

## New year, new beginning!

**M**ost farmers want 2009 to be quickly forgotten! The economic melt-down, unpredictable weather conditions and floods that affected most of the African continent, put most farmers at risk.

In Kenya, Africa's milk hub, the devastating drought has caused widespread hunger and thirst and, in the case of cattle, many deaths were recorded. Photographs of hundreds of cow carcasses being tipped into a mass grave near Nairobi, emphasised the scale of the disaster.

The current drought is the worst since 2000, and one in every ten Kenyans is now in need of outside help. Many areas have suffered as much as four consecutive failed harvests. Meanwhile the rate of malnutrition among young children – already above emergency levels in some areas – are rising, and cattle are dying in their thousands.

Climate change is a reality that is with us to stay. As one devastating drought follows another, the future is bleak for millions in east Africa. Next year *Dairy Mail Africa* plans to focus on climate change in a bid to educate our readers. Our thanks to ESADA for endorsing the dairy sector climate change policy.

This edition of *Dairy Mail Africa* focuses on feed and we trust that the practical and valuable advice given, will assist farmers to counter the effects of climate change and drought.

We hope and believe that 2010 will be a better year. The economy is set to look positive. The FIFA 2010 World Cup to be hosted by South Africa, is a stone's throw away. Thirty-two teams will be competing for gold and we hope all the fans, footballers, supporters, heads of government and delegates will have a litre or two of milk daily.



In South Africa, we look forward to the All Africa Dairy School & Expo, which will be held in April. This is an event not to be missed. See the advertisement elsewhere in this edition for more information.

We also look forward to seeing all of our readers and contributors in Rwanda next year, when that country will be hosting the ESADA conference. We wish the organisers the best of success with their arrangements.

Season's greetings to one and all.

**Editor**



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**On the cover:** A farmhand from Kipkaren Division in Kenya, making feed

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# Briefly | Africa

## **Super dairy farm now operational**

President Hifikepunye Pohamba recently officially inaugurated the Aimab Super dairy farm situated just outside Mariental in Namibia. The farm was built at a cost of N\$120 million by Namibia Dairies, a subsidiary of the Ohlthaver & List group of companies.

The Aimab super dairy farm already produces 30 000 litres of milk per day from about 1 000 cows, accounting for approximately 50% of the country's milk needs. The farm was built with technology from Israel and South Africa.

The farm has four cow houses accommodating 400 dairy cows each. Next to the milk production plant, some 250 hectares are being cultivated to produce fodder for the cows. About 30 000 tons of fodder is required annually. According to Namibia Dairies, farmers nearby will also be contracted to produce lucerne and hay for silage.

The Development Bank of Namibia and the Agricultural Bank of Namibia (Agribank) funded the project. – *New Era*

## **Dairy body warns of fake products**

Uganda's Dairy Development Authority (DDA) has warned the public against buying and consuming fake milk powder. The market has been filled with adulterated milk products of Nido, which are packaged in old tins. Agnes Baguma, DDA head of quality control, said: "The seals to the product in question have been tampered with and resealed using super glue."

Baguma said in an interview that during a marketing survey by the Uganda National Bureau of Standards, two tins of fake Nido were found in lock-ups 003 and 030 in the new taxi park. She said the case was reported to the police and in-

vestigations were continuing. Baguma added that the tins were old and contained low quantities of milk powder and a lot of sugar. In Uganda Nido is imported by Translink LTD and supplied to by Transglobe LTD.

Raj Thakrara, the managing director of Transglobe, said quality and regulatory experts had arrived from Nestlé Foods Kenya Limited in Nairobi, the company that manufactures Nido, to identify the fake products and withdraw them from the market. – *New Vision*

## **Clover to invest in Zambia**

South African dairy and food processing giant, Clover Group, will invest US\$520 000 in the initial phase of its entry into Zambia, which would see the country transformed into a processing and distribution hub for the southern section of sub-Saharan Africa.

Clover Africa business development manager, Pieter Uys, said the group had decided to enter the Zambian market in order to make Zambia a processing and distribution hub for its products. At the launch of Clover Zambia in Lusaka in August, Uys said the Clover group wanted to make a footprint in Africa and saw Zambia as a strategic entry point.

"We want to grow in Zambia as a dairy production and processing hub for the region and we expect to export dairy products from Zambia to countries such as the Democratic Republic of Congo and Malawi," he said.

Uys said the company, which aims to capture 20% of market share in the first year of operation in Zambia, would also like to contribute to national food security by helping to increase milk production.

He said there is potential for milk processing and consumption in Zambia, where total milk intake was below 20 million litres per year. According to 2006 figures by Parmalat Zambia, the total milk intake was 19 650 000. – *Zambian Times*

### Angolan dairy potential restored

The Angolan government is rebuilding the country's dairy potential that existed before the armed conflict. This information was released recently in Luanda by the deputy minister of agriculture, José Amaro Tati. Tati was speaking at the end of a visit to the Angola dairy company (Lactiangol), accompanied by the Portuguese minister of agriculture, rural development and fisheries, Jaime Silva.

Meanwhile, the Portuguese minister said Latinagol is a plant of the future, adding that the country is growing and the Angolan population needs to eat well.

Lactiangol director, José César Macedo, said the country's milk production is still insufficient to cover its needs. Lactiangol produces 50 000 litres of milk, 7 000 litres of yoghurt, 6 000 litres of ice-cream and 3,5 litres of cheese daily. – *Angola Press*

### Support for Zambian milk producers


The United States African Development Foundation (USADF) has signed an enterprise expansion grant agreement with Mpima Dairy Producers Cooperative Society (MDPCS). MDPCS is a small-scale milk production cooperative in the Central Province of Zambia. USADF funds will help the cooperative and its members produce more milk, which will then be sold to meet market demand. USADF's support to enable milk processing, will stimulate economic growth, create jobs within the community and improve the income of MDPCS members.

To date, the cooperative has expanded from 34 to 49 members, and is looking to employ four additional employees to help implement this project. – *Press release*

### Expired products sold in Ghana

Investigations by the *Ghanaian Journal* has revealed that certain products on the market, are past their consumption expiry dates. Products such as Tampico and Fan Ice from Fan Milk Ghana Ltd were being sold after having expired.

Three Fan Milk Ghana vendors also confirmed that they have been receiving complaints about the weird taste. However, Angel Nelson, Fan Milk Ghana LTD quality assurance manager, blamed the company's agents and described them as neglectful in their handlings of the products.

According to Nelson some retail shops purchase and store the products for too long periods, before selling them. – *Ghanaian Journal* 



# Feed your cows the **milk shrub**

by Fidelis Zvomuya (Photographs supplied by EADD)

*"It takes approximately 500 shrubs of calliandra calothyrsus (Kalibwambuizi in Swahili) to feed a cow for a year. For 3 kg of calliandra and 1 kg of dairy meal, a farmer can get an extra two litres of milk from his/her cows," explains Maria Muthamia, a dairy farmer in Eldorate, in Kenya's Rift Valley.*

Muthamia says that with the plant maturing in approximately 12 months, *calliandra calothyrsus* can be pruned and fed to livestock for up to 20 years. "We grow the shrubs in hedges around the farm perimeter or along contour ridges to reduce erosion. The major advantage of calliandra and other fodder shrubs such as *Trichandra* and *Mulberry*, is that farmers do not have to stop growing other crops to make room for them," she says. It is best to prune the shrubs to a height of about one metre to avoid shading nearby food crops.

