

Feeding dairy concentrates and Urea-Molasses-Mineral Block to dairy cows

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Dairy animals require nutrients for maintenance, growth, foetus development and milk production. Forages, the basic diet of ruminants, do not contain sufficient nutrients and minerals to meet the feed requirements for dairy animals, especially for high milk production. Energy and protein are the major limiting nutrients for milk production in all dairy cattle production systems.

Concentrates are low-fiber, high-energy feeds. Concentrates provide the essential extra energy and protein dairy cows need on top of forages to support modern production levels. They have a higher unit cost than forages, although when their higher nutrient densities and dry matters are taken into account as well as the capital costs of forage production, differences in overall value tend to be very much less.

Main concentrate types

1. **Straights:** Individual feed ingredients, either home-grown or purchased,
2. **Blends:** Unpelleted mixtures of ingredients in varying degrees of sophistication,
3. **Compounds:** Pelleted mixtures of ingredients, generally well-balanced and mineralised. The suitability of these different concentrates types for individual herds depends on facilities and feeding systems as well as relative cost and convenience.

1. Making homemade dairy meal for feeding dairy cows

Commercial concentrates are expensive and where there is no enforced regulation on animal feed standards, returns to commercial concentrate feeding could be negative. However, in a smallholder production system, homemade dairy concentrates are a good way to reduce the costs of concentrate feeding. Homemade concentrates can make use of available farm produce. Leaf meal from fodder trees and shrubs such as Calliandra leaf meal of Wild Mexican Sunflower (*Tithonia diversifolia*) and herbaceous legumes such as alfalfa and Lablab can substitute for oilseed meal, which is more expensive and may not be readily available.

You can save over 30% of the total cost by mixing your own concentrate.

Advantages of homemade rations

- Increase in animal production in remote areas where commercial rations are not available.
- Increase in farm efficiency by using on-farm by-products.
- Reduction in the cost of production where homemade rations are cheaper than commercial rations.
- Homemade concentrates are fed fresh and are of good quality.

Disadvantages of homemade rations

- It is not easy to maintain quality control and balance the ration because some ingredients may not be available.
- Due to variability in quality it is difficult to determine feeding rates.
- It is difficult to mix homogeneously, especially the ingredients used in small amounts, because mixing is done manually,
- It is difficult to observe recommended limitations for some ingredients, which can be toxic or have negative effects.

Tables 1 and 2 show simple formulae a farmer can be used to formulate homemade dairy concentrates.

Table 1: Proportions (kg/100 kg DM) and price per kilogram of components in a homemade concentrate (with fodder tree leaf hay)

Ingredient	Dry matter content (%)	Crude protein content (%)	Proportion in a mixture (kg)	Crude protein contribution (%)	Cost per kg of ingredient (Ushs)	Total cost
Maize bran	83.8	10.7	72	8	500	36,000
Cotton seed cake	93.6	45.2	15	7	1800	27,000
Mineral premix			2	0	5000	10,000
Fodder tree leaf hay	78.9	22.5	10	2	300	3,000
Labour			1	0	10000	10,000
Total			100	17		86,000

Cost per kg of homemade concentrate: Ushs 860

Table 2: Proportions (kg/100 kg DM) and price per kilogram of components in a homemade concentrate (without fodder tree leaf hay)

Ingredient	Dry matter content (%)	Crude protea in content (%)	Proportion in a mixture (kg)	Crude protein contribution (%)	Cost per kg of ingredient (Ushs)	Total cost
Maize bran	83.8	10.7	82	9	500	41,000
Cotton seed cake	93.6	45.2	16	7	1,800	28,800
Mineral premix			2	0	5,000	10,000
Labour				0	10,000	0
Total			100	16.0		79,800

Cost per kg of homemade concentrate: Ushs: 798

The amount of concentrate supplement offered to a dairy cow depends mainly on:

- quality of the forage,
- milk production level of the cow,
- weight of the cow and,
- availability of either forages or the concentrate.

