



RESEARCH
PROGRAM ON
Livestock



FEEDS AND FEEDING REGIME FOR CATTLE

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- **Feed classification for cattle**
- **Feed sources for cattle**
- **Feeding regimes at different stages**
- **Feed preparation methods**

FEED CLASSIFICATION FOR CATTLE

1. Roughages: basic component of cattle diet.

- Include grass, straw, stalk and forage leaves, crop by-products, etc., either succulent (green roughages) or dried (dry roughages).
- High fiber content (accounting for **>18% dry matter**), large volume (bulky) but low nutrients per 1kg feed.



FEED CLASSIFICATION FOR CATTLE

2. Concentrates: supplemented when roughages do not sufficiently meet nutrition needs.

- High-energy concentrates include:
 - Cereal grains and their by-products: corn, broken rice, rice bran, etc.
 - Tubers: cassava, sweet potato, edible canna, lesser yam, etc.
 - Molasses, cassava pulp, brewery spent grains, distillery residues (wet concentrates).



FEED CLASSIFICATION FOR CATTLE

High-protein concentrates:

- Plant origin: soybean, sesame, peanut, oil cakes (peanut, soybean, etc.).
- Animal origin: fish, fish meal, shrimp meal, meat meal, silkworm pupae powder, earthworm, termite, etc.



FEED CLASSIFICATION FOR CATTLE

3. Mineral rich feeds

- Feed ingredients with high mineral content, involved in formation of bones and other organs.
- Include: clam shell powder, crab shell, snail shell, eggshell, bone meal, limestone powder, etc.



FEED SOURCES FOR CATTLE

1. Green roughages

- Include pasture grasses, cultivated fodders, green stalks and leaves, and some green vegetables, etc.
- Large volume but low nutrient content per 1 kg → cattle need to consume a large amount of this type to meet their nutritional needs.
- High water content (60-80%), high digestibility, palatability, loved by cattle.
- Well-balanced nutrients, contain many high-quality vitamins and proteins.



FEED SOURCES FOR CATTLE

1.1. Natural grasses

- Mainly Bermuda grass, broadleaf carpetgrass, false daisy, etc.
 - Can be used as pastures for grazing or harvested for barn feeding.
 - Quality varies greatly and depends on the season, where it grows, whether it is young or old and the composition of the grasses in the pasture.
- 
- Do not graze or harvest from areas with pesticides, herbicides, etc., to avoid digestive disorders or poisoning for cattle.
 - Young grass or those harvested right after rain should be half-dried to prevent bloating or flatulence for cattle.

FEED SOURCES FOR CATTLE

1.2. Cultivated grasses

- Such as Mulato II, elephant grass, Mombasa guinea, Stylosanthes, VA-06 grass etc.
- Grass cultivation is very important, especially in intensive livestock and livestock farming.
- Grass cultivation ensures ready availability of green roughage sources with quality and year-round stability.

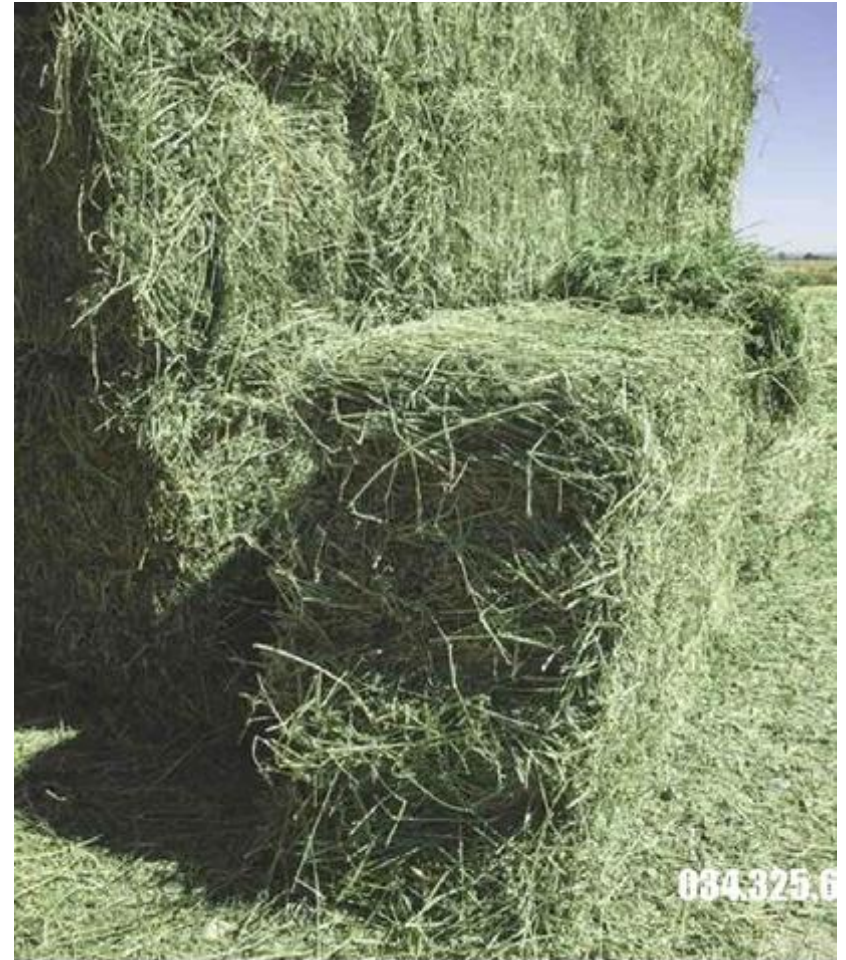


FEED SOURCES FOR CATTLE

2. Dry roughages

2.1. Hay

- Is green roughages that have been dried or sun-dried and stored in piles or blocks.
- This is an easy preservation method, which allows stockpiling large volumes for use in the winter season.
- The nutritional values of hay are always lower than those of the same green grass as nutrient losses are inevitable during drying and preservation.