### Fodder shrubs

*Calliandra*, introduced in 1995 for the first time in East Africa, was meant to resolve a problem that has plagued dairy farmers for generations, namely the lack of inexpensive high protein animal feed.

According to the World Agroforestry Centre (ICRAF), smallholder dairy farmers' use of the shrubs in Kenya, Uganda, Tanzania and Rwanda is increasing rapidly, although it is still only being used by an estimated 5% of dairy farmers.

In an interview with *Dairy Mail Africa*, ICRAF director-general, Dennis Garrity, he explained that the shrubs are easy to grow and improve soil fertility. Garrity says with grazing land in short supply, and because of periodic drought, raising animals in Africa is a risky business that can easily defeat even the most skilful farmer.

### Produce more milk

According to Garrity, fodder shrubs do not involve cash expenses or require farmers to take land out of production. Instead, dairy producers substitute small amounts of family labour for cash that would otherwise be spent purchasing

commercially packaged feed.

Cost analysis studies show that Kenyan farmers who plant an average of 500 fodder shrubs, are able to increase farm income by between \$95 and \$120 per year. Because at least half the farmers involved are women, the funds are typically used to pay for school fees or household improvements. Annual net returns in 2006 totalled some \$8 million in Kenya alone.

According to Muthamia, her milk production more than tripled in five years' time. "Now I get more than 22 litres per cow daily, up from a mere 12 litres in 1996," she says. "My customers also say the milk has a higher protein and butterfat content."

Animals fed on calliandra produce thick milk and good fat. Not only does the shrub help animals to produce more milk – it also boosts their health, especially when mixed with animal feeds.

Muthamia got her first 400 seedlings of *calliandra calothyrsus* and within a year she was already feeding her cows on the fodder. "The leaves and pods of calliandra are rich in protein. They constitute 40-60% of all ruminant feeds needed," she says. Calliandra contributes 25% to animals' diet, compared to elephant grass and other grasses which contribute between 8% and 10%.

### Save money

Small-scale dairy producers in Africa are faced by high input costs and low returns. Most of them say feed costs account for nearly 80% of their input costs. ICRAF estimates that nearly 50 000 African farmers can feed their dairy cows this year with "milk shrubs".

East African farmers who have adopted the technology, are producing enough milk in a one-year period and saving money on purchased feeds, to increase profits by Sh8 000 a cow. Researchers project that within a decade, the overall benefits in East Africa could exceed Sh7 billion a year.

According to the Craft Systemwide Livestock Programme, they recently invested Sh11 million to help nearly 20 000 farmers plant some 6,5 million shrubs. This generated a net return of nearly Sh188 million a year.

Farmers who cannot buy specialised dairy feeds, can mix 2 kg of calliandra with other feeds such as maize bran (1 kg), one part shrub fodder (chopped and mixed with other protein-rich materials) to every three parts of Napier or other grass. If a farmer is not feeding dairy meal, feed each cow 6-10 kg of fresh fodder per day. If fodder and dairy meal are mixed, then feed 6 kg fodder and 1 kg dairy meal per cow per day.

When drying *Calliandra*, do this in the shade to avoid the loss of nutrients. The dried leaves can be stored for a long time. Before feeding animals on calliandra, cut it into 2,5 cm pieces so that animals can consume it faster. One mature cow needs approximately 500 shrubs throughout the year, while a mature goat needs about 150 shrubs.

### Where and when to plant

Calliandra grows well and fast, especially near lake shores and around hills, and in areas with coffee trees. After a year, the shrubs can be harvested every 8-12 weeks. Cut back to approximately 15 cm after 6-7 years to promote new growth.

It is advisable to start planting calliandra during the rainy season. The planting holes should be approximately 20 cm wide and 60 cm deep and one metre apart. In drylands, the holes have to be large enough to store more water. The topsoil is mixed with manure and thrown back into the hole.

For easy seed harvesting, maintain the shrub at a height of 2 m.

A farmer can put manure or decomposed plant material mixed with new ash around the plant. This helps calliandra to grow well in poor soil and also repels termites.

Shrub trunks are prone to pest attacks. As a solution, mix washing powder and water, and spray on the attacked part of the trunk, using a pump.


Tiny insects that can attack the trunk, can be eradicated by destroying their nests. One can also smear wet cow dung or used car oil on the trunk or spray ash around the stem to repel them.

### Feeding your cows

An important observation by ICRAF is that 87% of farmers who cultivate legumes, are able to use them for feeding their cows all year round. Growing and feeding legumes is positively associated with cow herd size.

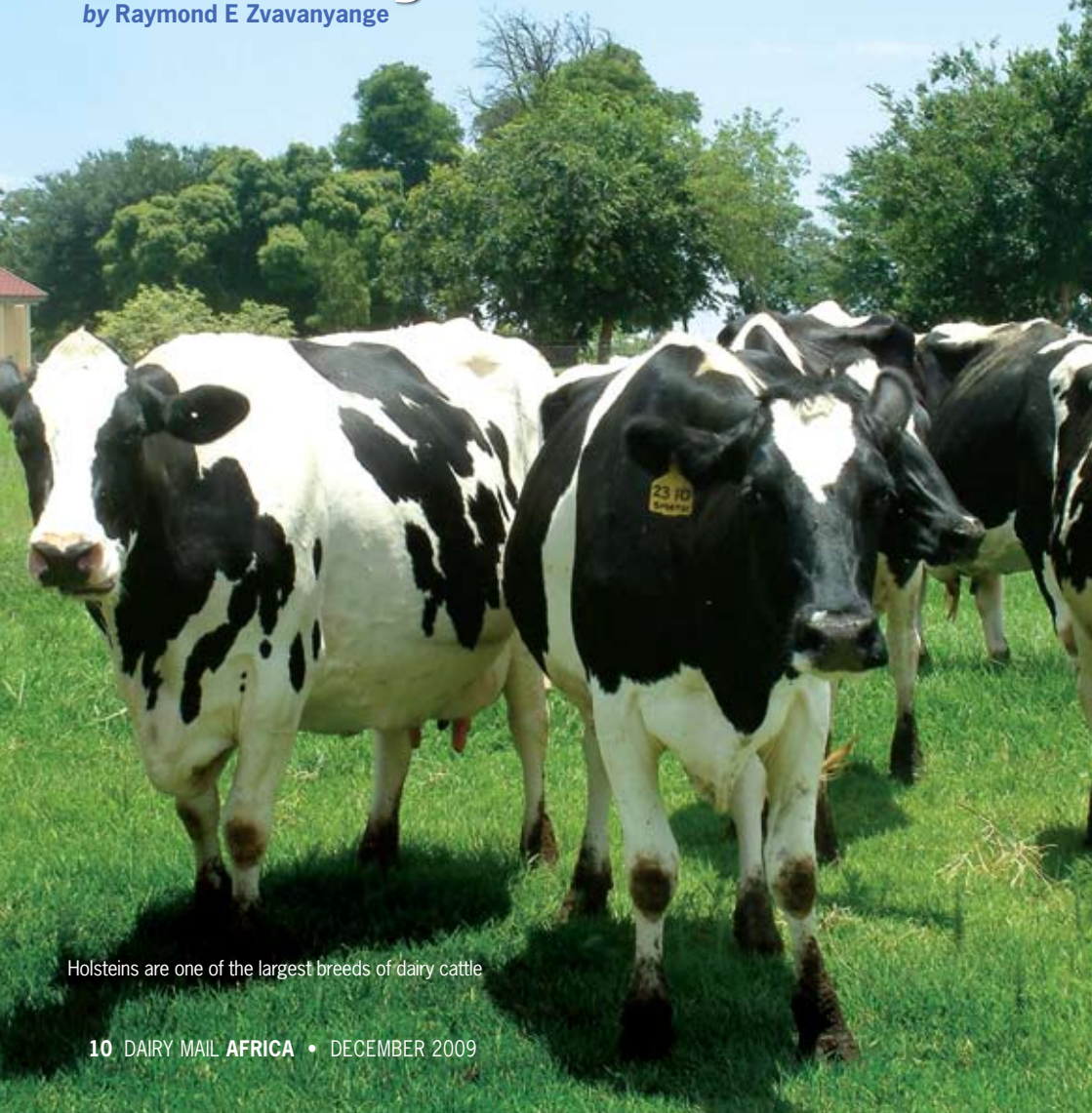
Farmers must also know that before they can start balancing their dairy cow rations, they must study each animal's nutrient requirements.

