof. Kimani asserts.

He decries the fact that drought, lack of soil fertility and socio-economic factors have

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Drip Irrigation System To Boost Production



A drip irrigation system at work

It must be emphasized that any training or advice on the use of drip kit systems should not only cover kit installation and maintaenance but also all aspects of growing vegetables under drought conditions since the purpose is to increase yields. Thus training and advice should include lessons about bed preparation and composting, transplanting, irrigation-water management and pest and disease control.

Common preparation Requirements and features are as follows:

- Prepare the area to be irrigated. This could be simple land preparation or involve the formation of planting beds.
- For best result drip systems are used to irrigate level beds. If the drip rube go uphill, downhill or around corners, the system will not give equal water low from each dripping out-let.
- Construct the water container stand. Ensure that it can support the weight of the container and water when full.
- Mount the water container on the stand so that the water outlet is at the height necessary to provide the water pressure required to operate the system.
- Mount the container water outlet, water Etta-dun and Low regulator fittings.
- Lay the water distribution system components that connect the water container to the individual drip lines. Make sure that the open ends are dosed to avoid foreign material entering the pipe.
- Unroll the drip lines and lay them along the full length of each row of plants to be irrigated.
- Connect the drip lines with the water distributor on system (header pipes).
- Flush the system to remove any foreign matter that may have entered the pipeline.
- Close the end of the drip lines.

Preparation of a planting bed

1. Lay out the planting bed depending on the length. spacing and number of the drip lines.
2. Excavate shallow trenches (15-30 cm deep) lengthwise where the row crops will be planted.
3. Place plant stover or green material in the trench to a depth of about 15 cm.
4. Add a 5-10 cm layer of fresh manure on top of the green material.
5. Cover the trench and level the ground to form a raised bed 10-20 cm above aisles.

Maintaining the system

- Ensure that only clean water is used in order to minimize the chances of clogging the filtration system. A fitter screen will keep coarse, particles from entering the drip lines. If there is fine silt in the water or blowing sand in the air, a piece of cloth can be tied over the top of the bucket. Water can be poured through the cloth to keep the fine particles from entering the bucket.
- Clean the filtration system at least twice a month.
- Inspect the emitters to identify clogged emitters at least once a week and unblock or replace any dogged emitters. Clogged drip emitters cause non-uniform application of water and result in non-uniform growth of the plants.Flush the system at least once a month. The frequency can be increased or reduced depending on the amount of impurities in the irrigation water.
- Check and repair leaks frequently.
- Take extra care during field operation, particularly weeding, to avoid cutting the drip lines.
- Take precautions to minimize the destruction of drip lines by termite.
- When no longer in use uninstall the components of the system and move them in a safe place.

Water management tips

- Maintain an optimum soil-moisture regime by applying the required amount of water at the right frequency. Shallow sandy soils require more frequent (1- 2 day interval) irrigation deep day loam soils allow less frequent (3-7 day) irrigation.
- During the early stages of crop growth, the plant roots are shallow and therefore there is a need for more frequent irrigation and less water per irrigation event.
- During the flowering or late vegetative stage of the crop, water consumption is highest and an adequate water regime is vital. Ensure that the crop does not experience moisture stress during this period.
- Crop water use will vary from 3 to 7 mm/day. Ensure that adequate amounts (depending on the area and crop growth stage) are applied.
- All leaks should be mended quickly to prevent water wastage.

Planting tips

- To ensure that the plants are planted where they will benefit most from the water supplied by the emitters, irrigate the field before planting and plant seedlings on the wetted circle.
- Most crops require manure at a rate of 1-2 handfuls and/or 1 tablespoon of double super phosphate per planting hole.

" Drip irrigation systems consist of water storage water filtration water conveyance and distribution and water application sub-systems.
Details of some of these drip irrigation systems are available in the market. "



A crop being irrigated using drip



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Farmers Adopt Conservation Agriculture



Mulching applied in a farm

Farmers adopting conservation agriculture make basins or holes for seeds with a hand hoe at intervals for plant spacing. They plant in furrows if they have animal power. Jab planters introduced by the project, became popular direct planting tools because no basins furrows core necessary.