FEED SOURCES FOR CATTLE

2.2. Rice straw

- Is an important source of dry roughages in cattle raising, particularly in winter.
- Has low nutritional values, contains many fibers that are difficult to digest, is low in protein and minerals.
- Often treated with urea to soften and be more appealing to cattle; as well as to increase nitrogen content, digestibility rate and nutritional value.



FEED SOURCES FOR CATTLE

3. Agro-industrial by-products

3.1. Sugarcane tops

- The discarded tops after the stalks are harvested. Often account for 20% of the whole plant.
- Sugarcane areas produce large volumes of sugarcane tops every year, which should be made use of for cattle raising.
- Have high sugar and fiber contents but low protein, hence they are often ensiled.
- Should not be used to completely substitute forage grasses for prolonged periods.



FEED SOURCES FOR CATTLE

3.2. Pineapple tops, crowns, peels and pulps

- Source of by-products from pineapple plantation and processing plants for exporting.



- Peels and pulps are high in sugar but lack protein and fiber. Thus, they should not be used to completely substitute green grasses.
- Pineapple peels contain bromelain, which irritates the tongue if cattle eat too much. It is best to feed cattle about 8-12 kg daily and divide in multiple meals.
- To enhance quality and effectiveness, pineapple tops, crowns, peels and pulps are often ensiled.

FEED SOURCES FOR CATTLE

3.3. Soybean meal

- By-product from the production of tofu or soybean milk.
- Very high fat and protein contents → provide protein, each cattle can eat 8 - 12 kg/day.
- When using raw soybean meal together with feeds containing urea (such as urea ensiled straw, etc.), it is recommended to give them in multiple meals. As raw soybean meal contains enzymes that break down urea, if the two types of feeds are fed at the same time and in large quantity, urea will be broken down quickly, generating a large amount of ammonia gas and poisoning cattle.



FEED SOURCES FOR CATTLE

3.4. Brewer's spent grains

- Aromatic, tasty, stimulate appetite.
- Rich in protein, mineral and vitamins (mainly vitamin B) → supplementing proteins.
- High digestible rate.
- Quality depends on the water proportion, storage time, origin and processing.
- When they are stored for a long time, the fermentation process causes some nutrient losses and make them acidic. Hence, it is recommended to add 1% salt to prolong the storage period.



FEED SOURCES FOR CATTLE

3.5. Cassava pulp

- By-product from making cassava starch from cassava tuber. High in carbohydrates (about 60%) but low in protein.
- Can be kept for a relatively long period as part of the carbohydrates is fermented and creates pH = 4 - 5.
- Fresh cassava pulp has a slight sour taste, which cattle like to eat. Hence, it can be fed fresh to cattle (about 10-15 kg/head/day).
- Can be airdried or dried to make ingredients for mixing concentrates.



FEED SOURCES FOR CATTLE

3.6. Molasses

- By-product of cane sugar production. Molasses accounts for 3% of fresh sugar cane, over 1,300 kg molasses/ha/year is harvested.
- Is a source of energy, contains many macronutrients and micronutrients.
- Is often used to supply additional sugar in ensilage, is the main ingredient of feed supplementation blocks, or is fed together with rice straw, etc.
- As it has sweet taste, cattle like to eat it. It is recommended to offer only 1 - 2 kg/head/day. Eating too much of it (more than 2 kg) can cause diarrhea.



FEED SOURCES FOR CATTLE

4. Silage

- Silage can be kept for a long time, allowing sufficient feed supplies for cattle in dry and cold seasons. In addition, ensilage also improves feed digestibility.
- Properties of silage:
 - Has a pleasant aroma, mild acidic taste, is not bitter and not acrid
 - Has a uniform color, almost similar to the plant's color before ensilage.
 - Has no molds and is loved by cattle
- Green roughages, agro-industrial by-products, grains, seeds, roots, tubers and fruits can all be ensiled. Corn meal, rice bran, cassava flour, molasses and salt are often added when ensiling.
- Silage can be used to partially substitute fresh grass, about 15-20 kg/head/day.



FEED SOURCES FOR CATTLE

5. Roots, tubers and fruits

- Including sweet potato, potato, carrot, radish, gourd, squash, etc. This is a very good feed type for cattle.
- Is aromatic, tasty, and loved by cattle.
- Is high in water, carbohydrates and vitamin C, but low in protein, fat, fiber and minerals; difficult to preserve and store for an extended period.
- Due to the above properties, roots, tubers and fruits are often used to improve low-water, high-fiber, and low-carbohydrate feed (e.g., hay). The average amount of roots, tubers and fruits is about 4-5 kg/head/day.



FEED SOURCES FOR CATTLE

6. Concentrates

- Feeds containing less than 18% fiber content.