Different feeds or combinations of feeds can maintain high production levels, growth and health. There is no single type of feed that, on its own, can ensure successful dairy cow feeding. The quality of the ration is determined by a combination of feed types and the palatability of the mixture. For profitable milk production, a cow must eat a ration with sufficient nutrients to satisfy each of her nutrient requirements.

Feed requirements are also influenced by the amount of milk produced and its butterfat content. Heifers calving for the first time generally have additional requirements to enable them to reach mature body mass. During pregnancy, feed requirements increase to provide for the undeveloped foetus. 

# A concise "dictionary" of dairy terms (Part 1)

by Raymond E Zvavanyange



Holsteins are one of the largest breeds of dairy cattle

Speaking at the graduation ceremony on 8 October 2009, the principal director in the division of livestock and veterinary services under the ministry of agriculture, mechanisation and irrigation development of Zimbabwe, Dr Stewart Hargreaves, highlighted the need to regularly dose, dip and vaccinate animals.

Technical language involving terms such as dosing, dipping and vaccination is only understood by personnel with training and exposure in the relevant fields. It is thus possible that among the graduates, there were some who might still be struggling with other technical terms.

In the same vein, the ever increasing need to conform to the same standards, methods, regulations and operations in the dairy industry, makes it paramount for dairy farmers and stock persons alike to be conversant with all technical terms.

This first article in a series of three, aims to generalise most of the common terms used, thus making dairy farmers technically competent. The following areas are covered: Breeding and genetic improvement, feeding and nutrition, dairy calf and heifer rearing, milk production and herd health. We will cover the first subject (breeding and genetic improvement) in this edition.

These articles on definitions are not meant to be a complete "dairy dictionary", as it is not exhaustive of the known existing terms. Rather, it is meant to initiate a process where dairy farmers and stock persons alike know what they mean when they use certain terms at the farm.

### Breeding and genetic improvement

**Artificial insemination (AI):** Use of artificial means for reproduction purposes where the semen is deposited in the female reproductive tract. It is the means of reproduction recom-

mended for most dairy farms, as it reduces costs in bull maintenance.

Through AI, superior and proven sires in one part of the world have been tested and proven in other parts of the world with numerous benefits. The date of insemination must be recorded to work out the due date or return to oestrus (heat).

**Breed:** Refers to animals having a common origin and characteristics that distinguish them from other groups of animals of the same species. An example of a dairy breed is the Holstein-Friesian. It is one of the largest breeds of cattle and is black and white in colour. Standard weight is 567 kg for cows and 816 kg for bulls. Meat quality is excellent.

Holstein-Friesian milk has a butterfat percentage of 3,64. Friesian-Holstein milk yield (kg) per lactation is 7 245 kg. The above averages are different for other dairy breeds, e.g. Jersey or Guernsey.

**Breed average:** The average production of animals within a breed, e.g. Holstein – 3,64% butterfat, and Ayrshire – 4,01% butterfat (National Milk Recording Scheme Zimbabwe, 2001).

**Cell:** The basic unit of all living tissue.

**Conformation:** The shape and arrangement of the different body parts of an animal.

**Cross-breed:** The progeny from crossing two breeds, lines or strains. The parents may be purebreds or grades. The reasons for crossbreeding could be (1) changing enterprise, e.g. beef to dairy and (2) to increase the fat percentage in milk or the amount of milk to satisfy market demands. Crossbreds now form the largest proportion in smallholder dairies.

**Culling:** Refers to the removal of poorest or injured animals from the dairy herd. In theory, any individual cow should be culled regardless of age if there is a heifer available that is expected to outperform her. Excessive culling will increase the proportion of young cows in the herd, further reducing herd yield as yield



There are a number of functional traits of form, rump, legs, feet, udder and teats, each of which gets a rating when one does scoring of a dairy animal

tends to increase with parity up to the 5th or 6th lactation. Culling is most effective when there are accurate records.

**Dam:** Mother.

**DNA:** (Deoxyribonucleic acid) The chemical compound that makes up the basic structure of the genes.

**Fertility:** A measure of the ability of the female to conceive and produce offspring, or of the male to fertilise the female.

**Genetic engineering:** Modifying the genetic constitution of the animal directly through manipulation of genes. (A gene is a minute length of chromosome and is found in the nucleus of a cell).

**Grade:** Any animal not purebred, that possesses the major characteristics of a breed, is classed as a grade of that breed.

**Herd book:** Permanent record of the identification and ancestry of a breed.

**Parity:** Refers to giving birth once. Parity increases with an increase in the number of births.


**Parturition:** Calving, the state of calving. Another name for calving is "freshening".

**Pedigree:** A record of ancestry.

**Purebred:** Cattle that trace back through all lines to the foundation cattle of that breed. All "registered" cattle are purebreds. Another term for purebred is full-blood.

**Scoring:** Estimating the amount of fatty tissue under the skin of certain areas of the cow's body and an indication of body reserves. In linear scoring the objective is to breed better functional characteristics that will allow the cow to produce more milk over a long period of time. There are a number of functional traits (characteristics) of form, rump, legs, feet, udder and teats each of which gets a rating or score. When the scores are added, the final score represents the degree of physical perfection of any given animal.

