HOME MADE ANIMAL FEED CONCENTRATES

FOOD AND AGRICULTURE ORGANIZATION
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TYPES OF FEED AND CONCENTRATED FEED

There are two major categories of feed: concentrates (grains) and roughages (pasture, hay, silage). Roughages are usually high in fiber. Concentrates are usually high in protein or carbohydrates.
For an animal to grow normally and to gain weight efficiently, the amount that it eats in one day must contain enough energy and protein for body maintenance, growth, and production.

Pasture, forbs, and browse

Pasture, range, forbs, and browse are usually the primary and most economical source of nutrients, and in many cases, all that a cattle needs to meet its nutritional requirements. Pasture is high in energy, protein, and palatability when it is in a vegetative state. However, it can have high moisture content and it can be difficult for high-producing animals to eat enough grass for maximum productivity.
As pasture plants mature, palatability, digestibility, and nutritive value decline, thus it is important to rotate and/or clip pastures to keep plants in a vegetative state. Forbs usually have higher digestibility and crude protein levels than grasses at similar stage of maturity.

Hay

Hay is forage that has been mowed and dried for use as livestock feed. It is usually the primary source of nutrients during the winter. Hay varies in quality on basis of plant species. Proper harvesting and storage is necessary to maintain nutritional quality of hay.
Hay is a moderate source of protein and energy. Good grass hays have energy as legume hays, but legumes have 50 to 75% more protein and three times as much calcium.

Silage

Silage is the term used for the feed produced by controlled fermentation of high moisture herbage. Silage can be made from forage or grain crops. As with fresh forage, the high-producing animal often cannot consume enough high moisture silage to meet its nutritional needs. For small and medium sized flocks, silage bags make silage feeding a possibility.

Urea

Urea is not a protein supplement, but is a source of non-protein nitrogen for protein synthesis by rumen bacteria. It should be used only in conjunction with high-energy feeds such as corn. Urea, which is 45 percent nitrogen and has a crude protein equivalent of 281 percent, should not supply over one-third of the total nitrogen in a diet.

Vitamin and minerals supplements

Producers mixing their own simple rations should use supplements that contain vitamins and minerals. These supplements can easily be combined with whole grains or by-product feeds to create a balanced concentrate ration.
Complete mineral mixes are recommended when grazing low quality roughages and during gestation and early lactation. The most important minerals are calcium, phosphorus, salt (NaCl), and selenium. Normally, when a well-balanced ration is fed, the only necessary supplement is salt and can be added by placing a salt block in the pasture or by providing salt in a pan or trough.

By-product Feeds

There are numerous by-products available as a result of processing a traditional feed ingredient to generate another product. By-product feeds can often be economical sources of nutrients. The high moisture content of some by-product feeds may limit consumption of the diet result-

ing in poor animal performance.
From the sugar beet industry come beet tops, which are used on the farm either fresh or ensiled, and dried beet pulp and beet molasses, which are produced in sugar factories. These are palatable, high-quality sources of carbohydrates.

Concentrated feeds
Feed concentrates provide nutrients that forage alone cannot provide. This is particularly true in the case of high-producing animals. At times concentrates are a more economical source of nutrients than forages.
There are two types of concentrate feeds: carbonaceous and proteinaceous.

- Proteinaceous concentrates or "protein feeds" contain high levels of protein (>15%). Examples include soybean meal, cottonseed meal, peanuts (groundnuts), flaxseed (linseed), canola, cottonseed, coconuts, oil palm, and sunflower seeds. Protein quantity is generally more important than protein quality (amino acid content) in ruminant livestock because the microorganisms in the rumen manufacture their own body protein. Livestock do not store excess protein; it is burned as energy or eliminated (as nitrogen) by the kidneys.
- Carbonaceous concentrates or "energy" feeds are high in total digestible nutrients, but tend to be low in protein (8-11%). They include the cereal grains -- corn, barley, wheat, oats, milo, and rye.