6.1. Rice bran

- Rice bran quality depends on the milling process and storage time.
- If left for a long time, the oil in the bran will be oxidized, causing it to become rancid, have burnt smell, bitter taste, turn lumpy, moldy and cannot be used.
- Rice bran is considered a concentrate that provides energy and protein.
- It is not recommended to use only rice bran as feed as its calcium content is very low. Bone meal, shell powder and salt should be added to meal ratios containing high amount of rice bran.



FEED SOURCES FOR CATTLE

6.2. Corn meal

- High in starch content, used as a source of energy supply.
- Low in calcium and phosphorus → necessary to add bone meal, shell powder and salt to corn meal for use.



6.3. Cassava meal

- A concentrate rich in sugar and starch, but low in protein, calcium and phosphorus → necessary to add urea, high-protein feeds such as soybean meal, brewer's spent grains, bone meal, shell powder, etc., to cassava meal before use.
- Dried cassava chips can be kept throughout the year. Cassava contains toxic HCN, which can easily cause poisoning for cattle → recommended to peel, soak in water, and change the water multiple times before slicing and drying.



FEED SOURCES FOR CATTLE

6.4. Oil cakes

- By-products remaining from the process of extracting oil from seeds and coconut kernel, including peanut oil cake, soybean oil cake, cotton seed oil cake, sesame oil cake, coconut oil cake, etc.
- Provides energy and protein for cattle. The protein and energy content in oil cakes depends on the oil extraction technology and the input materials.
- Soybean and peanut oil cakes are low in calcium and phosphorus so minerals should be added when using them.
- Oil cakes can be separately fed to cattle or combined with other feeds to make mixed concentrates.



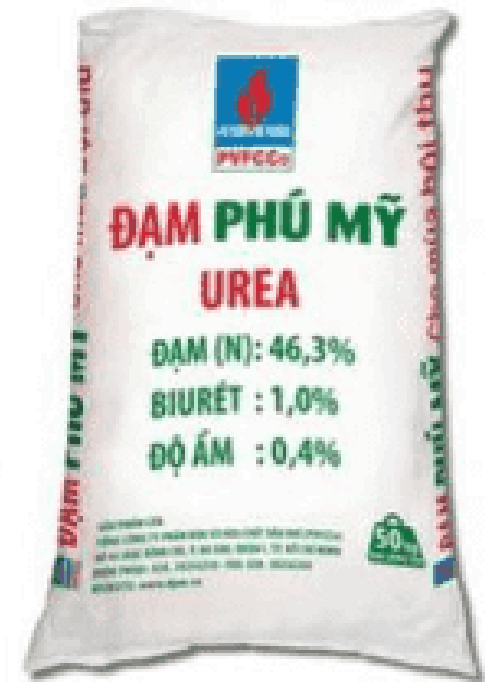
FEED SOURCES FOR CATTLE

7. Supplements

- Added to cattle diets in small amounts to balance some deficient nutrients such as protein, minerals and vitamins.

7.1. Urea

- Urea is a source of non-protein nitrogen, which has been used widely in cattle feed.
- Cattle can consume urea as there is a microbiological system in their rumen that can turn nitrogen in urea into high biological value protein to supply to the host.
- Urea can be used in 4 ways: mix into mixed feeds, mix with molasses, mix with some ingredients of feed supplementation blocks, or mix with grass or straw for silage.



FEED SOURCES FOR CATTLE

➤ When using urea, note the following:

- ✓ Provide adequate fermentable carbohydrates in cattle diets, otherwise cattle will be poisoned and die.
- ✓ **Do not dissolve urea in drinking water given to cattle**
- ✓ If a cattle has never consumed urea, it is necessary to allow some time to adjust: feed multiple times/day, a little at a time, introduction time from 5 - 10 days.
- ✓ Only use urea for adult cattle.

➤ Recommended urea use in cattle diet:

- ✓ Mixing with concentrates: no more than 1%.
- ✓ Mixing in silage: no more than 0.5%
- ✓ No more than 0.5% of total diet dry matter.
- ✓ Urea should not be used in concentrates for fattening cattle that have diets comprising 70-80% concentrates



FEED SOURCES FOR CATTLE

7.2. Mineral supplements

- **Mineral macronutrients** (calcium, phosphorus): limestone powder, shell powder, bone meal, or dicalcium phosphate.
- **Mineral micronutrients** (cobalt, copper, zinc, etc.): used in the form of sulfates (cobalt sulfate, copper sulfate, zinc sulfate, etc.).
- In practice, different types of minerals are combined to make mixed minerals then mixed with concentrates.
- Minerals can be supplemented for cattle in lick blocks in which molasses, clay or cement, etc. are mixed.



FEEDING REGIME FOR BEEF CATTLE AT DIFFERENT STAGES



FEEDING CATTLE AFTER CALVING

TẠI SAO PHẢI BỔ SUNG THỨC ĂN TINH CHO BÒ MẸ SAU SINH?



- Bò mẹ nhiều sữa
- Bê con nhanh lớn
- Bò mẹ sớm lên giống lại
- Khoảng cách lứa đẻ ngắn

- Bò mẹ ít sữa
- Bê con chậm lớn
- Bò mẹ gầy, chậm lên giống lại
- khoảng cách lứa đẻ dài

Phải bổ
sung
thức ăn
tinh



FEEDING CATTLE AFTER CALVING

- Supplement concentrates for cattle from calving until the age of 3 months.
- Concentrates should have protein content of 15-16%.
- Composition of concentrates: cassava meal 40%, corn meal 40%, concentrated bran 17%, salt 1%, urea 1%, minerals 1%.
- Concentrate amount to feed:

Cattle weight (kg)	Ration (kg/day)
150 - 200	1.2 – 1.7
200 – 250	1.7 – 2.0
300 – 350	2.5 – 2.9
350 - 400	2.9 – 3.3

- Give 2 meals/day, offer concentrates before green roughages.