**Sire:** Father.

**Teaser:** A vasectomised male that acts as a normal male, but cannot pass any viable sperm. 



# Milk report

**A**frican rural economies have been particularly hard hit by the changes linked to globalisation. In the animal production sector in particular, regional trade in animal products and imports from the global market are increasing. These changes stem from the liberalisation of African economies as a result of regional integration policies and international trade agreements.

Between 1994 and 2004, powdered milk imports into West Africa trebled. The problem is that not all stakeholders in local supply chains are capable of resisting such competition. On the contrary, they do not all have the same potential to respond to the new forms of competition and new possibilities in terms of outlets. Globalisation thus risks exacerbating inequality.

African trade in livestock and livestock commodities is currently far below what is required to support the level of economic development needed on the continent. Based on annual averages for the period 2000 to 2006, Africa produces 31 million tons of dairy products (milk equivalent) annually (FAOSTAT, various years), but consumes 12,8 million tons and 36,4 million tons respectively.

**Importation figures**

Approximately 5,3 million tons of dairy products are imported annually to meet the deficit in consumption. More than 15% of dairy products consumed are imported. Of the total dairy products produced, only 1% is exported respectively. Africa

accounts for 3,8% of world trade in dairy products.

In general, imports of dairy products increased by 3% per year between 1990 and 2006. The deficit (net imports) in dairy products rose sharply from US\$1,4 billion in 2001 to US\$2,2 billion in 2006.

The continent spends US\$3,6 billion a year in order to meet the deficit in consumption of meat and dairy products. This deficit represents 0,5% of sub-Saharan Africa's GDP and constitutes a valuable foreign exchange loss that would otherwise be used for other development purposes.

**Fact sheet**

- Africa accounts for 5% (31 million tons) of global dairy production.
- Africa consumes 36,4 million tons of dairy products a year.
- More than 5,7 million tons of dairy products are imported annually to fill the deficit.
- One per cent of dairy products produced in Africa are exported.
- Africa accounts for only 3,8% of global trade in dairy products.
- Exports of dairy products have declined since 2000.
- Africa earned less than US\$1 billion from exports of meat and dairy products and live animals in 2006.
- Africa spent US\$4,5 billion to import meat, dairy products and live animals.

**TABLE 1: Milk production by region**

Commodity	Production (Int \$ 1 000)	Production (MT)
<b>Africa</b>		
Cow milk, whole, fresh	6 923 134	26 578 917
<b>East Africa</b>		
Cow milk, whole, fresh	2 420 118	9 100 241
<b>Middle Africa</b>		
Cow milk, whole, fresh	156 139	587 122

Northern Africa		
Cow milk, whole, fresh	3 032 768	11 804 000
Buffalo milk, whole, fresh	1 148 850	2 300 000
Goat milk, whole, fresh	520 291	1 769 700
Southern Africa		
Cow milk, whole, fresh	832 211	3 275 500

TABLE 2: Milk imports by region

Commodity	Quantity (tons)	Value (1 000 \$)	Unit value (\$/ton)
Africa			
Milk whole dried	390 497	1 447 043	3 706
Milk skimmed dry	186 300	747 883	4 014
East Africa			
Milk skimmed dry	16 390	59 406	3 625
Central Africa			
Milk whole dried	22 471	101 538	4 519
North Africa			
Milk whole dried	196 481	760 232	3 869
Milk skimmed dry	121 424	505 040	4 159
Cheese of whole cow's milk	57 780	217 327	3 761
Milk whole dried	196 481	760 232	3 869
West Africa			
Milk whole dried	147 909	510 857	3 454
Milk skimmed dry	34 405	131 650	3 826

TABLE 3: Milk exports by region

Commodity	Quantity (tons)	Value (1 000 \$)	Unit value (\$/ton)
North Africa			
Cheese of whole cow's milk	31 647	65 018	2 054
Algeria			
Milk whole dried	205	426	2 078
Angola			
Cow milk, whole, fresh	13	11	846
Burundi			
Milk skimmed dry	10	6	600
Congo Brazzaville			
Milk whole con	27	23	852

Source FAOSTAT 



# Make hay while the **SUN** shines!

by Brain Dugdill, EADD chief advisor

*“Making hay while the sun shines” is an old English saying. Basically it means using the good times to provide for the bad times! The same is true for making your dairy cows profitable. Cows are only profitable if they produce enough milk. And cows can only produce enough milk if they have access to enough feed, during the good times (the wet season when grass grows well) and during the bad times (the dry / winter season or droughts).*

In Kenya, Rwanda and Uganda feed is arguably the most important component of milk production, representing up to 70% of a farmer's production. Good quality cows will only produce good quantities of good quality milk if they have access to sufficient quantities of good quality feed and clean water.

The three golden EADD “rules” for dairy cow feeding should include:

### 1. Feeding balance

A dairy cow requires feed for milk production, body maintenance, her own growth and, if pregnant, for the growth of her calf. Just like humans, a cow needs a ration that is balanced in energy, protein and minerals. An unbalanced ration leads to decreased milk production, poor body condition and fertility problems, i.e. fewer calves, all of which contribute significantly to reduced productivity and profitability per cow.

To produce milk and optimise the profitability of each cow, it is essential to have a farm feeding plan to get the right **quantity, quality and balance** of feed. This includes unlimited access to **clean water** – a cow producing milk may drink upwards of 60 litres a day, unlimited access to roughage, such as improved pasture, Napier grass, maize stover, *Leucaena*, hay, silage, etc and a calculated amount of **concentrates** related to milking potential.

### 2. Feeding according to production potential

Dairy advisers (usually those who are office-bound like me these days) often say you can only get out of a dairy cow what you put in.

This is only partly true! Each animal is different; a well-managed, low-maintenance, low-cost cross-breed cow is almost always more profitable than a poorly-managed, high-maintenance, high-cost pure breed cow. In our East African situation, it's almost always easier to manage a cross-breed cow, especially for dairy farmers just starting up.

The basic building block of balanced feeding, is good quality roughage such as Napier grass with a dark green colour and about 2-3 feet tall, not overgrown with a yellowish colour and 5-6 feet tall. Roughages such as maize stover, banana stems, mature yellowish Napier grass and silage made from chopped Napier grass are all low in protein.

*“A dairy cow requires feed for milk production, body maintenance, her own growth and, if pregnant, for the growth of her calf”*

To compensate for this, feed roughage from pastures improved with protein-rich grasses such as *Desmodium* and *Cloris gayana* (Rhodes grass) or legumes or, if you can afford the investment, from *Leucaena* fodder trees. As a rule of thumb, the feed trough should never be empty if your cows are zero-grazed. If your cows are free or paddock-grazed, the pasture should be plentiful and improved with ‘high protein’ grasses or legumes.

A large cow, e.g. Friesian, Ayrshire or large cross-breed, needs 90-110 kg of roughage per day; a smaller cow, e.g. Jersey, Guernsey or smaller cross-breed, needs 65-85 kg per day. This will produce 7-8 kg of milk per day.