Certain concentrates are reduced to high protein content, comprising of a combination of vegetable proteins, urea, essential vitamins and minerals, rumen modifier and limestone, designed to be mixed with grain and roughage, to produce a complete ration. Such concentrates are mix 94% grain and 6% concentrate. The concentrate is not fed directly to the cattle.
Many feed companies offer "complete" mixes of feed, balanced for the needs of the animals of a particular age and production class. Complete feeds should not be mixed with other grain, because this may create nutritional imbalances. Complete feeds tend to be significantly more expensive than home-made concentrate rations.
These mixes are called concentrates and, because they usually have a high content of cereal grains, mixes that contain only grain are also called concentrates.

WHY HOME MADE CONCENTRATES (HMC)

Generally, a cow will eat from 2.5 to 3 % of its body weight in feed daily. For top performance, about 70 to 80 % of this feed should be a concentrate mix and the remainder good quality roughage. On good pasture, concentrate mix can be reduced 50 to 70 %, but more concentrates produce faster gains.

There are many commercial concentrate mixes available. Some are high in protein for use during the first part of the feeding period. Others are high in energy for use during the last part of the feeding period.
You can also make your own concentrate mixes if the ingredients are available.

- Concentrate use can be even higher than 1:1 concentrate to milk yield
- Feed costs are about 70% of total operating costs for animals, so decreasing equals significant income
- Concentrate supplementation for lactating cows has been proved as successful by many small-holder farmers
- The use of local feed resources to reduce production cost should be more a primary concern for dairy farmers
- Most of farmers use home-made concentrates, plus by-products and commercial concentrates home-made concentrates comprised of local feed resources decrease feed cost of production, by adding value to the own production

NUTRITIONAL NEEDS OF CATTLE

Prior engaging in home making of concentrates a farmer should be aware of nutritional requirements of their livestock.

(400 kg) Head per day	Unit	Cows lactation and after weaning	Lactating cows first 1/2 of lactation	Dry pregnant cows 2 months before calving	Heifer 1 month, 40 kg and growth 650 g/day
Feed unit	--	6.70	8.30	6.40	2.30
Exchange energy	MJ	82.00	98.00	79.00	16.90
Dry matter	g	10.50	12.00	9.80	0.80
Digest protein	g	570.00	780.00	704.00	220.00
Fat	g	214.00	266.00	211.00	190.00
Fiber	g	3015.00	3400.00	2867.00	65.00
Sugar	g	489.00	626.00	540.00	200.00
Calcium	g	50.00	63.00	60.00	10.00
Phosphorus	g	27.00	36.00	35.00	5.00
Magnesium	g	0.00	0.00	0.00	0.00
Potassium	g	0.00	0.00	0.00	0.00
Sulfur	g	19.00	23.00	18.00	0.00
Hardware	mg	526.00	720.00	492.00	40.00
Copper	mg	70.00	86.00	68.00	6.00
Zinc	mg	302.00	448.00	324.00	35.00
Manganese	mg	475.00	604.00	440.00	30.00
Cobalt	mg	5.40	7.20	4.80	0.50
Iodine	mg	4.00	6.00	4.50	0.30
Carotene	mg	248.00	320.00	250.00	30.00
Vitamin D	MO	5.40	7.60	6.40	700.00
Vitamin E	mg	234.00	315.00	256.00	30.00

All cattle require energy, protein, minerals and vitamins for maintenance and growth. Energy is the major cost component of the diet. In general, cattle will utilize low fibre/high energy diets more efficiently than high fibre/low energy diets.
Protein is the next major component of the diet and it becomes limiting when poor quality, high fibre diets (stemmy silage, hay or straw), are fed.

Knowing of the nutritional needs and producing own blends and mixes may represent a cost saving over purchased concentrate feeds, as wastage is reduced and home made concentrates supplement available feeds.

The table shows the average nutritional requirements of cattle and calves at weights mostly present in individual farming households.

