



# Low-Cost Multi-nutrient Block Supplement for Improving Animal Productivity and Enhancing Utilization of Poor Quality Feed Resources



*Multi-nutrient blocks produced by farmers in Burundi under a World Bank funded ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) project*



*A youth making blocks for sale*

**<sup>1</sup>Kabirizi, Jolly M.L.; <sup>2</sup>Rumanzi, S. and <sup>3</sup>Asiimwe M.**

Valley University of Science and Technology  
(<https://vust.ac.ug/>), Bushenyi district

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**Contact:** <sup>1</sup>[jmkabirizi@gmail.com](mailto:jmkabirizi@gmail.com);  
<sup>2</sup>[smith.rumanzi@gmail.com](mailto:smith.rumanzi@gmail.com);  
<sup>3</sup>[asiimwemichael1234@gmail.com](mailto:asiimwemichael1234@gmail.com)

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## Introduction

Feeding accounts for more than 70 percent of the total cost of milk production; therefore, balanced feeding of dairy animals plays a pivotal role in a successful dairy development programme worldwide. To maximize profitability from the animals, one needs to ensure that these animals must receive the required quantity of protein, energy, minerals, vitamins, preferably from locally available feed resources. All these nutrients can be supplied by an innovation called “**Multi-nutrient Block Lick**”, which can help livestock farmers to increase milk production and profit.

## Multi-nutrient Blocks

Multi-nutrient blocks are lick blocks containing energy, protein, vitamins, minerals and other nutrients. Multi-nutrient blocks comprise of forages, concentrate and other supplementary nutrients in desired proportion capable to fulfil nutrient requirements of animals. The feeding of the blocks is a convenient and inexpensive method of providing a range of nutrients required by both the rumen microbes and the animal, which may be deficient in the diet. Multi-nutrient blocks are **supplements** for ruminants (goats, sheep and cattle) fed on low-quality pastures. Strategic ruminant supplementation is one of the technologies to reduce methane gas which is also responsible for global warming.

### ■ Advantages of Multi-nutrient Block Technology

- It fulfills the nutrient requirements of the animals in the best possible way.
- Quality feed is available all around the year.
- It is cost-effective.
- The locally available animal feed resources can be utilized.

- Easy and cheap to store.
- Provides added benefit of correcting a multi-nutritional deficiency in animals.
- Enhances the utilization of poor quality of roughages.
- Results in low methane emission from animals.
- Improved productivity.

During the last decade, efforts were made to change from the traditional extensive animal farming to an intensive system. Research recommends supplementing Multi-nutrient blocks to dairy cows under intensive and open grazing systems fed poor quality fibrous feeds (e.g. straws, low quality pastures, hay, stubble, etc.) particularly during the dry seasons. By adopting this technology, the farmers can save lot of money being wasted on animal treatment. Youth groups can also adopt this technology to produce Multi-nutrient blocks in large scale for sale to livestock farmers.

## ■ Nutritive Value of Multi-nutrient Blocks

Multi-nutrient block is rich in:

1. **Minerals** – It contains elements such as calcium, phosphorous and other minerals that are not naturally found in grass. These minerals are important for growth, reproduction and milk production.
2. **Protein** – The block gives up to 50% protein needed by animals for growth.
3. **Energy** – The block gives about 45% energy needed by animals to increase meat and milk production.

## ■ Some of the Materials for Making Multi-nutrient Blocks

Multi-nutrient Blocks can be made from a variety of ingredients depending on their local availability, nutritive value and price.

- 1. 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.
- 2. Wheat, Maize or Rice Bran:** Provides some key nutrients including fat, protein and phosphorus. They also serve as an absorbent for the moisture contained in molasses and give structure to the block. They may be replaced by other fibrous materials such as dry and fine bagasse (the residue from sugar cane processing) or groundnut hulls or bean husks which are finely ground.
- 3. Oilseed meals:** Cotton seed cake, Sunflower cake or soybean cake provide both soluble and insoluble proteins and are a good source of phosphorous. It is appropriate to add such ingredients when blocks are given to animals in production.
- 4. Crop Residues:** Milled crop residues such as cereal stovers (maize and sorghum) and straws (rice and wheat) can be included in the block depending on their availability. Some crop residues and by-products will provide more nutrients than others.
- 5. Fodder tree or forage legume leaf meal:** Fodder tree leaf meal or hay such as Calliandra (*Calliandra calothyrsus*), Gliricidia (*Gliricidia sepium*) and Mexican sunflower (*Tithonia diversifolia*) improve the protein content of block.