Additional milk production can be achieved by feeding your cow concentrates and mineral supplements. Another rule of thumb is that one kg quality concentrates will produce about 1,5 kg of milk. Thus, if your cow is capable of producing up to, say 12 litres daily, you should feed about 2,5 kg of concentrates. Feeding any more is a waste of your hard-earned money!

Concentrates is the generic term used for feeds such as dairy meal or cubes. Concentrates are manufactured dairy feed ingredients balanced with the right amount of protein (16%), energy, minerals and vitamins.

Other concentrates such as maize bran, rice bran, brewer's waste, etc are rich in protein but poor in energy. On the other hand molasses is a high energy feed. There are many types of concentrates on the market, some of good quality, some of not-so-good quality.

### **3. Feeding according to locally available feed resources**

In our three countries we have different feed resources available at different time of the year. Using home grown or locally available feed resources keeps feed costs down, enables feed quality to be closely monitored and makes farmers independent of feeds from other areas.

In our EADD situation we encourage our dairy farmer business associations (DFBAs), farmers and BDS service providers to set up feed mills to make dairy concentrates from locally available crop residues. These are plentiful and cheap at harvest time.

### **Hay-making**

Good quality roughage is the basic element of profitable milk production. Good conserved roughages, such as hay, can be produced in great abundance in the milksheds where our project operates.

Hay is a generic term for grass or legumes that have been cut, dried, and stored. Hay making in one form or another has been practised around the world by farmers for millennia. It is thus a well-trying and tested, practical technology that works, especially for feeding dairy cows in the dry season or for coping with drought conditions when pasture or green feed is not available.

*“In our three countries we have different feed resources available at different times of the year ”*

Three golden EADD “rules” for good hay-making may be considered by EADD farmers:

#### **1. Growing good quality grass**

Hayfields do not have to be reseeded each year in the way that grain crops are, but regular fertilising improves hay yields. In most of our EADD milksheds there is plenty of pasture, but it is of very poor quality.

The yield and quality of hay produced by poor pasture can be improved significantly by over-seeding every few years with, for example, Desmodium or legumes. This can be done by hand broadcasting seed, or by using a pointed stick to plant individual seeds. Fencing off part of your pasture for hay also helps.

Legume seed and foliage are comparatively higher in protein than other grasses. Well-known legumes suitable for use by EADD farmers include clover, pea, and vetch. Alfalfa is a legume usually grown by large farmers.

#### **2. Harvest the grass at the right time to make good quality hay**

Hay making involves a stepped process of cutting, drying or curing in the field, process-

ing and storing. Whether done by hand or using modern mechanised equipment, tall grass and legumes at the proper stage of maturity should be cut and allowed to dry in the sun, then raked into long, narrow piles known as windrows. Next, the dried hay is gathered up, usually by some type of manual or mechanised baling process.

### 3. Storing and feeding the hay properly

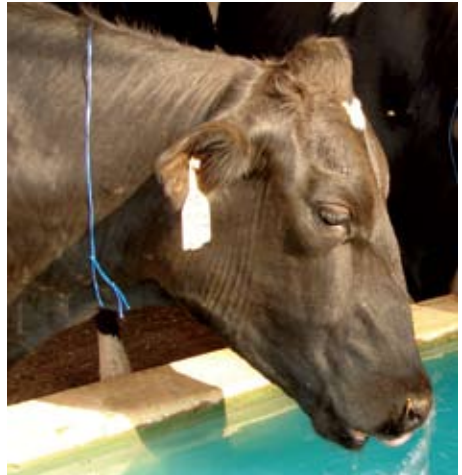
Hay must be fully dried when baled or harvested loose, then piled into a haystack or a shed to protect it from moisture and rot. If hay is baled while too moist or becomes wet while in storage, there is a significant risk of spontaneous combustion, i.e. the hay may catch fire.

Some of the advantages of baled hay when compared with loose hay are: (i) reduces losses of more nutritious and digestible leaf matter; (ii) cheaper to transport and improves storage capacity on the farm by up to 50%; (iii) enables more accurate feed budgeting, as the number of bales can be counted.

Hay is best fed opened-out in racks above the feeding trough in the stall or in racks in a field so that wastage is minimised.

### EADD Haymaking Handbook

A *Haymaking Handbook* will soon be published in the pages of *Dairy Mail Africa*. The handbook will describe practical coping strategies, including hay banks at farm and DFBA level, for dry season and emergency feeding, e.g. during prolonged drought – hay may be stored for many years, silage cannot. DFBA may also own haymaking equipment (tractor, mower, tedder, baler, etc) for contract haymaking and storage for milk producers. In Kenya, EADD will help set up 10 000 fodder farming businesses.



A cow producing milk may drink upwards of 60 litres a day and therefore needs unlimited access to clean water

### More information

If you would like to learn more about haymaking or some of the more technical aspects of feeding dairy cows such as feeding value, dry matter intake, digestibility etc, ask your local DFBA service provider or local EADD dairy feed team for support. Information may also be obtained from our EADD Information Offices or website [www.eadairy.org](http://www.eadairy.org)

#### Kenya Country Office:

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E-mail [info@eadairy.org](mailto:info@eadairy.org)

#### Rwanda Country Office:


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(Sources for this article available from the author.) 



## East Africa Dairy Development

In partnership with



### Highlights from Uganda by Beatrice Bamulesewa Nabwire

EADD has continued to assist farmers to organise themselves into dairy farmer business associations (DFBAs) and dairy interest groups (DIGs). DIG is an approach to enhance farmer mobilisation and increase access to the EADD service package, which include organising farmers and strengthening farmer organisations, access to affordable production technologies such as artificial insemination (AI), improved feed and fodder production, access to markets and capacity building of BDS service providers.

### Training and demonstrations

Farmer training is continuing, using the approach of farmer trainers. Previously, EADD Uganda selected and trained farmer trainers. Farmer learning trips/exchange visits and field days also provide practical learning approaches for farmer-to-farmer exchange of knowledge, information and skills.

Fodder demonstration gardens continue to be established by host farmers. So far 172 demo plots/gardens have been established.

To improve milk production, EADD is actively promoting the use of AI. AI centres are operational and have been equipped with semen banks and liquid nitrogen storage tanks. A total of 4 745 inseminations had been completed by October 2009.

Farmer mobilisation is continuing and has increased to over 9 000, representing a growth of about 68%. Two hundred and fourteen community mobilisers have been recruited and trained by EADD to assist in farmer mobilisation.

### Chilling plants

A chilling plant has been installed at Kinyoga DFBA and officially commissioned in November 2009.

The following chilling plants were installed by November 2009:

- Luwero Dairy Development Co-operative Society Ltd.
- Nsambya Livestock Farmers' Co-operative Society Ltd.
- Maddu Farmers Co-operative Society Ltd.
- Nabitanga Livestock Co-operative Society Ltd.

The Kiboga 5 000-litre capacity chilling plant that was installed in March 2009 continues to operate with daily milk volumes chilled averaging 3 600 litres.

### Field offices

For easier access, EADD Uganda has established field offices in Kiboga, Luwero and Masaka.