A farmer experienced in using a jab planter was able to plant one acre (half a hectare) in six hours. An animal-drawn direct planter could plant it in two hours. Ordinary ploughing with hand hoes, required eight adults two days to complete one acre and another day to plant with hand hoes. It took two days for a pair of oxen to plough an acre using a mould board plough.

Farmers used an animal-drawn subsoiler to break the hardpan. Farmers with no access to one broke the hardpan by double digging with hand hoes.

Farming with permanent soil cover

Farmers achieved soil cover in arable fields mainly by using living cover crops and mulch made from crop residue and prunings from trees and shrubs. Farmers started using a combination of mulch and living crops. Some planted cover crops during the cropping season or after removing the main crop to cover the whole field. Some cut and brought in field grass and plant material such as leaves from outside their fields.

Most annual crops are good sources of mulch. After harvest the cereal stalks can be cut and spread evenly over the soil to provide cover. Farmers who adopted conservation agriculture started leaving crop residue in their fields as mulch and no longer grazed livestock in their fields after harvest.

Conventionally, the practice was to let the animals graze fields immediately after harvest. Those who had fields far away from the homestead cut and carried the crop residue to feed livestock at home. Some people used maize stover as fuel and farmers complained of their neighbours stealing their residue for fuel or livestock feed.

In Siaya, the most grown cover crop ***Dolichos lablab***. However, lablab is prone to insect pests, especially flowering calling for use of pesticides. This was an extra cost, but cover crops grown cover crop did not much for farmers who did not use pesticides. After the lablab formed a dense cover, farmers were afraid to walk through it for fear of temp bitten by snakes or ether animals that might hide beneath the canopy. Farmers with livestock used lablab leaves to feed livestock, especially when milking.

During two seasons recently, most of Siaya experienced drought and subsequent crop failure. Farmers were forced to feed their livestock with crop residue such as mama stover and lablab vines, since there was no other feed. Most farmers did not set aside any land for grazing or planting fodder such as napier grass for livestock feed. As a result, farmers fed the animals crop residue rather than leaving it as mulch In the fields. This resulted in conflict between crop and livestock.
With poor cover crop management lablab sometimes smothered the maize, killing it

completely, as if it were a weed. When the lablab and maize were planted at the same time. lablab grew faster and covered the maize crop. As a result some farmers abandoned lablab and started growing canavallia, pumpkin, groundnut, desmodium, cowpea, sweet potato and improved fellows such as tephrosia as cover crops. Farmers who used cover crops reported that labour for weeding went down and soil fertility increased in subsequent seasons.

Siaya has potential for other cover crops as well as lablab. Other legume cover crops have been tried. ICRAF promoted improving soil fertility through fellows such as crotalaria and tephrosia. Tropical Soil Biology and Fertility trained farmers on organic and in-organic fertilizers. When selecting a cover crop, most farmers prefer one with the following qualities:

- **Can improve soil fertility**
- **Can be used as animal feed**
- **Has edible seeds and vegetables suppresses weeds**
- **Grows vigorously to form a ground cover in a short time**

It is important to plant the cover crop at the same time as the maize. As most farmers have only small pieces of land they cannot commit to pure cover crop stands and the soil after planting urgently needs cover. Since rainfall in Siaya is unpredictable, planting the cover crop at time onset of rain makes better use of the moisture.

Cover crop management

Cover crops that are climbers need to be cut or vines uncoiled from the main or they may overgrow the main crop one smother it (Telmoi 2005). This happened in Onalo Boke Farmer Field School at some farmers" fields where maize was intercropped with lablab. The lablab completely covered the maize and the farmers harvested none although the season was good. Consequently, some farmers perceived lablab as a weed and grew it only as a pure stand or simply abandoned it.

Some farmers cut the lablab 15 mm (6 inches) above the ground before planting maize. This allowed it to grow back. If regrowth was not needed, they cut it at the base, left it to dry and then planted maize.

The KALRO Legume Research Network Project provided farmers with 10 varieties of good legume cover crops. The farmers evaluated them to determine the best ones.

Pests and disease control in cover crops

No disease attacked the crops during the project at any of the sites. However, there were pests-many bean flies and caterpillars. Some farmers who did not spray the lablab with the pesticides had flower abortion and empty pods. But this was minor, since most areas overcame the problem without any pesticides. Mucuna had minor insect pest problems and more seed for matron than the labials

Rotating and associating crops

Intercropping cereals with legumes is not a new concept among the farmers. The practice has existed from time immemorial. Traditionally, farmers planted beans, sorghum or maize and cowpea in one field. The following season they planted tubers, such as cassava or sweet potato, then back to beans and maize or beans and sorghum.