A general rule on feeding concentrate suggests 1 kg of concentrate for each 2–3 litres of milk.

2. Homemade dairy pellets

Feed pelleting can be defined as “conversion of finely ground mash feed into dense, free flowing pellets or capsules, in a process that involves steam injection (moisture and heat) and mechanical pressure”.



Homemade dairy concentrate pellets

Why feed homemade dairy cattle pelleted supplements?

The advantages of pelletizing also include the following aspects:

- Easy storage and cost less.
- Low dust: reduced inhalation of dust by people and cows which makes a safer, healthier and more pleasant work place.
- No ingredient separation: even nutrient blend received by cows.
- No further processing required: pellets are ready for consumption; no extra labour to roll or mix rations.
- In addition, for ring die feed pellet mill there is steam processing for ingredients. Better starch utilization: up to 15% more and increased milk production per kilo of feed
- Quality assured: ingredients to be targeted directly at your requirements and ensure the accuracy of each ingredient time after time. (additives can be added uniformly if necessary).
- They provide a strategically formulated supplementary ration to meet the energy and protein requirements of dairy cows feed on forages as a basal diet, to support high production levels, improve reproductive performance and household income.
- They are highly palatable hence they are readily accepted by dairy cattle.
- Dairy cattle performance and feed efficiency benefit from good quality pellets. The better the pellet, the better the performance.
- Reduced waste, less segregation in the feed, improved palatability and shorter eating periods- all of these feed pellet merits are brought by feed pellet mill.

How do you make dairy pellets?

Homemade dairy pellets can be produced from locally available and low cost energy, protein and mineral sources and agro-industrial by products (Table 3). The dairy pellets are affordable compared to commercial imported pellets.

Production process of dairy cow feed pellets

1. **Crushing:** crush raw materials by feed hammer mill to get fine grinded ingredients.
2. **Mixing :** all of the ingredients are mixed in a feed pellet blender for a period of time to get a uniform mix. Then a moist, cohesive mash is obtained at end of the final mixing.
3. **Pelletizing:** after mixing, the mash is delivered to the pellet mill feeder. It is fed into the feed pellet mill and then to the roller and die extruder. (Note: flat die feed pellet mill better for home use and ring die feed pellet mill for cow feed factory.) When the mash is compacted through the die, soft, moist pellets are formed. The extruded pellets have a moisture content of 16-17%.
4. **Drying:** the wet pellets are dried in a locally made solar drier or under sunshine to obtain moisture content below 12%

Table 3: Simple formula for making homemade dairy pellets

Ingredient	Quantity (kg)	Cost of material/kg (Ushs)	Total cost (Ushs)
Maize bran	57	500	28,500
Cotton seed cake	20	2,000	40,000
Mineral premix	2	5,000	10,000
Fodder tree leaf hay	10	300	3,000
Molasses (1 jerrican)	30	2,000	60,000
Labour for mixing, grinding, pelleting and drying	2	15,000	30,000
Fuel for pelleting equipment and mixer (litres)	10	4,240	42,400
Total	131		213,900

Estimated cost per kg of homemade dairy pellets: Ushs 1,633

Equipment used to make homemade dairy pellets



Pelleting equipment



Forage chopper



Motorized feed mixer

Basic rules for feeding pellets

The basic rules for feeding dairy pellets are the same as for feeding grain.

- Introduce dairy pellet feeds slowly.
- Lactating cows will need additional roughage.
- Ensure that internal and external parasites are not a problem: these can limit animal responses to feed.
- Consider dehorning cattle—it reduces the amount of troughing required, cuts down on aggressive behaviour and reduces bruising.
- Dairy pellets are specially formulated to supplement dairy cattle on a basal diet of pastures, crop residues and/or conserved forages (hay and silage).
- Provide (quality and quantity) feed resources for cow health and milk yield to increase profitability.
- Provide cows with plenty of clean drinking water and mineral supplements.
- Vaccinate the cows against diseases.
- Keep cattle breeds with a high genetic potential for milk production.
- Use improved dairy cattle feeds and management technologies to manage your farm as a business.
- Provide good/clean and comfortable environment to your cows
- Feed 1 kg/cow/day for every litre increase above 8 litres of milk
- Keep records