### Exchange visits

EADD-registered farmers were taken for a tour to learn from other model farms such as Baraka

# EADD News

farm; agricultural shows such as the Nakuru and Nairobi agricultural shows, and Tanykina Dairy Plant Limited, an existing EADD site.

Apart from the numerous local exchanges, EADD Kenya was fortunate to host 67 farmers from Uganda, who participated in a regional exchange visit. The farmers toured ADC farm, New KCC plant in Kitale, Kabiyet Dairies Company Limited (a newly established milk cooling plant in Nandi North) and Kipkaren Dairy Plant Limited, an existing chilling plant also in Nandi North.

## Farmer field days

A production-led field day was held in OI Kalou Dairy Plant Limited, one of the four existing dairy plants. Approximately 380 farmers were trained in general animal health topics such as tick control, deworming and hoof-trimming. EADD partnered with pharmaceutical companies namely Norbrook, Coopers and Ultravetis and the ministry of livestock development in training the farmers.

## Strategic review meeting

About 39 executive committee members were trained on corporate governance and leadership. It also included sharing and learning from successful plants such as Muki Dairies from North Kinangop.



## Highlights from Kenya

by Jane Kithuka

## Extension provider workshop

Participants from Kabiyet, Metkei, Lelan and Kipkaren in the North Rift were trained in forage and fodder production, and feeding management.

## Gender mainstreaming workshop

Seventy-six farmer trainers and board directors from Lelan, Kabiyet, Kipkaren and Metkei were educated in gender mainstreaming. This training aims to increase female participation at shareholder as well as decision-making level in the project.

## Demo farms

More than 120 farmer trainers were recruited and trained. The demonstration plots ranged from 50-1 000 m<sup>2</sup> on which 17 different species/practices were demonstrated.

## Site launches

EADD commissioned two new milk chilling plants, namely Lelan Highland Dairies Limited and Kabiyet Dairies Company Limited, where milk is now being collected, bulked and chilled. The two launches were officiated by the minister of livestock development and the minister for agriculture. For more information on the commissioning, visit our website [www.eadairy.org](http://www.eadairy.org).

## Ground-breaking ceremony

The permanent secretary from the ministry of livestock attended a ground-breaking ceremony at the construction site of Kieni Dairy Products Limited, where he officially broke the ground for construction.

## MOU: EADD and KDB

A memorandum of understanding was signed between EADD and Kenya Dairy Board, where areas of collaboration were formalised for better services in the dairy sector.

# EADD News

## MOU: K-Rep Development Agency

An MOU was signed between EADD and K-Rep Development Agency for the financing of 30% loans to the DFBA.

## Agreement between dairies

An agreement signing ceremony was held between EADD and two new sites, Kokiche Dairies in Cheptalal and Cherobu Dairies in Cheborgei, both located in the South Rift.



## Highlights from Rwanda

by George Mose

## MOU signed

In its endeavour to improve its working relationship with the government of Rwanda, EADD is partnering with different government bodies. In addition to signing MOUs with the Rwanda Animal Resources Development Authority (RARDA), Umutara Polytechnic University and the ministry of infrastructure, EADD signed another MOU with the Umutara Dairy Marketing Cooperative Union (UDAMACO) on 24 August 2009. The MOU formalised a working relationship with UDAMACO under which eight primary cooperatives that EADD is working with, fall.

## Farmer training

In collaboration with the government, EADD has been able to conduct various training sessions on various topics with the ten dairy farmer cooperatives in the districts of Nyagatare, Gatsibo and Rwamagana.

## Training of ToTs

The third quarter also saw intensive training for farmer trainers. Topics included good milk

handling practices, animal health, records and record-keeping, animal feeds and fodder, and cow and calf management.

## Distribution of vet kits and bicycles

All the trained community animal health providers (CAHPs) from the three districts of operation, were provided with vet kits and bicycles. The bicycles aid the farmer trainers in accessing remote farms.

*“Lack of markets is a common issue shared by almost all the dairy cooperatives in Rwanda.”*

## Artificial insemination

An army week AI-campaign was conducted and 3 000 cows were inseminated during the campaign. Forty seven cooperative and sector veterinarians were trained in AI.

## Providing market linkages

Lack of markets is a common issue shared by almost all the dairy cooperatives in Rwanda. As an intervention, EADD has undertaken initiatives to link chilling plants with milk processors. EADD therefore engaged Inyange Industries, one of the biggest milk processors in Rwanda, Rubirizi and the Nyagatare Dairy Plant, to buy milk from farmers.

## Financial linkages

EADD has engaged with a government lending institution, the Rwanda Development Bank (RDB), to execute the financing of the six cooperatives whose business plans have been submitted. 

# EADD Dairy Mail Africa questionnaire

The East Africa Dairy Development Project has partnered with Agri Connect to publish this quarterly magazine to help you make informed decisions as a dairy farmer. This initial issue has been sponsored by EADD and distributed to you free of charge. Subsequent issues will be sold at a fee by your dairy farmer business association (DFBA). This simple questionnaire will help us improve the quality and availability of the magazine. Please fill it in and drop it at your DFBA.

## 1. How did you receive a copy of Dairy Mail Africa? [Tick boxes]

- a) From your DFBA
- b) From EADD staff
- c) From a neighbor
- d) From a friend
- e) During a farmer field day
- f) Other

## 2. Did you find it useful as a dairy farmer?

Yes  No

## 3. Which story did you find most interesting in this issue?

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## 4. Would you like to receive future issues?

Yes  No

## 5. A). Would you be willing to pay for future issues of Dairy Mail Africa?

Yes  No

## B): If yes, how much would you be willing to spend on an issue?

KSHs/UGS/RWF 

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## 6. Which training topics on dairy farming would you like to see more of in future issues?

- a) Feeds and fodder
- b) Dairy management
- c) Artificial insemination (AI)
- d) Milk quality improvement
- e) Farmer group dynamics
- f) Chilling plant management
- g) Gender and youth in dairy

## 7. Which areas would you like us to improve on? ---

## 8. Does your edition of Dairy Mail Africa reach you on time?

Yes  No

Your name 

---

Name of your DFBA 

---

 Country 

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# Making hay from vetch

by Josephine Kirui

*During the growing season grass grows at a fast pace. It is at its greatest nutritive value when all leaves are fully developed and seed or flower heads are almost mature. At this stage the pasture is cut.*




1 Make hay bales by tamping the hay into a wooden box



2 A hay bale is easy to store and carry

Hay cut too early will not cure as easily due to its high moisture content. It will also produce a lower yield per acre than longer, more mature grass. But hay cut too late is coarser, loses some of its nutrients and has a lower feed value. There is usually approximately a two-week window of time during which hay is at its ideal stage for harvesting.