*Calliandra tree (left) and Calliandra leaf meal (right)*



*Mexican sunflower*

Calliandra leaf hay and other leguminous forages have well balanced amino acids that are protected from degradation in the rumen. Fodder trees and forage legumes such as Lablab enhance microbial protein fermentation, digestion and improves feed efficiency.

**6. Salt:** Common salt is added because this is often deficient in the diet and it is cheap.

**7. Mineral powder:** Provides much of the macro mineral requirements (sodium, potassium, calcium and phosphorus) of the microbes as well as those of the host animal.

- 8. Binder:** A binder such as Calcium bentonite, Diatomaceous feed additive or cement is necessary in order to solidify the blocks. Research on the use of cement as a mineral supplement have not shown adverse effects at levels of 1 to 3 percent of the total diet dry matter. Calcium bentonite and Diatomaceous feed additive help to bind aflatoxins and reduce mycotoxin (a poisonous substance produced by a fungus and especially a mould) bioavailability from contaminated feeds in the animal's gut. It is a fine clay material mined from the earth. Large doses of aflatoxins can lead to acute poisoning and can be life threatening to humans and animals, usually through damage to the liver.
- 9. Chemicals or Drugs:** Various chemicals or drugs for the control of parasites or for manipulation of rumen fermentation can be added to the molasses blocks, which can be an excellent carrier for these products.

### Example 1:

#### Formula for a Low Cost Multi-Nutrient Block

Ingredients	Quantity (kgs)
Milled cereal stover, grass or straw	24
Wheat, maize or rice bran	35
Cottonseed cake	35
Mineral premix	2
Calcium bentonite or Diatomaceous feed additive	2
Salt	1
<b>Total</b>	<b>100</b>

## Example 2:

### Formula for a Low Cost Multi-nutrient Block

<b>Ingredient</b>	<b>Quantity (kgs)</b>
Molasses	40
Maize, rice or wheat bran	20
Cotton seed cake	16
Cement (as a binder)	4
Diatomaceous earth or Calcium bentonite	4
Mineral powder	5
Calliandra leaf hay (or any other leguminous hay)	9
Salt	2
<b>Total</b>	<b>100</b>

### ■ Multi-nutrient Block Making Process

1. Prepare and weigh the ingredients according to proper proportions.
2. Mix all the ingredients until they are evenly mixed. You can use a motorized mixer.
3. Add molasses and mix well. Different types of mixers can be used. If adequate labour is available and only few blocks (50-150) are needed then manual mixing is possible. With 3 people and one supervisor, about 150 blocks of 5 kg each can be made over a period of 8 hours. However, a concrete or motorized mixer is recommended for producing over 150 blocks/day. The cylinder of this mixer should turn horizontally and as slowly as possible, to avoid the molasses, which is highly viscous, sticking to the side of the mixer. Spillage of the mixture should be avoided.





**Manual mixing**



**Manual mixer**

4. Pour the mixture into moulds to form the blocks. Moulds are necessary to set the blocks in an acceptable shape. Once set, the frame can be removed for reuse and to allow the drying process to continue. The size of the mould will depend on the preferred size of the block(s). The most appropriate for small-scale farmers are frames made out of a number of wooden planks with slots cut to enable easy assembly and removal. Each compartment measures 25 x 15 x 10 cm and can hold a block weighing 4.5-5.0 kg.



**A simple wooden (left) and metallic mould (right)**

Small plastic containers have been used successfully for preparing the blocks. They produce blocks (1 to 5 kilos each) with acceptable solidity and are suitable for use in small units. Wooden moulds should be lined with a plastic or water to prevent the mixture from sticking to the wall of the mould.

5. Press it until they became hard enough and you can use small scale machinery.
6. After removal of the moulds, the blocks are placed under a shade with good ventilation or in a solar dryer After 24 to 72 hours the blocks are dry enough to be transported.



***A simple solar dryer***



***A simple rack to store dry blocks***

## ■ Feeding Multi-nutrient Blocks to Animals

The blocks are offered to animals as a **supplement** not as a basal diet. Remember that the purpose of the block is to improve the utilisation of roughage and not to substitute it. The blocks are offered to animals in a wooden box or bucket of dimensions slightly larger than that of the block, which restricts biting of the block by animals. In the beginning, you must give the feed in small amounts and once they get adapted to it, you can increase the quantity.