NUTRITIONAL VALLE OF FEED AND CONCENTRATE COMPONENTS

In order to be able to produce feed, farmers beside the knowledge of the nutritional needs of their livestock, should also have working knowledge of the nutritional value of different components often used in homemade concentrates. Farmers should additionally be aware of the nutritional values of other types of feeds that are complemented to feeding of home made concentrates.

The tables below contain the average nutritional values of the usual components of homemade concentrates as well as of roughage most commonly complemented with concentrated feeds.

PLANING AND COMPOSING JOUR RATIONS

Concentrates (grains) usually account for 10-40% of the energy obtained from feed in cattle, 40-85% in pigs and 5-25% in sheep and goats.
Starch content in grains is approximately 45% in cereals and up to 72% in maize grain. Different sugars make up to 2.5% of the dry mater in grains. The level of raw proteins is limited (10-14%) due to which concentrate mixes usually contain both carbohydrates and protein reach components.

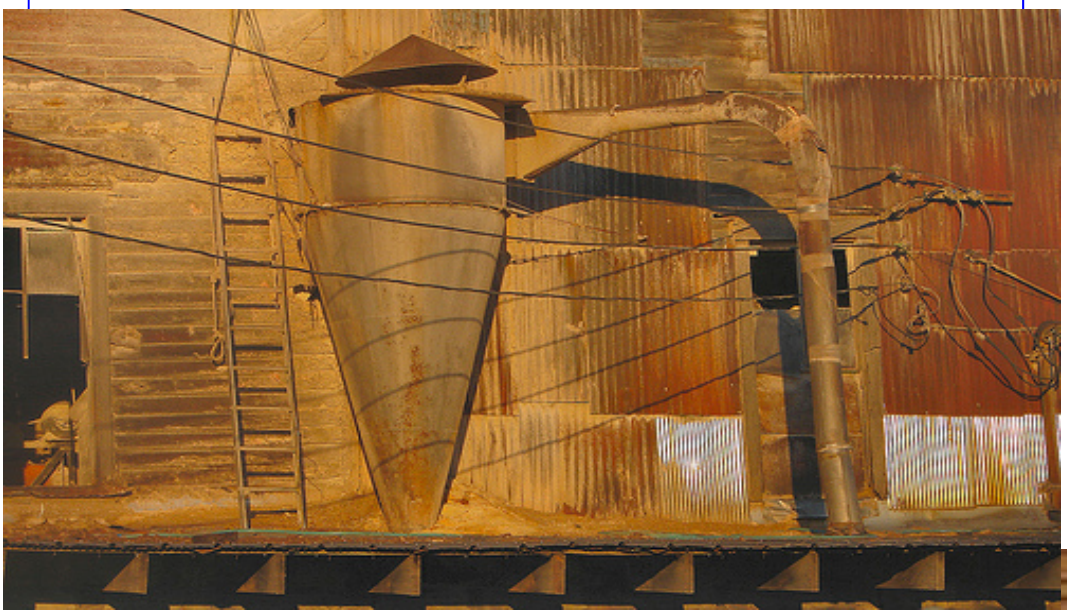
Despite the advantages of concentrates (grains) farmers need to be careful as high amounts tend to cause digestive problems, like acidosis and timpani. High levels of starch when fed in abundance cause fermentation related problems in the rumen, especially during the lactation, when low fat volume syndrome appears. Therefore farmers should be aware and limit the starch content in cattle rations to max 35% of the dry matter content, meaning that grains content should not present more than 60% in the total dry mater content.

Formulating Rations With the Pearson Square

The Pearson square for balancing rations is a simple procedure that has been used for many years. This booklet will take you trough the calculation for preparation of an concentrate mix on basis of available ingredients.
In taking a close look at the square, several numbers are in and around the square. The most important number appears in the middle of the square. This number represents the nutritional requirement of an animal for a specific nutrient. It may be crude protein, minerals or vitamins.
If we start with the choosing a specific animal to feed lets say a lactating cow during weaning cow of 400 kg live weight (nutritional needs are provided in chapter 4). Table 4 shows that such a cow would need approximately 570 grams of protein per day.
Than we start with the recommendation from chapter 8 (example 2) that a cow should eat approximately one kg of concentrates per every 100 kg of live weight, meaning our cow would need to be fed with 4 kg of concentrates which fully or almost will satisfy provide 570 grams of protein. If we divide 570 grams on 4 kg we will get 14 or the percentage of protein the concentrate has to contain.
This number we place in the middle of the Pierson's square.