Some farmers planted beans, sorghum. maize and cowpea together. The only difference with conservation agriculture was that farmers either intercropped lablab and mucuna with maize or planted them as pure stands to fix nitrogen, conserve moisture and provide soil biomass. Where lablab was established as a pure stand, the following season farmers slashed it and planted maize.

In Siaya, the most problematic weed is witch weed, striga hermonthica, which is a parasite on maize, millet and sorghum but can be controlled by rotating them with other crops.



Maize and lablab growing alongside

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Calliandra Forage Increases Cow Milk Output



Calliandra plant leaves are nutritious for dairy cows

Calliandra Calothyrsus is a small, leguminous tree which grows well in a wide range of ecological conditions, from the coast to the highlands, but performs well in coffee zones. With a characteristic of pink flowers, the tree grows relatively fast and can provide quality fodder, fuel, wood, stakes, poles and bee forage as well as help in soil erosion control. The benefits of the trees are realized within the first year after planting and can continue for more than 10years.

To improve milk production of dairy cows, farmer is advised to feed them with fodder legumes at the rate of 25 to 35 per cent (about 1 part legume to 3 to 4 parts of the basal forage). The farmer is further advised to try to use a combination of fodder supplements that are rich in protein.

These include legume such as calliandra, leucaena, desmodium and lucerne and non-leguminous species like mulberry and sweet potato vines. Basal forage consists mainly of the grasses, nappier and maize stores fed alone or in a combination.

Feeding livestock with forages rich in nitrogen helps them to produce as much milk as they are capable of and to more efficiently use other feeds that are low in protein. However, excess feeding with leguminous species wastes valuable protein. However, excess feeding with leguminous species wastes valuable protein and may cause adverse effects on the health of the animals, such as bloating, or result in, unfavourable flavour in milk. It is, therefore important not to exceed these ratios when feeding your livestock.

Harvesting leaves

Frequent cutting of leaves stimulates vigorous regrowth and hence, sustained supply of fodder. It also ensures that the stems do not get woody (lignified), which would make the forage less nutritious.

For livestock fodder, systematically cut both upright and spreading leafy branches and maintain the height of the hedges at about one metre (3feet).

The best tool for harvesting forage is a pair of secateurs, which are normally used for pruning tea bushes, or pyrethrum. Otherwise, use a sharp panga or a knife to harvest the leaves, but to avoid splitting the stem or wounding.

Harvest from one end of the hedge and progressively move to the other end. This process can be repeated every 10 to 12 weeks, that is 4 to 5 times a year, although cutting frequency depend on rainfall availability and fertility of the soil .It is advisable to cut and carry calliandra forage them to let the animals browse the trees on the farm. Farmers who

Turn to page 30

Honey Militates Against Diabetes



Samples of various forms of honey

One of this is sugar. For instance, if you are a diabetic, you ought to monitor your intake of carbohydrates and sugar, as this could significantly impact your blood sugar levels.

If you have diabetes, it means your body is either unable to make or even use insulin or even unable to make any at all. Some studies highlight the importance of honey, in militating against diabetes, as it can help to increase cholesterol levels.

Raw honey starts as flower nectars. When bees collect nectar from these flowers, they naturally break this down into simple sugars, which they store in honeycombs. The honeycombs cause nectar from these honeycombs to evaporate, which can create thick and sweet liquid known as honey. Generally, honey from honeycombs contains pollen

Diabetes is a terminal illness that can significantly impact the amounts, types and varieties of food to consume

of bees, beeswax, as well as some parts of dead bees.Honey has a lot of healthful properties to the body, which include: wound-healing effects, antibacterial properties, anti-inflammatory effects as well as antioxidants for diets.

For instance, the antioxidants properties of honey mean it can prevent a variety of health conditions and chronic diseases, such as cancers. Moreover, honey has significant nutritional value, as it offers varieties of minerals and vitamins, which are good for the body.