The pellet size should be similar to the average particle size of the ration being fed to reduce sorting. Pellets that are too large can more easily separate from the final mix. For smaller animals like dairy calves, smaller pellets will often be beneficial in a number of ways including reduced fines, slower eating times and reduced sorting. From an animal perspective small pellets take longer to eat and help producers avoid one animal hoarding more than its fair share. From a quality perspective the larger the diameter generally the lower the quality and durability of the pellet.

3. Urea-Molasses-Mineral Block (UMMB)

Poor quality roughages, e.g. cereal straws, poor quality hay, or dry-season forage that contains a lot of stem but not much leaf, can be deficient in crude protein. Insufficient protein in the diet means that

rumen microorganisms cannot make enough microbial protein for the maintenance or growth of ruminants. This can become critical, resulting in loss of condition and increased disease risk.

Urea and ruminant digestion

When fed as a part of the diet to ruminants, urea is converted to ammonia by the microflora in the rumen. Microorganisms in the rumen use ammonia to make microbial proteins as long as energy is available at the same time. Bacteria and protozoa are then digested by the animal. Urea therefore has a value that is partly equivalent to protein for ruminants.

Molasses, urea and other ingredients can be used in the manufacture of molasses/urea feeds prepared as blocks. **Urea-Molasses-Mineral Block (UMMB)** is an excellent way of providing readily degradable protein and readily fermentable energy to ruminant animals, and they help increase the protein supply to the animal in situations where this may be limiting.



Urea-Molasses-Mineral Block

Rumen Degradable Protein (RDP) is the fraction of Crude Protein (CP) consumed which is broken down by rumen microbes.

Urea toxicity

All the ruminants are sensitive to a large quantity of urea which becomes toxic and intoxication can occur if a large amount of urea is ingested. So, it is essential that the blocks are accurately made so that animals are not fed too much urea at one time. Also, an adaptation period of at least three weeks is required for the animal to utilize efficiently.

Ingredients for Urea-Molasses-Mineral Block

Urea-Molasses-Mineral Blocks can be made from a variety of ingredients depending on their local availability, nutritive value, price, existing facilities for their use, and their desired influence on the quality of blocks. They can also include specific components:

(a) Molasses

Molasses is a major by-product of the sugarcane industry. Molasses provides fermentable substrate and various minerals and trace elements (but low amounts of phosphorous). Because of its pleasant taste and smell, it makes the block very attractive and palatable to animals.

(b) Urea

Urea provides fermentable nitrogen, is the most important component of the block. With the increase of the microflora in the rumen, urea may increase the intake of straw and other low-quality forages as well as their digestibility. The intake of urea must be limited to avoid toxicity problems but sufficient to maintain ammonia levels in the rumen for growth of microorganisms in the rumen and high rates of

degradation of fibre. It is important that urea and molasses are provided together to provide ammonia and energy at the same time – hence their combination in UMMB. The urea used in this formula is **fertilizer grade**, normally used as a nitrogen fertilizer in plantations. Since the urea is hygroscopic (“*readily takes up and retains moisture*”) it is possible that during storage lumps may form in the sacks. In order to prevent excessive consumption of urea in too short a period, which may cause intoxication of the animals, it is necessary that all the lumps are crushed before introducing the urea into the mixture. This will guarantee a homogenous mixture of urea in the mass.

(c) *Wheat, maize bran or r rice bran*

Wheat, rice or maize bran serve a multiple purpose in the blocks. They provide some key nutrients including fat, protein and phosphorus. It also acts as an absorbent for the moisture contained in molasses and gives structure to the block. It may be replaced by other fibrous materials such as dry and fine bagasse (the residue from sugar cane processing) or groundnut hulls which are finely ground.