FEEDING CATTLE AFTER CALVING

THINGS TO NOTE WHEN SUPPLEMENTING CONCENTRATES:

- The concentrate mixture should be well mixed.
- It is recommended to mix 10-15 kg/batch, keep in a sack, store in a dry place and take out portion by portion to feed cattle.
- Do not cook concentrates; it is recommended to offer them as dry or slightly moist.
- Depending on the physical condition of the cattle, increase or reduce the ration accordingly.
- Offer plenty of good quality fresh grasses + add dry straw at night.
- Provide adequate drinking water.



FEEDING CALVES STAYING WITH THEIR DAMS (after parturition until weaning)

- Dam's milk: In the first month, the main food for calves is their mother's milk
- Early weaning for calves:
 - ✓ Mixed concentrates: Introduced to calves from 10 - 15 days old, fed in between 2 milk feeds. Starter concentrates must have good quality and protein content of 16-17%. The initial amount of concentrates is about 0.1kg, and is gradually increased to 0.5kg (from 2nd month to 5th month), to 1kg (from 6th month).
 - ✓ Mixed concentrates can be made depending on available ingredients:
 - Mix 1: 50% rice bran + 50% soybean meal
 - Mix 2 (after calves can eat concentrates): Rice bran 40%, corn meal 39%, concentrated bran 20%, minerals 1%.



FEEDING CALVES STAYING WITH THEIR DAMS (after parturition until weaning)

- ✓ Hay: stimulate growth of the digestive system. Introduce hay for calves to wean since day 7-10 by putting good quality hay in a bucket hung in the pen.
- ✓ Grass: introduce at the end of the first month, offer at the pen or by directly grazing on pasture.
- ✓ Roots and fruits: recommended to introduce from 3rd month onwards, stop if calves have diarrhea.
- ✓ Minerals: From the first to 5th month, calves need plenty of Ca and P, so bone meal, limestone powder, shell powder, etc., should be supplemented.
- A separate area should be constructed for feeding calves roughages, equipped with troughs to hold starter concentrates, accessible to only calves and not to dams.
- Calves are given dry matter equivalent to 2.5-3% their body weight.
- Water: during weaning, ensure calves always have access to adequate drinking water.



FEEDING FOR CALVES AFTER WEANING (7-12 months old)

- Ration standards depend on body conditions and expected weight gain. Weight gain expectation usually from 700- 1000g/head/day.
- Grazing on pastures and meadows is best → make the best out of pastures and facilitate conditions for calves to move and boost body growth.
- Ensure the daily amount of green grass for calves is from 15 - 20kg (7 - 12 months old), concentrates from 1-2kg.
- With such care, if calves do not gain weight or experience slow weight gain or have ruffled hair, check their manure to look for helminth eggs. Deworm if there are. If not, give additional 0.5-1kg molasses or concentrates.



FEEDING HEIFERS (13 - 24 months old)

- Besides grazing, give them additional concentrates, cut fresh grass, silage, hay, urea treated straw, etc.
- The daily feed ration for heifers can be as follows:
 - ✓ From 13 - 18 months old: 20 - 25kg fresh grass + 1.5kg mixed concentrates
 - ✓ From 19 - 24 months old: 30 - 35kg fresh grass + 2.0kg mixed concentrates
- The daily concentrate ration is offered into 2 meals per day.



BEEF CATTLE FATTENING

➤ WHY FATTENING?

- ✓ Increase yield and beef quality. → Meet market demand, sell at higher prices.
- ✓ Take advantage of feed sources, labor, create jobs, increase income.



➤ CATTLE FOR FATTENING?

- ✓ Culled cattle
- ✓ Cattle aged more than 20 months old



BEEF CATTLE FATTENING

➤ WHAT FEED TO USE FOR FATTENING?

✓ Concentrates

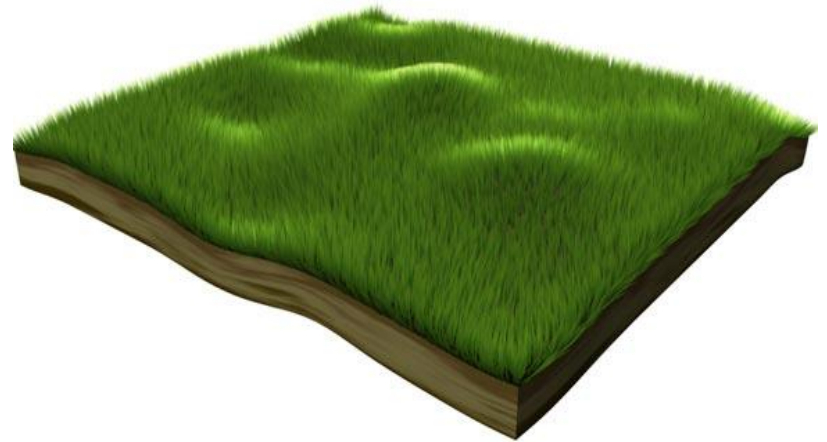
✓ Roughages:

- Green roughages (elephant grass, natural grass, corn stalks, etc.), feed as much as needed.
 - Silage (about 30-50% compared to green roughages)
 - Rice straw, hay.
- ✓ Drinking troughs should be available and drinking water should be readily available in the barn.
- ✓ Before fattening, diseases (if any) in the cattle must be treated and dewormed.