As a farmer, investing in bee keeping is a good investment for farming business, as honey is profitable in the market, and it also offers a healthier alternative and substitute for sugar. Others assume beekeeping is a relatively easy practice, considering the bees make the honey for themselves. However, as pointed out in this article, owning and managing a colony is a huge responsibility and entails a lot of work. Indeed, learning how to keep bees happy, healthy, thriving and well-protected is not a small responsibility.

How to maintain and care for Bees

A poorly maintained bee hive will eventually become weak and be filled with infestation, which is not good for you and your honey yields. For instance, when bees do not find enough space to create bees, they swarm to find bigger homes, which can put you are the risk of invasion by bees (a dangerous health risk).

One of the simplest and ways of caring for your bees to ensure maximum output of honey yields is providing enough room for your bees to produce honey. You can start this process by considering your environment. Various studies have shown that an average bee flies for miles away from the hives, foraging and searching for nectar, pollen as well as propolis (which are resin from trees.) Another way to properly care for your bees, and ensure good yields of honey, is simply planting flowers.

Flowers are like the raw material bees need to make honey, as bees derive nectar from flowers to make honey. A simple practice would be to plant flowers in the surrounding area of your beehive. You can also consider moving to areas with many flowery plants, as this will ensure a healthy hive. As you do this, make sure the flowers are within the vicinity of the bee hives, albeit more closer. Just like any species, bees also tire from long commutes and distances of travel, as this will affect production rates. Indeed, putting your bees through a lot of work is stressful to the bees, and it can greatly diminish the quality and quantities of honey production.

Remember that having water is important for bees. If within your space, you have enough room for a small body of water, or even avail a few buckets of water for bees to drink from, you will contribute significantly towards stimulating honey production for your bees.

Moreover, if you have planted trees which produce propolis, where bees can harvest and set-up their hives, you will greatly contribute to bees' comfortability, which will subsequently stimulate increased production of honey. Another good practice is maintaining clean bee hives, so that your bees don't relocate to set up different hives.

Maintaining safety in Bee-farming.

Bee-keeping is protable, but it can also be very dangerous. Indeed, bee stings can be very lethal, at times even causing death. For instance, the African wild bees, which are one of the different types of bee breeds, can be very dangerous when provoked. In this regard, it is important to rear and breed your bees where they will not be able to attack or injure humans. As good practice, bee hives and apiaries are often sited away from densely populated regions, even forests if possible.



A farmer harvesting honey

Moreover, as you deal with bees, always have protective gear on, which can protect you in case of stings or attacks. As is common practice, you can wear a veil, protective jackets or long gloves when harvesting honey, as they may also attack for you as you do your work. If possible keep young children away from bee hives, to avoid the possibility of accidents and its resulting negative aftermaths.

Embrace Bee Farming

Having start-up capital of KSh100,000 or less is enough to start the practice of beekeeping. Moreover, present growing platforms and tutorials can avail you with the basic know how and technical skills needed to set-up and manage a bee-hive. Learning from industry practitioners and others involved in bee-keeping practices is also a good way of educating oneself on proper bee keeping practices. For instance, to attract bees into an empty beehive, you can consider putting in beeswax. Rubbing beeswax against the inner walls of the beehive will attract bees into the hives.

With increasing consciousness on effective health practices and effective growing concern about lifestyle changes, more and more people are switching to the use of natural food products, one of which is raw honey. It has seen the demand for honey increasing dramatically. Therefore, as a farmer, investing in bee keeping and honey production is a sure bet, not only for the profitability of your farm business, but also for your own health concerns.

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Only three of the microminerals, copper, zinc and selenium are likely to be deficient in grazing beef cattle diets.

i)Cobalt

Cobalt functions as a component of vitamin B-12, which is synthesized in the rumen by bacteria.
The primary deficiency symptom is loss of appetite and poor growth. Most forages in the Southeast have adequate levels of cobalt; however, it is usually added in the mineral mix at approximately 10 ppm to ensure no deficiencies.
High-grain diets require more cobalt than forage-based diets and cobalt should always be included in the mineral mix when feeding your cow grain-based diets.

ii) Copper

Copper is the most common micromineral deficiency in grazing cattle. It is an important component of many enzyme systems essential for normal growth and development.
Deficiency signs include reduced fertility, depressed immunity and reduced pigmentation of hair (black hair changes to red).
Dietary deficiencies can as well occur, but most deficiencies are caused by the consumption of antagonists, which reduces copper absorption. When feeding your cattle, copper should be supplemented as copper sulfate, tribasic copper chloride or an organic complexed form because copper oxide is very poorly absorbed.