If we presume that as components we have,

- Maize grain with protein content of ***8,9%*** and energy value of ***13.67*** (Table 5.1).
- Soybean cake with protein content of ***44%*** and energy value of ***12.90*** (Table 5.2).
- Fodder peas with protein content of ***15.5%*** and energy value of ***11.2*** (Table 5.2).



TWO COMPONENT MIX

First we add the maize grain crude protein percentage in the upper left corner and the Soybean cake protein percentage in the lower left corner, and cross subtract it. We would get the values of parts in the meal 30 and 5.1, which we add and get the final number of parts or 35.1

8,9% | 14 % | ***44%*** - 14% = 30 x 100/ 35.1 = **85%**

+

44% | ***8,9%*** - 14% = 5.1 x 100 /35.1 = **14.53 %**

= 35.1

Than we calculate the pars in order to get the total percentage participation of both components

100 x 30 / 35.1 = **85%** for maize grain, and 100 x 5.1 / 35.1 = 14.53 % for soybean cake. The energy value of the mix is calculated by multiplying of the percent of each component by the energy value **85%** x 7.3/100 = 6.24 MJ/Kg and 14.53 % x 7.2/100= 1.05MJ/Kg or 7.29MJ/Kg in total.

8,9% | 14 % | ***44%*** - 14% = 30 x 100/ 35.1 = **85%** x ***13.67***/100 = 11.6 MJ/Kg

+ +

44% | ***8,9%*** - 14% = 5.1 x 100 /35.1 = 14.53 % x ***12.9***/100= 1.87MJ/Kg

= 35.1 =13.47MJ/Kg

If you are mixing two component the calculation stops here, and we note the energy value of 7,29 x 4 kg of concentrates = 29.16 MJ out of the needed 82 MJ/day. In order to get to the required energy value our concentrate should have at least (82/ 4 kg of concentrate) 20.5 MJ/kg.

THREE COMPONENT MIX

Using the same steps we calculate the combination of the second mix or maize and fodder peas.

8,9% | 14 % | ***15.5%*** - 14% = 1.5 x 100/ 6.6 = **22%** x ***13.67***/100 = 3 MJ/Kg

+ +

15.5% | ***8,9%*** - 14% = 5.1 x 100 /6.6 = **77%** x ***11.2*** /100= 8.62 MJ/Kg

= 6.6 = 11.62 MJ/Kg

Than we repeat the same procedure for calculating the needed quantity to reach the energy needed for the above-mentioned type of cow or 6.8 MJ/Kg

The final calculations provide for the assessment of the energy requirements. Just follow the color of the numbers to understand the origin and the calculation.

13.47 | 20.5 | 13.47 – 20.5 = 7.03 x 100/ 15.91= 44.1%

+

11.62 | 11.62 – 20.5 = 8. 88 x 100/15.91= 55.8%

=15.91

The final calculation provides for the percent of each of the three components

MAIZE	44.1%	* **85%**/100 =	37.48% +
	55.8%	* **22%**/100 =	12.2% or 50 % of maize in the concentrate
SOYBEAN PIE	44.1%	* **14.53%**/100 =	7% and
FODDER PEAS	55.8%	* **77%**/100 =	43%
			100%

Standard mixes of balanced rations are well known and examples are provided in the text below.

Example 1: 17 % CP

- 1 975 KG maize gluten and 25 KG minerals and vitamins
- 3 650 KG barley, 325 KG rapeseed meal and 25 KG minerals and vitamins

NOTE Minerals and vitamins should be added to these rations. Typical inclusion rates are 1 x 25 KG bag per tone. When feeding a ration comprising maize gluten only, a specific mineral balancer high in calcium should be used.

