

Feeding Methods



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To find the reasonable method of feeding in any farm, we must have an idea about:

- what is the kind of feedstuff will be used in the farm.
- Species of the animal.
- Farm management and what are available.

Feedstuffs

A feedstuff may be defined as any component of a diet that serves some useful function.

More than 2000 different products have been characterized to some extent for animal feeds.

Several factors determine the acceptability of a given feedstuff for inclusion in the diet of a particular animal species.

- Cost is relevant in all cases.
- Acceptance by the animal (palatability).
- Digestibility or bioavailability of the energy and nutrients contained in feedstuff.
- Nutrient content and balance
- Presence of toxins or nutrient inhibitors.

Classification of feedstuffs

Most feedstuffs provide an array of nutrients, but ingredients also may be included to provide:

- Bulk diet; this may includes:
Fresh forages; like grass, legume, and pasture plants.



Silages; like corn, sorghum, grasses.





Dry forages; like legume and nonlegume hay.



Figure 3. Box baled hay for storage and feeding dairy cows.



Roughages; like straw, corncobs, some grasses.



- Concentrates diet; this may includes:
Energy conc.; like cereal grains, milling byproducts, or molasses.
Protein conc.; like oilseed meals, animal meat, fish meal, and NPN.
- Mineral and vitamin supplements.
- Non-Nutritive additives; like antibiotics, hormones, and probiotics.

Forages and Roughages

The natural feed of herbivorous domestic animals is pasture herbage, and provide the major part of the diet for most or all of the year.

Natural grasslands normally include a large number of species of grasses, legumes and herbs, or may consist of mixture of small numbers of pure species.

Harvested and stored forages provide valuable E and nutrients for animals.

Roughages usually refer to high-fiber byproduct plant sources, which contain 18% or more CF.

Forages and roughages are of primary interest for ruminants, horses, and rabbits(?).

In general, roughages have a lower digestibility of E than most concentrates, with exception, for example, corn silage, and soybean hulls, are high in fiber but have a high energy value for ruminants.

Factors Affecting Forage Composition

- Stage of maturity
- Fertilization
- Harvest and storage methods
- Species and climate

Forages feeding methods

1- Grazing

Grasses:

This is the main way of small ruminants feeding on forages, either native or cultivated species.



As a food for grazing animals, grass has many advantages:

- Most grass species are palatable.
- Grasses have the ability to grow in most environment.
- Provide amounts of nutrients roughly in parallel with animal needs.

Legumes:

Many different legume are utilized by grazing animal

It is high palatability and excellent nutrients content.



Problems in grazing:

A. Early in the growing season, grasses, especially cool season species, have a very high water content and an excess of protein and total N for ruminants.

1-This may result in diarrhea, and in difficulty obtaining an adequate intake of energy(?).

2-Toxic symptoms may occur at level of 0.07% nitrate N, and 0.22% may be fatal to ruminants.

B. In comparison with legume (alfalfa), mature plants have lower CP, DE, soluble CHO, carotene, and some minerals(Animal need).

C. Stage of plant maturity (lignification).

D. Concentration of specific elements.

E. Cool and warm-season grasses; cool-season grasses mature at slower rate than warm-season grasses.

F. Some legumes, cause bloat in grazing ruminants (foam producing compounds),such as clover.

Field of White clover



2- Harvested dry forages

In temperate and subtropical regions, roughages are stored in the dried form.

The most common types are used for feeding during the time of the year when grazing is not available.



Hays:

Hay, from grasses or legumes, is grown and harvested almost exclusively for animal use.



The usual intent in haymaking is to harvest the crop at the optimum stage of maturity in order to capture a maximal yield of nutrients per unit of land.

Moisture content of green herbage may 65 to 85%, while for hay to keep satisfactorily in storage, the water content must be reduced to about 15% or less.

Problems in haymaking:

1- Losses in nutrients; Both the quality and quantity of hay that can be harvested depend on :

a) Maturity when cut.

b) Method of handling.

c) Moisture content.

d) Weather conditions during harvest.

It is clear that large amounts of DM may be lost in haymaking under adverse conditions.

About 15 to 20% is not abnormal for legume hays.

2- Changes during drying; Rapid drying, results in changing in chemical components of forage.

Slow drying in the field, stack or bale, also many changes may occur as a result of:

- Activity by plant enzymes and microorganisms.
- Because of oxidation (lose of carotenes).

3- Proteins may be modified as some hydrolysis occurs, and increase in NPN.