iii) Iodine

This is an essential mineral for function of the thyroid hormones that regulate energy metabolism. The first sign of iodine deficiency is goiter in newborn calves.
Iodine is rarely deficient in cow herds in the Southeast.
The maximum legal supplementation of Iodine is 50 mg per head each day. In some instances, Iodine has been included in diets to prevent foot rot; however, the amount of iodine required to prevent foot rot is much higher than requirements and most likely will not prevent foot rot when included at the legal maximum.

iv) Iron

Iron is primarily required for the formation of hemoglobin.
Deficiency symptoms of a cow lacking iron include anemia, depressed immunity and decreased weight gains.
Iron deficiency is rarely observed in grazing cattle. Iron oxide is often included in mineral mixtures but is unavailable to the animal and serves only as a coloring agent to give the mineral a dark red color. Iron sulfate is available to the animal and should always be used if iron supplementation is needed.

v) Manganese

Manganese is required for normal reproduction, and fetal and udder development.
Manganese deficiency is rare and

unlikely to be a problem in grazing cattle.
Manganese oxide is the most common form of manganese used in mineral mixes. Maize-based diets are low in manganese and supplementation is necessary when feeding such diets.

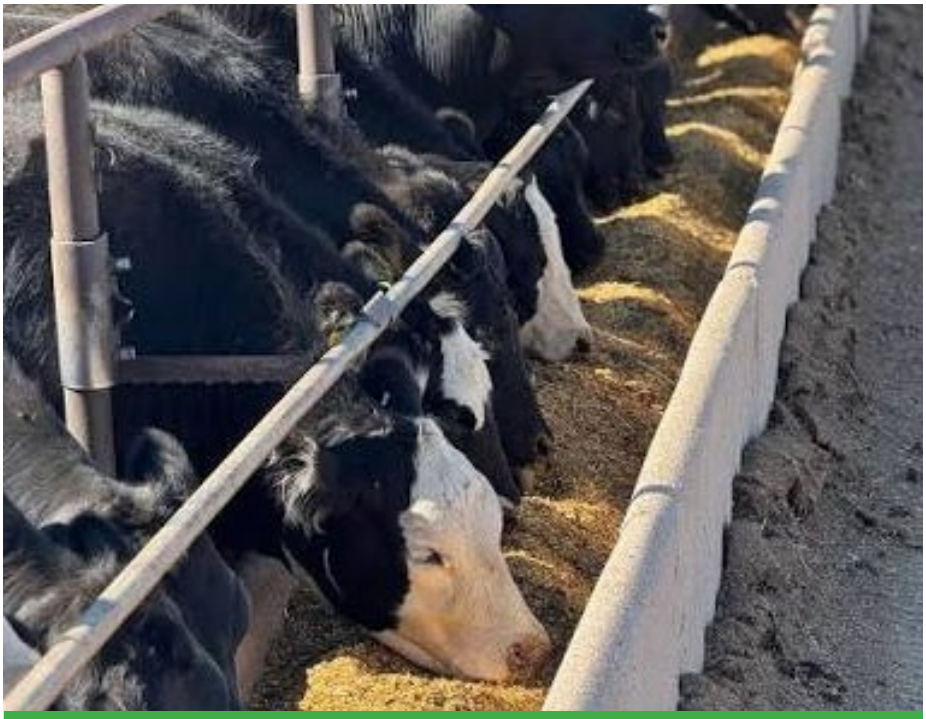
vi) Selenium
Selenium deficiency causes white muscle disease in newborn calves. It can also cause calves to be weak at birth and increase their susceptibility to calfhood diseases like scours.
Increased rates of retained placentas and poor reproductive performance are often observed in cows with selenium deficiencies.
Selenium is usually added to mineral mixtures in the form of sodium selenite. Selenium is very toxic and should be used in a premixed form only.
In areas where deficiencies occur, use the maximum legal level of selenium. Selenium deficiency should not be a problem if adequate amounts of selenium are consumed in the mineral supplement.
However, the concentration of selenium in the supplement and the labelled intake must not result in a total intake of more than 3 mg per day. A mineral labelled for intake of 4 ounces per head per day cannot exceed 26 ppm selenium.