Example 2: 14-15 % CP

- 1 650 KG maize gluten, 325 KG maize meal and 25 KG minerals and vitamins
- 2 325 KG maize distillers, 325 KG maize meal, 325 KG citrus pulp and 25 KG minerals and vitamins
- 3 600 KG barley, 375 KG maize gluten and 25 KG minerals and vitamins
- 4 875 KG barley, 100 KG soya and 25 KG minerals and vitamins
- 5 550 KG barley, 300 KG maize, 125 KG soya and 25 KG minerals and vitamins

Standard mixes of balanced rations can be provided also on basis of percentage shares of ingredients, as in the following examples:

Example 3: CP 13.0%
Maize Meal 25%, Distillers 25%, Citrus pulp 25%, Barley 20%, Molasses 2.5%, Min& Vits 2.5%.

Example 4: CP 15.7%
Barley 20%, Maize Meal 30%, Maize gluten 20%, Distillers 15%, Citrus pulp 10%, Molasses 2.5%, Min& Vits 2.5%.

Example 5: CP 13.5%
Barley 47.5%, Maize meal 20%, Rapeseed meal 15%, Citrus pulp 10%, Molasses 5%
Min& Vits 2.5%.

PREPARING HOME MADE CONCENTRATES

A number of methods of processing grains exist as part of both the preparation and mixing of concentrates. Therefore is important to be aware of the characteristics of the grains used for production of concentrates and therefore if possible to apply the relevant method.
Most methods aim at improvement of the availability of the starch for which reflects on the total digestibility of the feed. As most grains contain high starch levels it is important to make it easily accessible for digestion. Some of the methods used are mechanical, some chemical and some thermal, but in general they are divided in dry and wet methods and cold and hot methods.

Preparation of homemade concentrates is often limited to two or three operations due to the need for specialized equipment for different processes.

Pealing (dehulling)

Is designed to remove the shell (outer layer), of the grains in order to reduce the total amount of raw fiber that reduces the total digestibility in non ruminants. As result certain industries produce significant amounts of peelings that can be used as concentrate components for ruminants. Other grains such as soy are pealed to increase the total quantity of proteins by removing the excess amount of fiber.

Grinding

Is the oldest and most used method that uses mechanical force to physically break up the cells as well as the outer layer. Some One of the first steps in feed processing is the grinding. This is accomplished by increasing the surface area of the grain portion of the diet by a marked reduction in particle size.

Feeding fine, medium or coarse mash feeds results in increase in feed consumption and less feed wastage with the coarser feed. Grinding to medium size particles (like sugar or polenta (gomi)) has been proven to be most effective as dust or flower size particle of grinding, tends to increase wastage during using, storing and transport and cause digestive problems, especially in young animals.
During grinding attention should be devoted to limiting of the presence of foreign materials and contaminants

Heat treatment

Several methods of heat treatments are in use, mostly using low and medium temperatures as high temperatures denaturalize proteins and vitamins. Heat treatment (frying) of corn on 149 oC results in improved digestibility by 10% and increased daily production by 14%.

Heat treatment of whole soybeans, significantly improves the feeding value of the raw soybeans, as well as reducing pancreas weight to levels similar to that of the control, dehulled, extracted soybean meal. Fried whole soya beans results in increased digestibility by 5-10% due to increase in the fat content. As example unfired whole soya grains contain 22% of protein, fried whole soya grains contain 37% of protein while pealed soya grain contains 44% of protein, which means that frying is a good substitute to pealing.

Mixing

Mixing is important in order to homogenize the structure of the concentrates and to enabe equal composition in every scoop of concentrates. In addition it prevents animals from eating only components they prefer from the mix.

Storing

Storing is important in order to preserve the nutritional values of components and prevent spoiling. In general grains store as whole than as processed, so homemade concentrates should be used in general within a month of production. Vitamins tend to become unstable during long storing, carotene is lost, fats are easily spoiled and insects are able to more easily use and therefore more often attack processed components or concentrates.