Cattle weight (kg)	Green roughages (kg)	Hay (kg)	Rice straw (kg)	Concentrates (kg)
230	20	1	4	1.0 - 2.0
260	20	1	4	1.2 - 2.4
290	25	1	4	1.5 - 3.0
320	30	1	4	1.5 - 3.2
350	30	1	4	2.0 - 3.2
400	30	1	4	3.0 - 4.0

CATTLE FEED PREPARATION METHOD

- Stockpile green roughages from the summer-autumn crop harvest (silage or dried);
- Process and stockpile available agro-industrial by-products;
- Use locally available natural plants and forages;
- Cultivate additional plants and grasses for winter crop



STOCKPILE GREEN ROUGHAGES BY ENSILAGE



Ensilage refers to compressing feeds → fermentation under airtight conditions → during ensilage, **bacteria** transforms soluble sugars → organic acids → ↓ pH ensilage environment → inhibit bacteria/ plant enzymes → **ensiled feed can be preserved for a long period**

- 1) Stable source of roughages throughout the year, overcome shortages (droughts, winter, etc.)
- 2) Feeds can be preserved for a long period, negligible nutrient loss
- 3) Make full use of many sources of crop by-products (straw, corn stalks, sugarcane tops, cassava tops and leaves, pineapple residue, etc.)
- 4) Contribute to sustainable exploitation of available feed sources → livestock development and environment protection

Feed ensilage techniques

Silage pit/ bag

Location

- Near barn → easy transportation, manpower saving, avoiding dropping
- Silage hole: Choose a high location so water from outside can permeate through the pit

Ingredients....



Put feeds into the pit/ bag

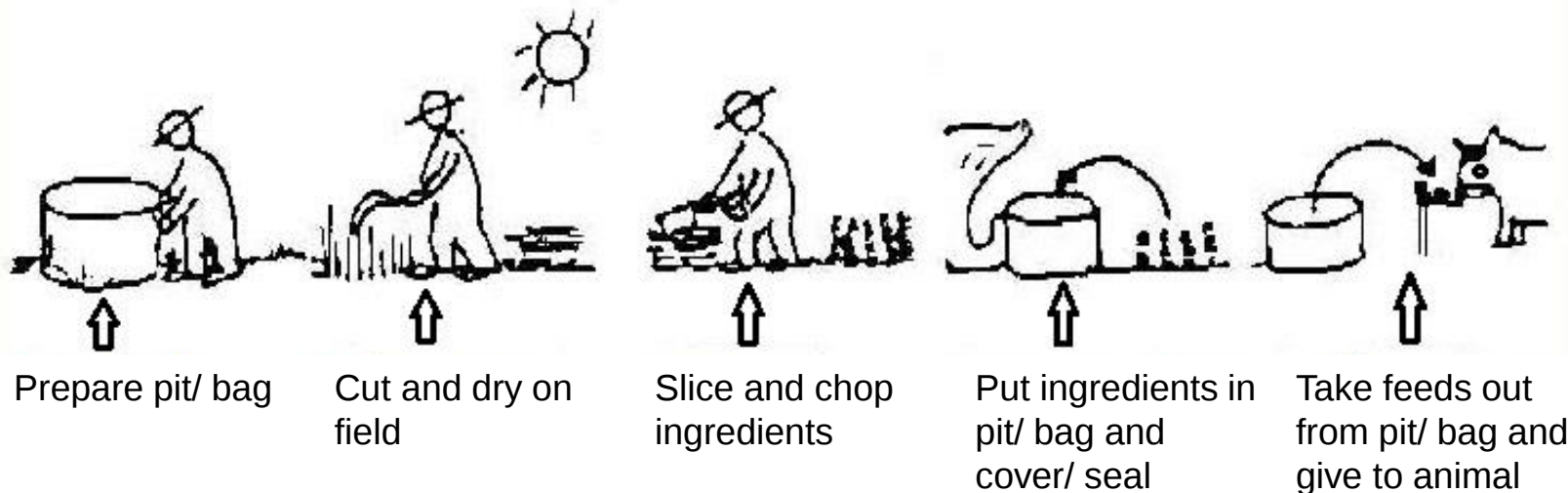
→ Check pit/bag

→ Check feeds

→ Put feeds into pit/bag

→ Cover pit/ seal bag

Steps to make silage



Usage

- Take out to feed after ensiling for 3 weeks. Only take as much as cattle's needs, keeping leftovers for the next meal is not recommended. Once a silage pit/bag has been opened, continuous feeding is recommended. Introduce to cattle from a small amount to larger amounts for them to get used to the silage (5-7 days).