*The blocks are offered to animals in a wooden box*

## UREA-MOLASSES MULTI-NUTRIENT BLOCK LICKS (UMMB)

Urea Molasses Multi-nutrient Blocks (UMMB) is prepared by mixing urea, molasses, mineral mixture and other ingredients in a suitable proportion. It is a readily available source of energy, protein and minerals for the dairy animal. Supplementing an animal with UMMB provides adequate

quantity of these nutrients and slow ingestion of urea leads to efficient microbial protein production and improved digestibility. UMMB is very useful for milk producers in green fodder deficit areas.

**Urea** provides fermentable nitrogen, which is the most important component of the block. **The intake of urea must be limited (usually 10 percent) to avoid toxicity problems.** The urea used in this formula is **fertilizer grade, normally used as a nitrogen fertilizer in crop fields.** Since the urea is hygroscopic (absorbs water and becomes clumpy), it is possible that during storage lumps may form in the sacks.

Supplementation with Urea Molasses Multi-nutrient Blocks can increase digestibility of poor quality feeds by up to 20%, increase the nutrients the animal receives and can increase feed intake by 25 to 30%. Urea-Molasses Multi-nutrient Blocks are a convenient way to make and store molasses and urea and also feed to animals. It can easily be made and used by small-holder farmers and commercial producers. In addition, a farmer can make and sell blocks to farmers as a source of income. The technology is particularly applicable in areas where ruminants basically feed on fibrous crop residues or poor quality forage diets.

Several formulations are available for the production of Urea-Molasses Multi-nutrient Blocks which allows responding to different prices and availability of potential ingredients.

## ■ **Components of a Urea-Molasses Multi-nutrient Block**

Urea-Molasses Multi-nutrient Block is made from different ingredients where each has its own contribution in the mixture. It is usually made up of molasses, urea, cement, wheat bran, protein rich by-products, salt and water which are mixed and processed to the form a block.

1. **Molasses:** provides energy and minerals like sulphur. Urea is a non-protein nitrogen source which is essential

to improve the digestibility of the feed by providing fermentable nitrogen.

- 2. Urea (fertilizer)** is a non-protein nitrogen source which is essential to improve the digestibility of the feed by providing fermentable nitrogen.
- 3. Cereal bran** is the most common fibrous feed used and provides energy and helps hold the block together.
- 4. Cotton seed cake** is added to supply protein and it is a by-pass protein source and provides immediate function for the animal.
- 5. Salt** is added to the blocks to supply minerals and to control the rate of consumption.
- 6. Cement** is used to make the block. It makes the block hard and provides calcium.
- 7. Diatomaceous earth** has been known to improve digestive health and give animals shinier, healthier coats, which makes it an excellent feed additive for your cattle. Diatomaceous earth is used as a binder to address poisoning from chemicals, drugs, food, and other harmful substances. A variety of binding substances are available, such as charcoal, diatomaceous earth, and bentonite clay.

## ■ Procedures of Urea-Molasses Multi-nutrient Block Production

### 1. Preparation of the Ingredients

The amount quantity of the different ingredients needed to make the **Urea-Molasses Multi-nutrient Block (UMMB)** depends on the size of the block to be produced and the formula to be used. The blocks with different weight/size (1kg, 5kg, 10kg) can be prepared. Using the following proportion, UMMB can be produced by thoroughly mixing the exact quantities of the components:

## ■ Simple Formula for Urea Molasses Multi-nutrient Block Production

Ingredients	Quantity (kg)
Molasses	34
Urea	10
Cement	13
Diatomaceous earth or Calcium bentonite (Aflatoxin binder)	2
Wheat or maize bran	25
Cotton seed meal	13
Common salt	3
<b>Total</b>	<b>100</b>

For instance, to produce a 5 kg UMMB, 1.7 kg molasses, 0.5 kg urea, 0.75 kg cement, 0.94 kg wheat bran, 0.65 kg Cotton seed cake and 0.15 kg common salt is needed.

### 2. Weighing and Mixing of Ingredients

Thorough mixing is a key for good UMMB making. Urea fertilizer **must be mixed thoroughly by breaking up lumps to avoid pockets of high concentration that could harm animals.** Do the following to mix the ingredients:

- Weigh the ingredients based on the proportion of the block.
- Add urea to the molasses while continuously mixing/stirring until the urea grains completely dissolve in molasses.
- The molasses can be heated in the sun to improve handling and mixing.