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Record keeping

Good record keeping is needed in order to obtain an overview of the cost benefit in using different components and in order to be able to asses increase in production.

Modern cattle's farming is not about the quantity of milk produced, but rather tends to revolve around price of a liter of milk produced.

In order to have adequate data farmers need to keep records on their spending, including the production of concentrates. An example of record maintenance for production of homemade concentrates is show below.

Date			**Lot No.:**		
Quantity	750 кг		**Destination**		
No	**Components**	**%**	**Kg**	**Price**	**Calculation**
1	Corn grain	36,0	**270**	0.12	**35.1**
2	Wheat bran	15,0		8,5	
3	Barley	20,0		7,5	
4	Rye	4,0		8,0	
5	Oats	7,0		8,0	
6	Меласа	1,0		20,0	
7	Sunflower pie	13,0		32,0	
8	Soy oil	/		/	
9	Pork fat	/		/	
10	Chock	0,5		2,0	
11	Salt	0,5		9,0	
12	Antibiotic	/		/	
13	Vitamins and Minerals	3,0		98,0	
Total		**100%**	**750 кг**	**/**	

TIPS ON FEEDING CATTLE WITH CONCENTRATED ANIMAL FEED

Prior production of your own homemade concentrates

- not every farmer has the management expertise to make it work effectively
- not all animals have the genetic potential to benefit from this feeding regime
- feeding is sensitive to market fluctuations in the price of concentrate components

After production of your own homemade concentrates

- Use a transition diet to adjust the rumen at least 2-3 weeks before calving.
- Concentrates are: most cereals and grains as well as already prepared animal feed.
- Introduce cattle to this ration gradually over a 10 to 14 day period.

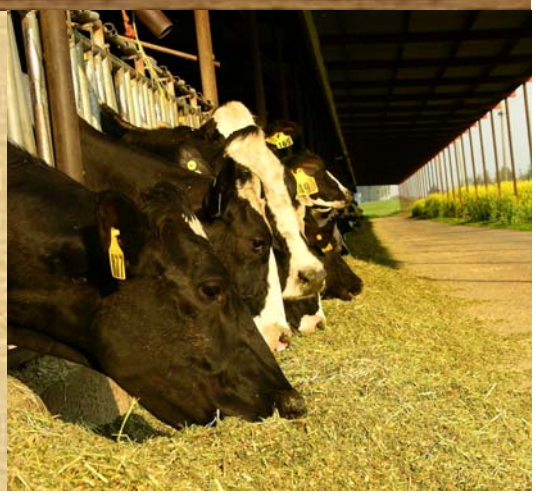
- The quantity of concentrate given daily to cattle should not exceed 2% of their body weight and are usually given at 1-1.3 kg per 100 kg/live weight.
- Multiple feedings during the day help keep the rumen stable.
- Feed grain/concentrate at least twice a day, if feeding more than 3-4 kg of concentrated feed per day.
- For non lactating cows concentrates with content of 12-15 % protein are usually used, meaning you can reduce the quantity of concentrates by 10-20%.
- For lactating cows use concentrates or combine feeds to reach content of 16% protein.
- The provided concentrate has sufficient content of vitamins, Ca and P to satisfy daily needs of cattle.
- Feeding fiber/forages before concentrate or feeding forages immediately after concentrates.
- Roughage supplied should be supplied adlib and to a mini-mum not less than 20% of their total intake.
- Ensure that there is ample access to clean water.
- The timing of feeding each day is important.
- If you can't feed forages before concentrate make sure cows get to forage quickly after consuming concentrate.
- Concentrate feeding with straw is an alternative to conventional silage and concentrate diets

Examples in preparing rations using concentrated feed

Example 1
For a 300 kg cow divide the daily feed in three rations and provide:

- First ration: provide 2 of straw, once eaten, provide 2 kg of concentrate,
- Second ration: repeat the meal with the same quantities
- Third ration: provide 2 kg of straw.

Example 2
Provide 5 kg of silage to cattle later provide 2 kg of concentrated feed and later provide 2 kg of straw.



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