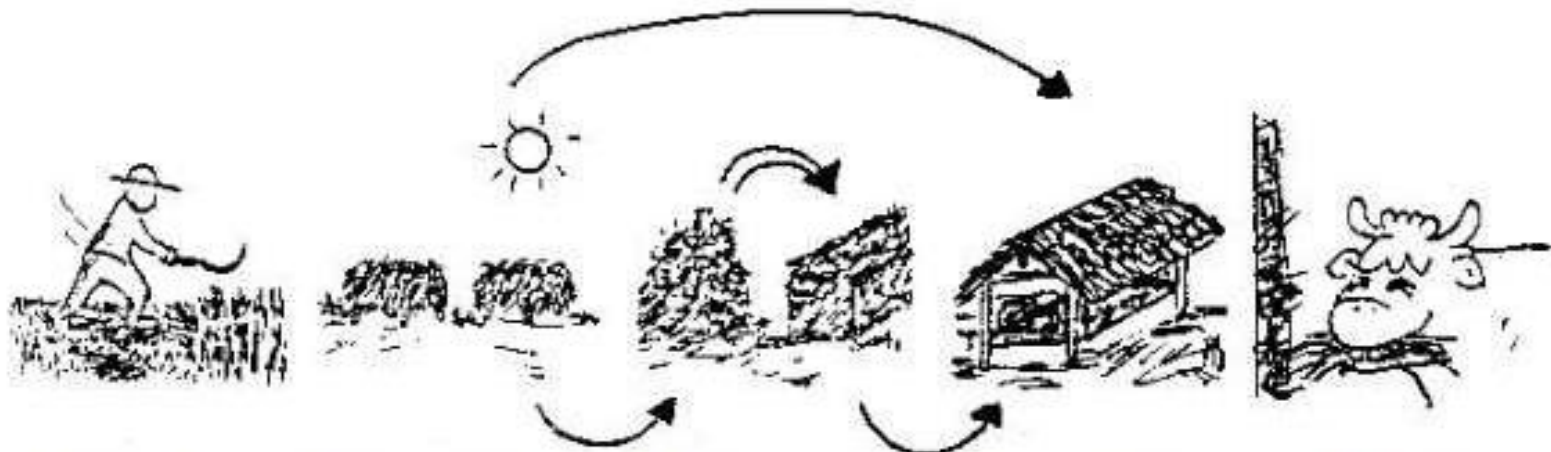
HAY STOCKPILING

Benefits

- Very simple method, not requiring complex techniques, little is spoiled;
- Applies for all scales of husbandry and stockpiling, particularly suitable for household-scale husbandry;
- Makes use of grazing time to cut grass for drying;
- No investment is required compared to ensilage → suitable for farmer households;
- Nutrition loss is not as high as ensilage for households ensiling at a small scale.



Steps to make hay



Cutting

Drying

Bundling

Storing

Feeding

From
April-
June

Spread
evenly and
thin to dry
in the sun

When hay reaches moisture content of 14-15%
→ pile up, make into bundles (best to use
bundling machine) for storing



USING HIGH-FIBER ADDITIVES TO MAKE WINTER FEEDS

- Limited pastures/meadows, agricultural land is mainly for cultivation of food crops and vegetables. Ruminant cattle → more dependent on crop by-products, etc. → Low quality roughages (straw) can still be exploited to the maximum.
- 3 disadvantages of agricultural by-products : (1) *seasonality of harvest* (2) *unbalanced nutrition* (lacking N, minerals, vitamins and fermentable energy) and (3) *lignified cell walls*
- 3 technical solutions
 - Collect after crop harvesting for long-term **stockpiling**.
 - **Supplement** lacking nutrients ➡ ability of rumen microorganisms.
 - **Apply treatment** to break cell wall linkages to allow easier contact between rumen microorganisms and substrates ➡ digestibility and intake

Treatment methods

- **Physical:** mechanical (mincing, chopping, grinding, soaking, pelleting, boiling); steam heat and radiation
- **Biological:** fungi or enzyme products are inoculated to break down lignin or chemical bonds between lignin and plant cell wall carbohydrates.
- **Chemical:** NH_3 ; NaOH; Urea; Lime and Lime + Urea combination