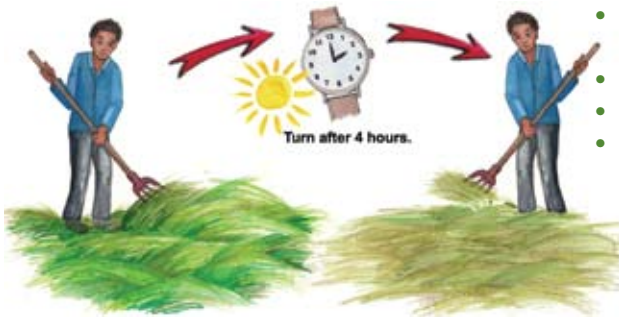
During the drying period, which should take 1 to 2 days under East African conditions, the process can be speeded up by turning the cut hay by hand, or by spreading it out with a tedding machine pulled by a tractor. If it rains while the hay is drying, turning the windrow can also allow it to dry faster.

Turning the hay too often or too roughly can also cause drying leaf matter to fall off, reducing the nutrients available to animals. Once hay is cut, dried and raked into windrows, it is usually gathered into bales or bundles, then hauled to a central location for storage. Bales are blocks of compressed hay that can be easily handled and stacked. In some places, depending on climate and culture, hay is gathered and stacked loose. 

# How to make hay



- Build a wooden box for baling.
- Store hay in a dry place away from sun and rain.
- Destroy termite mounds within a radius of 100 m from the storage place.



- Cut hay should be dried as quickly as possible.
- Spread the hay with a rake.
- Dry the hay for about 4 hours.
- Bale hay for easy storage.

- You can also dig a hole 1 m x 0,5 m x 0,5 m.
- Fill with hay, compress and tie together.



# Make multi-nutrient blocks

by Josephine Kirui



1

Weigh the different ingredients by using similar units e.g. a 2 kg tin. Mix the weighed ingredients thoroughly to get uniform mixture



2

Add molasses and binding ingredients to the mixture. Mix well to get a uniform mixture which is easy to mould



3

Put the mixture in a mould. Once the mould is well-compacted, remove the mould. Your multi-nutrient block is ready for drying. The mould should measure 25 x 15 x 10 cm



4

One can use different moulds. Once the blocks are ready, dry them in the shade for 48-72 hours before using them for feeding


One of the least costly methods of improving the nutritional value of crop residues, is through multi-nutrient blocks which are rich in minerals and are used as a feeding supplement for cattle. Multi-nutrient blocks are cheap, easy to make on a small scale and easy to store and handle.


Ingredients vary depending on price, availability and nutritional value. However, a block should consist of protein, energy, mineral and roughage-based ingredients such as:

- **Protein-based ingredients:** Ground calliandra leaf hay, ground lucerne, cotton cake, sunflower, soy bean, poultry waste and urea (caution should be taken when using urea).
- **Roughage-based ingredients:** Chopped

hay grass, cereal bran, ground husks, ground stovers.

- **Energy-based ingredients:** Molasses, bagasse, maize germ and flour (whole maize, sorghum and cassava).
- **Mineral source:** From the different mineral powders on the market.
- **Binder-based ingredients:** Cement, clay soil, banana and cassava flour, and lime stone.
- **Kitchen waste:** Banana peels, potato peels.

**Utilisation:** The block should be used as a supplement. Take great care when using urea and avoid over-feeding, which could result in urea poisoning. 



Rhodes grass – Boma variety

# About Rhodes grass

*Rhodes grass is a vigorous perennial grass, originating in South Africa. It has a strong root system that gives it good drought tolerance. It spreads quickly, forming good ground cover and grows to 1,5 m.*

It grows under a wide range of conditions. It is useful in the cut-and-carry system, for open grazing and is popular for hay-making. Common varieties are Giant, Boma, Mbarara and Masaba Rhodes.

## Advantages

- Does well in low rainfall areas (<900 mm) and is drought-tolerant.

- Withstands heavy grazing.
- Is very palatable.
- Is good for hay-making.

## Disadvantages

- Can be hard to establish because seed germination is poor.
- Can be overgrazed because of its high palatability.

## Cultivation

**Climate:** Grows at altitudes between 600-2000m. It does well in areas receiving more than 250 mm rainfall annually and also persists well under drought conditions.

**Soil:** Grows in a wide range of soil conditions but performs best in loamy, fertile soils. It does not do well in alkaline or very acid soils.

**Preparation:** It is best grown as a pure stand. Plough and repeat at least once to make a fine seedbed. Plough again when the weeds have emerged to reduce competition during establishment. Sow immediately after ploughing.

**Planting:** Rhodes grass is usually established from seed, but root splits can also be used. The best time to sow where there are two rainy seasons, is during the short rains. Where there is one rainy season, plant from early to mid-rains.

Sow when the soil is loose (dry). Make furrows 25 cm apart, using a peg to measure. Drill the seeds in the furrows at a seed rate of 12 kg per hectare (2,5 acres). That means 1,2 kg will sow 0,1 hectare or ¼ acre. Cover the seeds lightly, for example by placing light tree branches over the furrows.

**Fertiliser:** For high productivity, apply nitrogen fertiliser, preferably during heavy rains, at the rate of 100 kg per hectare.

**Weeding:** Make sure the plot is weed-free when it is first sown. Remove weeds between the rows using a hand hoe.


**Pests:** No diseases of importance, but common pests such as army worm may attack the pastures.

**Harvesting:** Start harvesting or grazing soon after grass flowers. If cutting, cut close to the ground to stimulate spreading. Leave to grow again until next flowering. Well-managed Rhodes grass can yield an average of 8 tons of dry matter per hectare per year.

**Seed production:** Seed can be harvested by hand with sickles and threshed with sticks. It is important to keep the seeding pasture clean of weeds, because Rhodes grass seed is more difficult to clean than most other tropical grasses. Rhodes grass often produces two crops of seed per year. Rhodes grass seed matures 23-25 days after flowering. Yields of up to 350 kg seed per hectare can be harvested. Seed can remain viable in storage for up to four years.

**Feeding:** Grazing is the most common method of feeding Rhodes grass. Avoid overgrazing – because its palatability is extremely high, livestock tend to overgraze pasture. Some farmers use the grass for cut-and-carry. It also makes good hay.



This information is meant as a guide and must be adapted to suit local conditions. 



Greenleaf desmodium

Silverleaf desmodium

# About desmodium

*Desmodium is a trailing or climbing perennial legume with small leaves and deep roots. In favourable conditions it forms a dense ground cover. Most common of the numerous varieties, are greenleaf and silverleaf.*

Greenleaf desmodium is leafier, with reddish brown to purplish spots on the upper surface of the leaves and reddish brown stems. Silverleaf desmodium has stems and leaves covered in dense hairs, which make them stick to hands and clothing. It has green and white leaves which are light-green underneath.

Desmodium is popular in cut-and-carry feeding systems. It can be intercropped with fodder crops such as maize or Napier grass, and can help control weeds.

### Advantages

- It is a high quality, protein-rich forage.
- It can be grown between or under other crops.
- Because it fixes nitrogen, it can increase intercrop yields or reduce the need for nitrogen fertiliser.

### Disadvantages

- It requires fertile soil with good moisture-holding characteristics.
- It suffers from continuous heavy grazing.
- It takes longer to establish than most tropical legumes.
- Its twining and climbing habit could compete with other crop species when intercropped.