vii) Zinc
This is a component of many enzymes and is important for immunity, male reproduction, and skin and hoof health.
Cattle have a limited ability to store zinc and supplementation is always necessary. Zinc absorption is closely tied to copper absorption and the zinc to copper ratio should be kept at approximately 3:1.
In addition, high levels of iron can decrease zinc absorption. Absorption of zinc decreases once the ratio of iron to zinc exceeds 2:1. Some feedlots feed supplemental zinc methionine to improve hoof health and improve daily gains and feed efficiency.

viii) Vitamins
Vitamins are closely linked to mineral metabolism and absorption. Vitamin A helps skin and mucous membranes stay healthy. Vitamin A requirements usually are met by grazing fresh, green, growing grass. Oxidation deteriorates vitamin A during storage, so diets based on stored feeds should be supplemented with vitamin A. Supplement diets with vitamin A any time the major portion is stored feeds.

Vitamin A can be added to a mineral mix in a stabilized form to prevent oxidation.
Vitamin A can also be added to the grain mixture to provide 15,000 to 30,000 IU per head per day, depending on individual requirements. An alternative method is to inject 1.5 million IU subcutaneously if a source of dietary vitamin A is not available for 60 to 90 days, although unnecessary injections are discouraged.
Vitamin D aids the absorption of calcium and phosphorus from the intestine and their deposition in the bone matrix.
Signs of vitamin D deficiency are similar to a calcium or phosphorus deficiency. Most cattle exposed to direct sunlight synthesize enough vitamin D, but cattle in a covered confinement feedlot may need supplemental vitamin D.
Vitamin E is usually present in the diet in sufficient quantities for all classes of cattle. However, a selenium deficiency could lead to an apparent deficiency of vitamin E.
Vitamin E can be helpful for short-term periods of stress that may occur when calves are co-mingled and transported at weaning.

Other essential vitamins are usually present in adequate quantities in the diet or are synthesized by bacteria in the rumen.