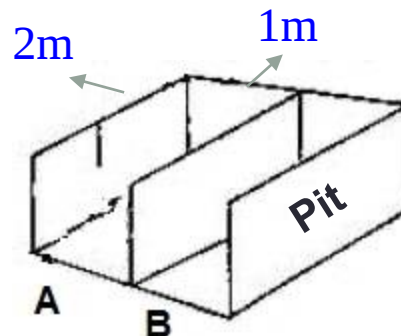
Hay treatment



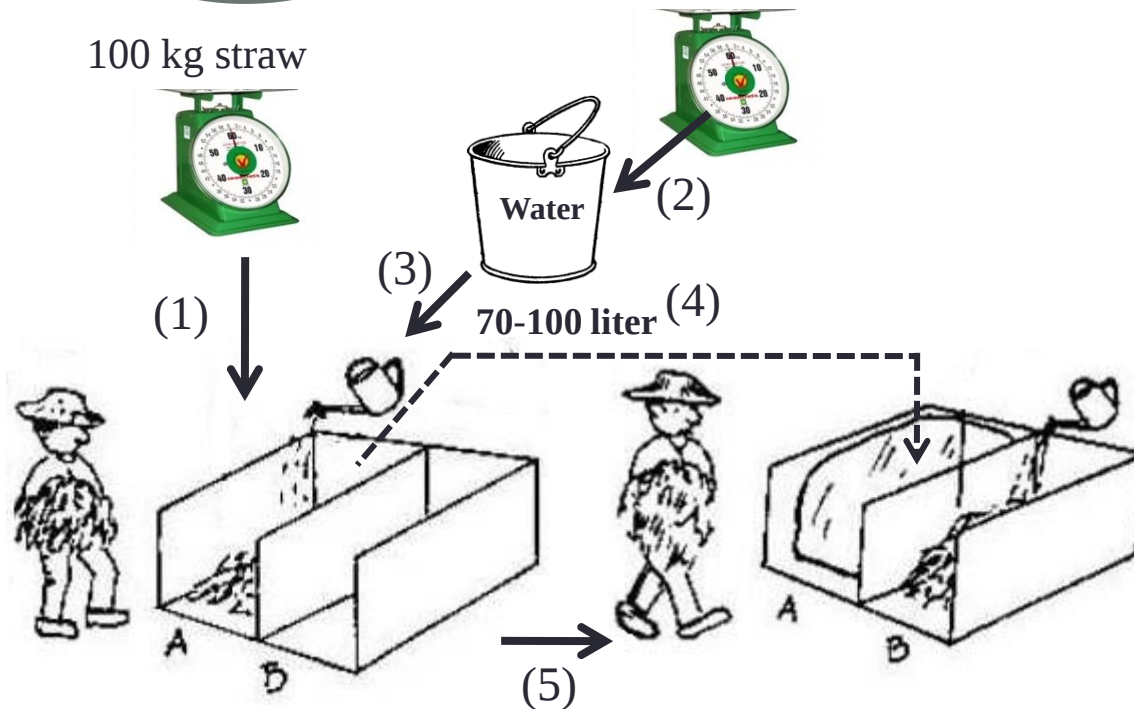
100 kg straw



4 kg Urea



Bag
(1m x
2m)



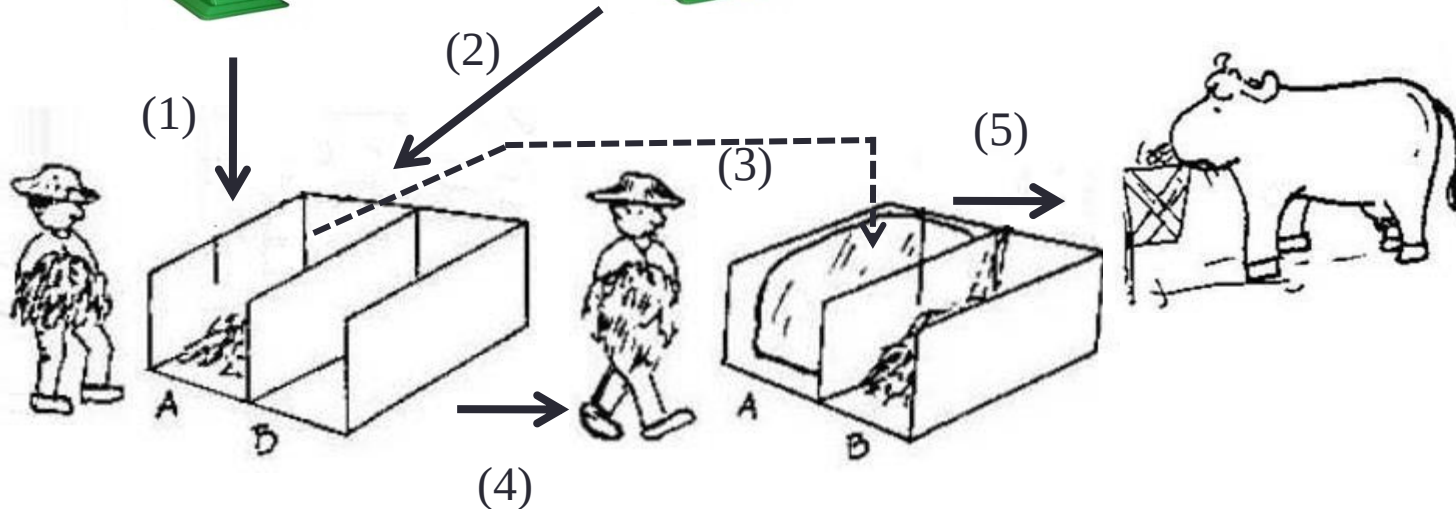
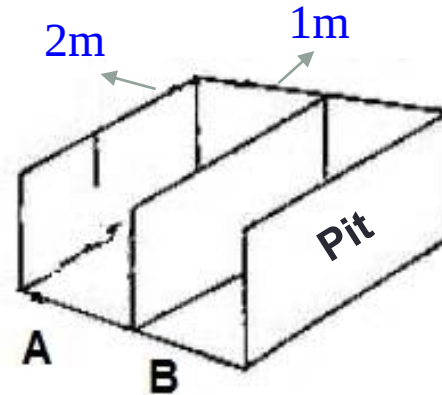
Fresh straw treatment using urea



100 kg straw



4 kg Urea



Corn stalks and leaves ensilage



Prepare
pit/bag



Half-dry



Finely
chop 3-5
cm



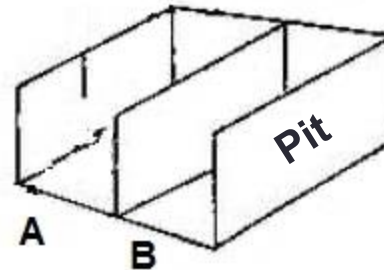
Put in layers of 20-30
cm, add 0.5% salt
and 3% bran, press
firmly



Cover pit
completely/
seal bag
tightly

For each **100kg** corn stalks and leaves,
add 3 kg cassava flour (rice bran) and
0.5 kg salt.