(d) *Other crop residues*

Other crop residues such as maize stover, Wild Mexican Sunflower (*Tithonia diversifolia*) or Calliandra leaf hay and milled grass hay can also be included in UMMB but this depends on availability, and some crop residues and by-products will provide more nutrients than others.



Tithonia diversifolia (Wild Mexican Sunflower)

(e) *Minerals*

Common salt is generally added because this is often deficient in the diet and it is cheap. Calcium is supplied by molasses and by mineral premix. Deficiencies of minerals will generally become a problem when production is increased, particularly when a by-pass protein supplement is given (proteins that are not degraded by rumen microorganisms and are digested in the intestines). In these cases, phosphorus should be included in that supplement.

(f) *Binder*

A binder such as molasses, Calcium bentonite clay, cassava flour or small quantities of cement is necessary in order to solidify the blocks. The use of Calcium bentonite clay adsorbents has proved effective at reducing the toxic effects of aflatoxin-contamination in animal feeds.

Instructions for making a 10 kg Urea-Molasses-Mineral Block

Constituents of Urea-Molasses-Mineral Block (for 10 kg mixture)

Ingredients	Amount (kg)
Molasses	4
Maize bran	2
Rice polish	2
Urea	1
Lime	0.6
Salt	0.5
Total	10.1

- Weigh 4 kg. molasses and put in a large container.
- Add 500g. common salt and 1 kg of urea and mix well manually.
- Keep this mixture for at least 12 hours.
- After 12 hours, the mixture in the container is again mixed well by hand.
- Add maize or wheat bran, rice polish or lime which were previously kept into separate containers and mix well.
- Place the mixture in a wooden mould (9 x 5 x 5 inches).



Wooden box to give the block a shape

- Apply pressure using a wooden cover to give the block a shape. The block will weigh about 2.5 kg.
- Remove the block from the mould and keep for 15 hours for hardening before ready for animal consumption.
- The block can be dried in a simple solar drier



Simple solar drier

Feeding Urea-Molasses-Mineral Block to dairy cows

As a feed supplement, it provides dairy cows with essential nutrients such as protein, energy, and minerals usually deficient in most forages and crop residues. The blocks are prepared in a solid, hard, compact form, but it is water soluble. It is given to ruminants as a lick. Care should be taken so that the cows cannot bite it. It is proven by experiments that by licking the block, the nitrogen level in the rumen remain longer period of time which increases the digestibility of coarse roughage (e.g. straw). Initially if the animal neither does not want to lick the block, it should be habituated by spreading salt or bran on it. It is recommended to feed a mature cow 0.5kg /day. A block of 5 kg may last for 7 to 10 days when given to a cow weighing 350-400 kg.

Benefits from feeding Urea-Molasses-Mineral Block

- It increases palatability and thus enhances intake of feeds.
- By feeding Urea-Molasses-Mineral Block the body weight gain, draught power and milk yield of cattle, buffaloes, sheep and goat is increased.
- The digestibility and absorbability of course roughages (straw) is increased by feeding Urea-Molasses-Mineral Block.
- It increases the nutritive value of hard feed.
- The female animals come to heat earlier and become pregnant by feeding Urea-Molasses-Mineral Block .
- Calving interval of cow decrease by feeding Urea-Molasses-Mineral Block.
- If supplied to the pregnant animals, strong and healthy calves are born.

Caution

- A block of this kind cannot be used as a supplement for animals younger than 6 months, or by animals which have not eaten anything for the whole day.
- Consumption of too much Urea-Molasses-Mineral Block must be prevented.
- Animals must always be provided with clean drinking water.
- The block must be protected from rainwater so that it does not soften.
- Not more than 500g block daily for cattle should be supplied daily.
- The blocks never be supplied in ground form or dissolved in water.
- Not provide to non- ruminants and calves.
- The animals should be supplied with other usual feeds like straw, fresh green grass, concentrates and sufficient amounts of clean drinking water in addition to the blocks.