### Cultivation

**Climate:** Desmodium does well in warm, wet regions at altitudes of 800-2 500 m that receive at least 875 mm of rainfall per year.

**Soil:** Adapted to a wide range of soils from sands to clay loams and tolerates slight acidity, but not salinity. Acidic soils can be

improved by applying manure at the rate of 8 tons per hectare before sowing or planting.

**Preparation:** Desmodium can be grown as a pure stand or as a mixture with Napier grass in cut-and-carry plots. It can be grown under a maize crop or even as a cover crop under banana or coffee. It can be established by either seeds or cuttings. Desmodium seed is relatively expensive and very small. The seedlings can be swamped by weeds, so it is best sown in a weed-free, well-prepared nursery seedbed with fine-textured soil. A seedbed 3 x 3 m, raised 15 cm, requires about 100 g of seed.

Desmodium needs to grow with beneficial rhizobia bacteria. These bacteria, which live in the roots of desmodium and other legumes, can fix nitrogen from the air. The nitrogen is then available as a free fertiliser to the desmodium plants. Obtain packs of rhizobia inoculant if available. Mix the contents with the desmodium seed and carefully follow the instructions on the pack. If not available, mix the seed with a handful of soil from another good desmodium plot.

**Planting:** The best time to plant is at the start of rains. For areas with two rainy seasons, sow seeds during the short rains, but plant cuttings during the long rains. Sow the seed immediately after adding the inoculant, either by drilling or by broadcasting.

For drilling, make shallow furrows approximately 5 cm deep spaced 30 cm apart. Cover the seed with 1 cm of soil and press softly. For broadcasting, spread the seed evenly over the seedbed. Water the nursery bed carefully and often. If the bed is shaded, remove the shade soon after germination.

Get cuttings from an established nursery or from desmodium in the field. Compared with seed, cuttings are bulky, but they can be obtained at little or no cost from a neighbour and they compete well with weeds during establishment. Desmodium cuttings should be vines 60 cm long with soil still attached to the new roots. Make furrows 30 cm apart and 10 cm deep; plant the vines 30 cm apart.

Desmodium can be grown between rows of Napier grass. Plant the Napier grass at a spacing of 1 m between plants and 2 m between rows, which is wider than usual. Make holes between rows of the newly planted Napier. Plant desmodium cuttings 30 cm apart. When desmodium is grown with Napier, the nitrogen it adds to the soil benefits the Napier and reduces the amount of nitrogen fertiliser required for topdressing.

**Fertiliser:** Apply 500 g of phosphate fertiliser, TSP (45% P) or DAP (46% P, 18% N) to the 3 x 3 m plot before sowing and mix thoroughly with soil. Alternatively, add 15 kg dry farmyard manure to the seedbed before planting. When growing desmodium with Napier grass, add one handful of farmyard manure per hole at planting and mix thoroughly with the soil. Also apply two bags TSP or DAP fertiliser per hectare during heavy rains. After every cut, apply manure in a furrow and cover with soil.

**Weeding:** Keep the plot weed free, especially during the early stages of establishment. Once desmodium is fully established, it forms a complete groundcover that smothers the weeds, thus reducing the labour and cost of weeding.

**Pests:** Common pests are aphids and the amnemus weevil, and can be controlled with insecticides. Strictly observe use and safety instructions on the pack. If aphids are not controlled, they may transmit a viral disease

known as little-leaf. A fungal disease, anthracnose, can affect desmodium, especially in poorly drained soil.


**Harvesting:** *Desmodium pure stand:* Start harvesting after at least four months. The best harvesting schedule is to cut at 12-week intervals, cutting 10 cm or higher above soil level.

*Desmodium-Napier mixture:* Wait at least four months after the desmodium is established, or when the Napier is about 1 m high, to cut first harvest. Cut at an interval of 4-10 weeks thereafter. Cut the desmodium and Napier together. Leave stumps 10-15 cm above the ground for both crops.

Harvest only what is needed and spread it in the sun for a few hours to wilt. Chop and mix thoroughly with other forages, such as maize stover or Napier grass, then feed. Excess desmodium may be cut, dried and baled into hay, and used as a protein supplement. It can also be mixed with grass when making hay.

Three to 6 kg of green desmodium is equivalent to 1-2 kg of commercial concentrate. Desmodium is a good-quality supplementary forage with high protein content. Feed in quantities less than 30% mixed with basal fodders.

The scientific name of greenleaf is *Desmodium intortum* and of silverleaf, *Desmodium uncinatum*. The climatic range is similar for both species, but silverleaf desmodium is more frost tolerant than greenleaf desmodium because it flowers about a month earlier. Greenleaf generally gives better yields (7-15 t/ha) than silverleaf (4-7 t/ha). Silverleaf is more tolerant to acid soils but less tolerant to drought.

*This information is meant as a guide and must be adapted to suit local conditions.* 

# All mixed rations are not the same!

All mixed rations are not the same, even when they have the same ingredients, according to research undertaken by the Centre for Dairy Research, at Reading University, UK.

This confirms what Tony Hall from Keenan told a group of farmers he was addressing at Stoneleigh in the UK. He said that ration mixing and presentation were crucial to cow intake and hence rumen function and yield.

"You have to pay attention to the physical side of the ration; how feed is presented to the cow is essential. Mixing identical rations in two different mixer wagons in a trial, gave markedly different results when they were fed to similar groups of mid-lactation cows."

## In the mix

Cows fed a ration mixed through a Keenan mixer, gave an average of one litre a day more than those fed a ration containing the same ingredients mixed through a tub mixer.

In the trial a ration containing straw, straights, grass silage and maize silage was mixed in a Keenan wagon and in the farm's tub mixer. Mixing in the Keenan machine was done to the company's recommended protocol, while the vertical tub was used according to the farm staff's own regime, he explained.

"With the Keenan mixer straw was added first, followed by straights, then grass silage and

finally maize silage, whereas for the tub mixer, straw was added first, followed by maize silage and finally straights so that they didn't settle towards the bottom of the mixer."

"On paper these were identical 17% crude protein rations, but in practice cows gave an average of one litre a day more when fed the ration from the Keenan mixer."

"In addition, milk protein levels were higher in milk from cows fed the Keenan ration and rumen pH was above the critical point of six for 37% longer. When rumen pH drops below six, there is a significantly higher chance of acidosis developing."

Mr Hall believes the differences are due to two factors: Firstly, ration presentation to the cow, with cows able to sort the ration mixed in the tub mixer far more easily and hence pick out the grain content, leaving the fibre content.

"And secondly, it would seem that mixing in the tub mixer damages the fibre content of the ration, leaving it less able to provide the scratch factor so necessary to stimulate effective rumen function. Also it appears the fibre elements of the diet are less well incorporated into rations when mixed in a tub mixer."

"It appears there is a certain type of physical ration structure and fibre type produced in Keenan mixers, which optimises rumen function and ensures that the formulated ration will deliver the desired results", adds Keenan International Nutrition Director, Prof David Beaver.

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