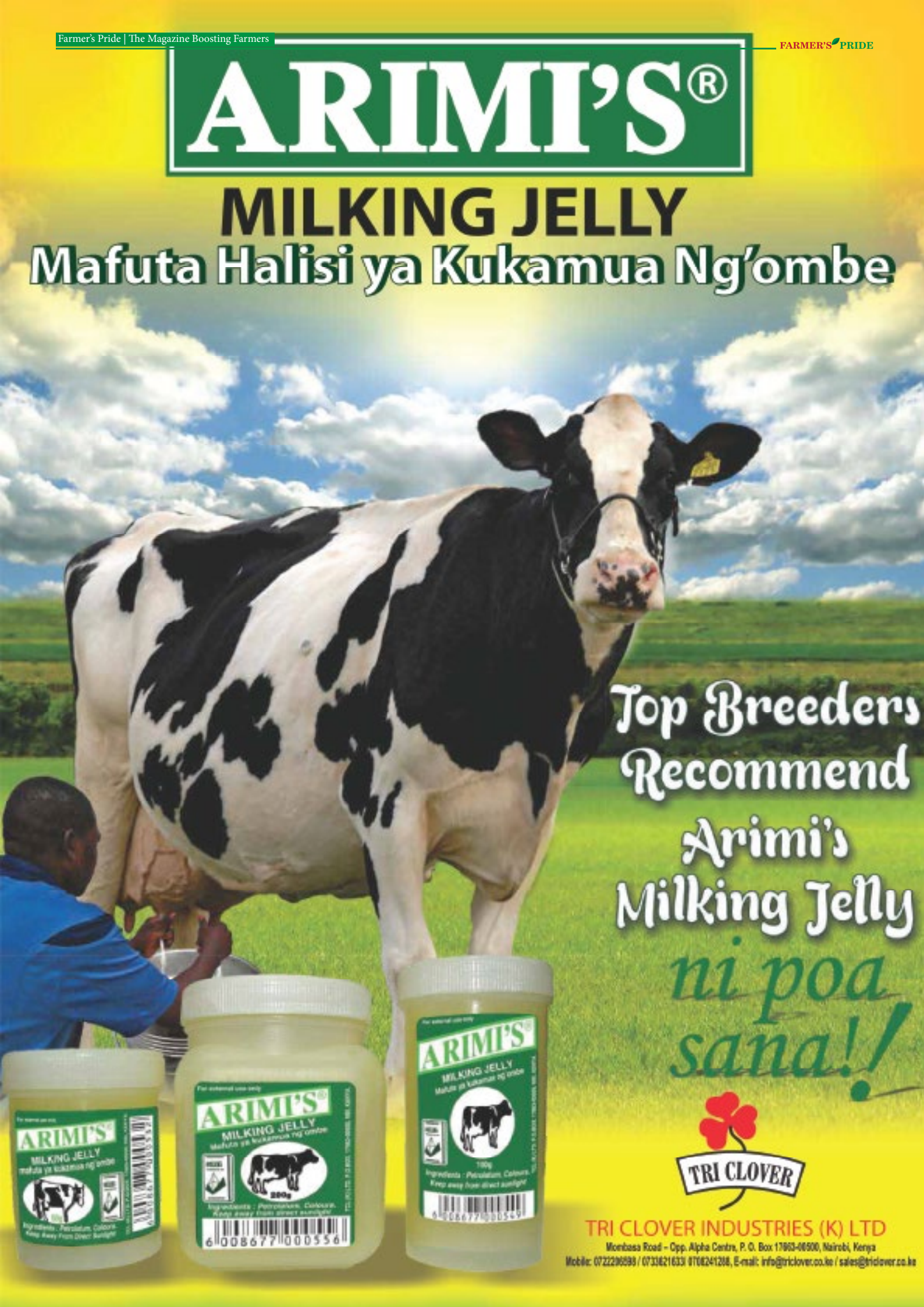


Cattle feeding in a trough

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Calliandra Contains High Levels Of Protein

From page 30

cannot afford dairy meal may make homemade rations that include calliandra and other other forage supplements.

High level protein

Calliandra contain high levels of protein (20-25% crude protein) which is far more than the amount available in basal diet. On the average grasses contain about 8-10% protein in the wet season and less than 7%in the dry season. Protein is important in increasing milk production and maintaining good health. However, digestibility of calliandra is low (about 40%) probably due to the presence of chemical known as tannins that bind to protein and affect the ability of the animal to digest the proteins.

Roughly 3 kilograms of fresh calliandra leaves gives about the same milk yield as one kilogram of commercial dairy meal(which usually has about 16% crude protein).on average most farmers who can afford commercial dairy meal feed their dairy cows with about two kilograms per day.

Some of these dairy meal food be replaced with calliandra and other forage suppliments .The substitution rate will vary considerably from farmer to farmer according to factors such as size and health of the animal, composition of the basal diet and the level of milk production. Due to high level of energy in dairy meal a combination of calliandra and commercial dairy meal gives the highest milk yield.

Farmers who cannot afford dairy meal may make home-made rations that include calliandra and other forage suppliment. For example a mixer of maize bran and calliandra forage at the ratio of 2:1 can improve the level of nutrition greatly. If using tree forage alone, feed 6-10 kilograms of fresh leaves per cow per day, and if in combination, feed one kilogram of dairy goat would need about 0.5 to 1 kilogram of tree fodder.

To be able to feed these amounts throughout the year the farmer needs to plant about 500 per cow which would occupy about 250 metres of land planted in single row hedges .A dairy goat would need about 150 trees. Calliandra leaves can be fed either fresh or dry. When feeding with succulent stems (up to 1 centimetre thick), which the animal can digest easily. If they are to be fed dry, the leaves should be dried under shade so as to minimize the loss of nutrients. Dried leaves of calliandra can be stored for a long period, for instance for feeding the animals during the dry period. However, drying can cause loss of nutrients and, hence, it is better to feed the leaves fresh, just after cutting.

The benefit of feeding livestock with calliandra compared with commercial dairy meal can be assessed both in terms of savings in money, time and effort and in term of increased milk production.It is easier and cheaper to meet the protein requirements of dairy animals from protein requirements of dairy animals from plants grown on the farm than through commercial dairy meal.

Other benefits of calliandra

Firewood

Calliandra dries quickly, and it burns well after only three days of drying. It burns steadily with little smoke. It can also be made into quality charcoal. The tree produces plenty of fuelwood, because it grows fast and produces multiple branches when coppiced.