*Mixing the two mixtures together*



*Molding the UMMB using small plastic buckets*

- Never add water to molasses. It has to be thick.
- Dissolve cement and salt in 200 ml of water prior to being added to the first mixture of urea and molasses.
- Add wheat bran and cotton seed cake to make a third mixture and thoroughly mix until the final mixture has a dough texture.

### **3. Casting and Moulding**

Once the ingredients are thoroughly mixed and homogenous mixture formed, place the mixture into moulds. Any local container, such as tin cans or small buckets can be used as a mould. Using a plastic sheet to line the moulds will make block removal from the mould easier. The size of the mould to be used depends on the size of UMMB to be manufactured. For example to manufacture 5kg of UMMB we can use rectangular wooden frame of 30 x 20 x 20 cm depth, length and width, respectively. Compaction can be done using a wooden bar. After this process leave the block for 24 hours in the mould until it maintains a proper shape.

## 4. Drying

- Remove the block from the mould after 24 hours.
- Leave the block to dry in a well-ventilated room under a shade for about 5 days depending upon the weather condition, after which it will be ready for feeding animals.



*Drying the UMMB under shade using wooden racks*

## 5. Characteristics of a good Urea-Molasses Multi-nutrient Block

A block is considered to be good when it fulfils the following characteristics:

- Ingredients are well distributed throughout the block
- It does not have lumps of urea
- It is hard enough not to be squashed between your fingers and should be resistant enough not to break when a person steps on it
- Your hands should feel the sticky molasses when we hold the block.



## 6. Feeding Urea-Molasses Multi-nutrient Blocks to Animals

- The blocks should be **fed as a lick** so that only the top surface is accessible to the animals. This prevents animals from pushing the blocks around, breaking them up and consuming large chunks that could cause **urea toxicity** (acute and often rapidly fatal, with clinical signs including muscle tremors, abdominal pain, incoordination, respiratory distress, and recumbency, -a state of leaning, resting, or reclining), then death). The block should be given to **cattle; sheep and goats above 6 months of age. It should NOT be given for calves, chicken and lambs/kids.**
- Urea-Molasses Multi-nutrient Blocks should be introduced to animals slowly and should be fed after animals have consumed adequate forage. This prevents animals from consuming too much at any one time. **UMMB should never form the main diet. They are meant to be a supplement to a basal diet of forage. It is also advisable to give access to cattle not more than 1 - 2 hours per day for adaptation.**
- UMMB block hardness will affect its rate of intake. If too soft, it is consumed too rapidly and there is a risk of toxicity. If too hard, intake may be too little. **Urea at high levels is unpalatable.** High levels of urea in UMMB may reduce intake of the block as well as of straw, hay or any basal feed due to the bitter taste. High levels or imbalances in minerals may result in excessive consumption in a short time also leading to urea poisoning. **Precautions should be taken to avoid this problem of overconsumption in drought prone areas particularly towards the end of the dry season when feed is scarce.**

## 7. Benefits of Feeding Urea Molasses Mineral Block (UMMB ) As a Feed Supplement to Cows

- UMMB can be used to supplement the diet of cattle and other ruminants.
- It helps maximize the benefits of poor-quality feeds by optimizing digestion – particularly in the dry season.
- UMMB can help reduce weight loss through improved rumen function in cattle when grazing feed quality is poor palatability.

## 8. Precautions While Supplementing Urea Molasses Multi-nutrient Block

It is essential to note the following while supplementing Urea Molasses Multi-nutrient Blocks.

- Feed to ruminants only (sheep, goats and cattle).
- **Do not feed to monogastrics, i.e., horses, donkeys, or pigs. .**
- Do not feed to young ruminants less than six months of age (kids, lambs).
- Blocks should be used as a supplement and not as the basic ration.
- A minimum of coarse forage in the rumen is essential.
- Never give UMMB to an emaciated animal with an empty stomach. There is the risk of poisoning due to excessive consumption.
- **The amount of blocks fed to sheep and goats should be limited to 100 grams/day while for cattle it should be limited to 700 grams/day.**
- The blocks should never be supplied in **ground form or dissolved in water** as this can result in over consumption.
- Provide the animal with adequate amount of water all the time.

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(<https://vust.ac.ug/>), Bushenyi district

**Contact:** <sup>1</sup>[jmkabirizi@gmail.com](mailto:jmkabirizi@gmail.com);  
<sup>2</sup>[smith.rumanzi@gmail.com](mailto:smith.rumanzi@gmail.com);  
<sup>3</sup>[asiimwemichael1234@gmail.com](mailto:asiimwemichael1234@gmail.com)