Sugarcane tops ensilage

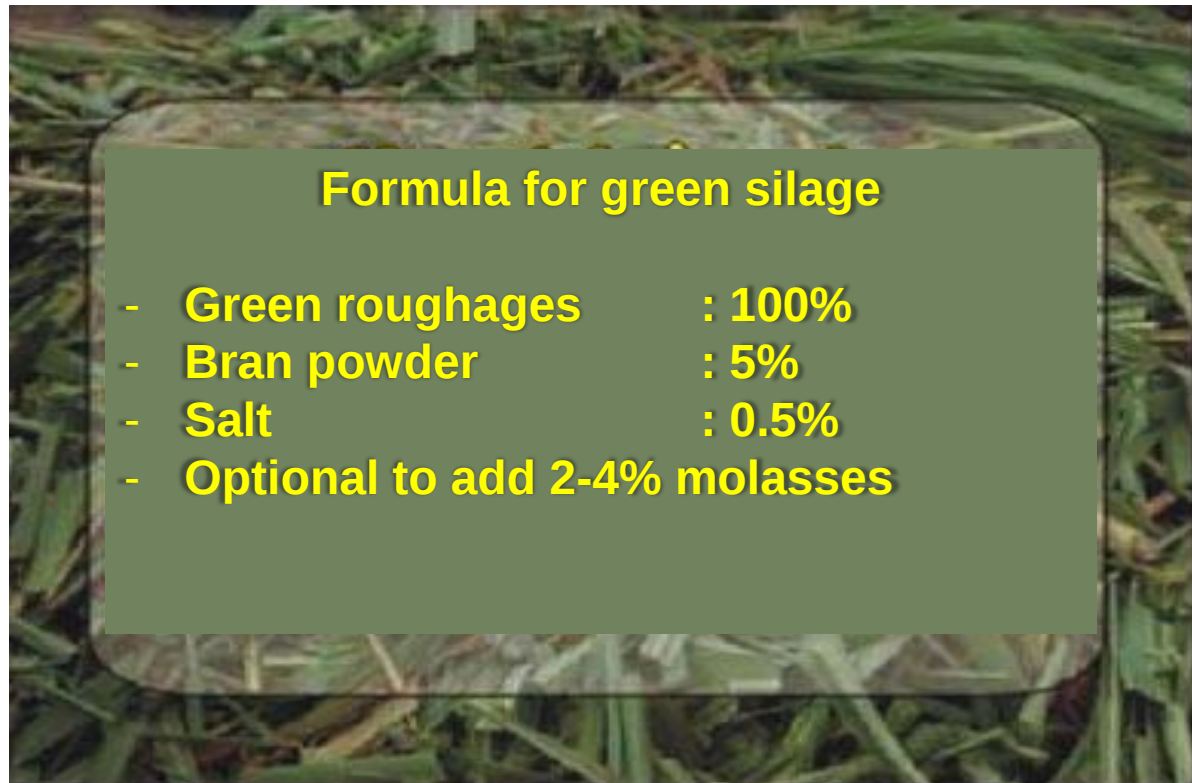


Sugarcane tops are fresh when harvested → finely chop to 3-5 cm. For each **100kg** sugarcane tops, add 1.5 kg molasses, 3 kg cassava flour (rice bran) and 0.5 kg salt.

Method of pit preparation and ensilage similar to corn ensilage.

Feed ration: winter 5 - 10 kg/day, to be supplemented with straw and grazing.

Fresh grass ensilage



Method of pit preparation and ensilage similar to corn ensilage.

Fresh grass for ensilage should be older than grass fed directly to cattle

Pineapple by-products ensilage



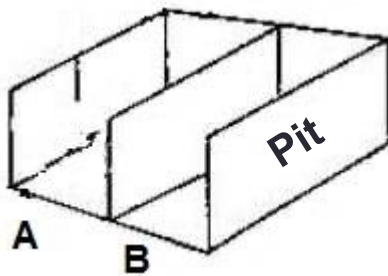
Can apply one of the following formulas:

- 1) 75% pineapple tops + 25% peel and pulp + 0.5% NaCl
- 2) 100% tops, stalks and leaves + 0.5% NaCl
- 3) 100% fruit peels and pressed pulp + 0.5% NaCl
- 4) 50% tops and other by-products + 50% corn + 0.5% NaCl.

Chop into 3-5 cm length



Put in layers, each 20 cm → sprinkle salt in → press after several layers to increase anaerobicity in pit



Cover completely with plastic, a 30-40cm layer of soil on the surface

Finish



Tightly seal bag

Peanut plant ensilage



Finely chop to 5-6cm → hang dry in shade to avoid rotting → ensile immediately in 1-2 days

For 100kg peanut plants, add 6-7kg cassava flour (or bran or corn meal) and 0.5kg salt

- Mix ingredients following the ratio, turn well outside of the pit → put in the pit in 15-20cm thick layers, use feet to press firmly
- Possible to weigh peanut leaves and layer them into the pit, each layer 15-20cm thick, sprinkle bran and salt as the above formula → compress firmly → ensile layer by layer until pit is full



Cassava leaf ensilage



- $\cong$ 1 million tons after root harvesting, rarely used as cattle feed
- rich in protein 18-20% but contains toxic cyanogenic glucoside $\rightarrow$ slow growth in cattle or possibility of causing death if the content is high

Crush the stalk (tops) and finely chop to 3 - 4cm. Add to each 100kg cassava tops: 5 - 6kg cassava flour, rice bran or corn meal and 0.5kg salt.

Pit preparation and method: similar to peanut.

Thank you for your attention!