Soil fertility improvement and erosion control

The deep root system of calliandra assists incollecting nutrients that are too deep in the soil reached by the crops, helping to bring them back to the soil surface forcrop use. The process of bringing back the nutrients to the soil surface involves the use of manure that comes from animals fed with calliandra and also from calliandra leaves that fall off and decomposes.As leguminous tree, calliandra improves the nitrogen status of the soil through its ability to trap nitrogen from the air, thereby enhancing soil fertility. Animals fed with calliandra leaves produce manure quality, because calliandra leaves, like those of other leguminous plants, have high nitrogen content. Calliandra hedges planted along soil-conservation structures provide the additional benefit of stabilizing these structures, thereby reducing erosion.

Bee forage

Bees enjoy calliandra flowers, and they are usually seen in the morning and evening collecting nectar from these flowers. Thus, farmers can benefit by placing bee-hives where calliandra is allowed to grow big and produceflowers, for example where it is planted for seeds, fuelwood or stakes. However, for seed production, the tip ofthe main shoot can be nicked when the tree is about 2.5metres(8 feet) tall to facilitate seed harvesting.

Poles and stakes

When coppiced, calliandra can produce large quantities of stakes and poles within a very short period.The stakes could be used for supporting tomatoes and climbing beans or for other horticultural purposes.

Research To Boost Legume Farming

From page 15

continued to deny the country of its potential to import more dry beans.

This has led to poor quality seeds as farmers have continued to rely on old varieties whose seed potential is poor and are very susceptible to drought and pests.

The country currently produces 400 000 tonnes per year against a demand of 600 000 tonnes per year. The deficit is usually sourced from Uganda and Tanzania

According to FAO findings, many of the world's poorest people, legumes are the major and sometimes only sources of protein and fat. Grain and forage legumes are grown on some 180 million hectares or 12 to 15 percent of the earth's arable surface.

Grain legumes like beans are key components in the diets of resource-poor people in the developing world, especially those that cannot afford to supplement their diets with meat. Legumes also generally attract higher market prices than other staple crops.

Another attractive feature is their ability to fix nitrogen thus reducing the need for fertilizers. Legumes can also help replenish nutrient-depleted soil.

Despite their numerous benefits in health, income creation and soil rehabilitation, relatively little research attention has been focused on legume crops in comparison with cereals.

In Sub- Saharan Africa, legume productivity is lower than anywhere else in the world. This has put considerable strain on the foreign exchange pool of African countries.

For example, it has been estimated that Kenya spends about 40 per cent of its foreign exchange on the import of fertilizer. They could probably reduce their expenditures on fertilizer imports through full exploitation of biological nitrogen fixation (BNF) which is gained from growing legumes. For the last two decades, the Kenya Agricultural and Livestock Research Organization (KALRO) has undertaken research on BNF.

Most of this research has drawn from previous efforts of the colonial agricultural research system to develop nitrogen inoculants for pasture legumes, in order to raise the livestock productivity from exotic breeds of cattle.

The research has demonstrated that the common bean (Phaseolus vulgaris) has the potential of fixing nitrogen up to the equivalent of 50 kg of nitrogen per hectare per year.

After a long time since the last release of improved bean varieties, five new bean lines were recommended for pre-release by the bean national variety release technical committee in Kenya Plant Health Inspectorate (KEPHIS) in early 2006.

KEPHIS has the national mandate of testing bean varieties submitted by breeding programs in Kenya. The demand for beans in the country exceeds local production levels.

Bean farming among the Kikuyu in Kenya provides a case in point. Available evidence indicates that in pre-colonial times a large variety of different bean species was cultivated in the Kenyan uplands. Beans moreover constituted a critical element of the diet of rural people, furnishing a rich source of protein to complement maize consumption and other available foodstuffs.

In particular, the varieties of indigenous black beans termed "njahi" in Kikuyu (Nigerand Dolichos), which were cultivated by women, constituted a good proportion of the harvest.

Beans in Kenya are predominantly a small landholder crop, largely farmed by women to feed their families. Traditionally, women tended to grow multiple varieties on the same field and to conserve multiple seed stocks as a hedge against disease and unpredictable climate.



A variety of beans grown in Kenya

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