4- Low drying always is accompanied by excessive mold growth (may be toxic).

Newly baled alfalfa hay should no more than 20-25% H₂O to avoid these problems.

3- Cut and carry

In this way, when the animals are kept in the farm, the forage can cut, using different processes, and carry it to the animals.



Many kinds of forage may used in this way:

- Green forage.
- Hay or straw.
- Green Chop (soilage),it is herbage that has been cut and chopped in the field and then fed to animals.
- Silage, it is the materials produced by controlled fermentation of high-moisture herbage.

High energy feeding

Feedstuffs included in this class are those that are fed or added to diet primarily to increase E in feed.

This is include the various cereal grains and some of their milling byproducts.

Energy from high-energy feedstuffs is supplied primarily either by readily available CHO and/or starches or by fat.

This is depended on the type of diet and the class of animal.

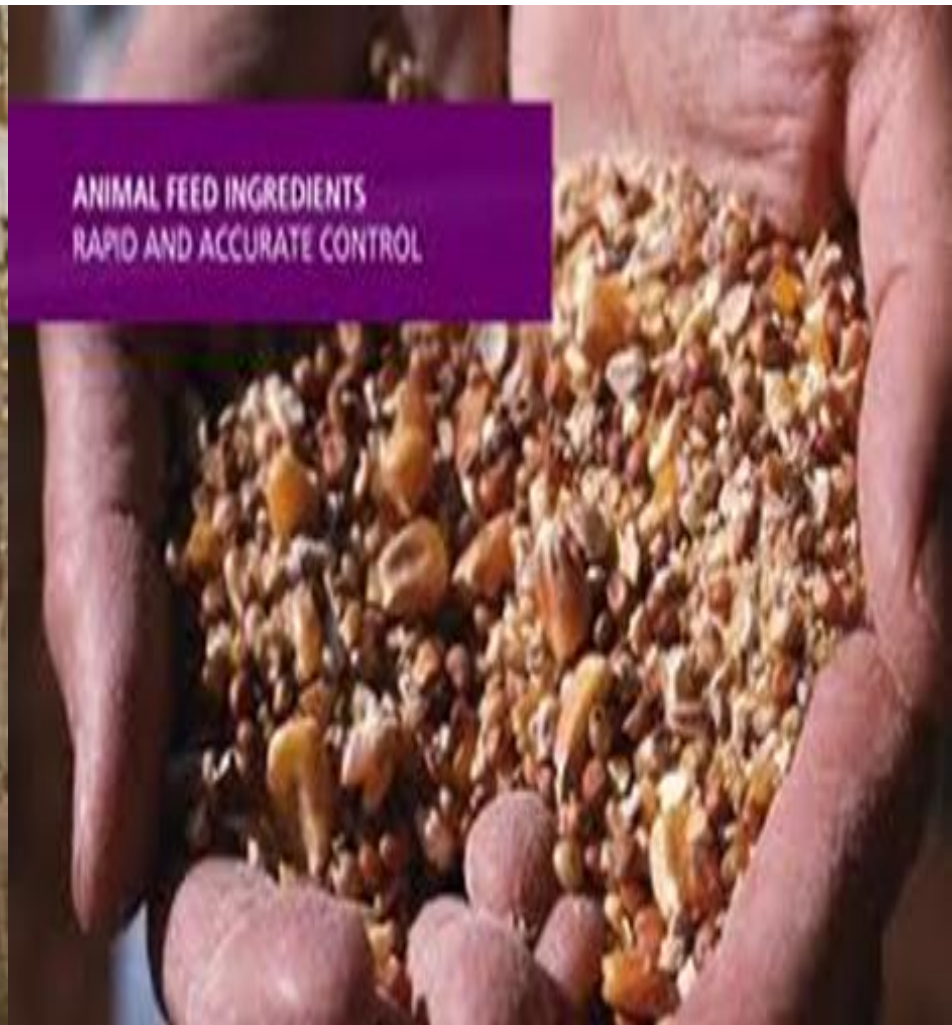
Cereal grains

Vast quantities of cereal grains and their milling and distillery byproducts are produced for use in animal feed.

The CP content of feed grains is relatively low (8-12%), fat also low (1-6%), while the CHO is high (starch and sugars).

Most hulls (seed coats) must be broken before feeding for efficient utilization, particularly for ruminants.

The main cereal grains are used in animal diets, corn, wheat, sorghum, barley, oats.

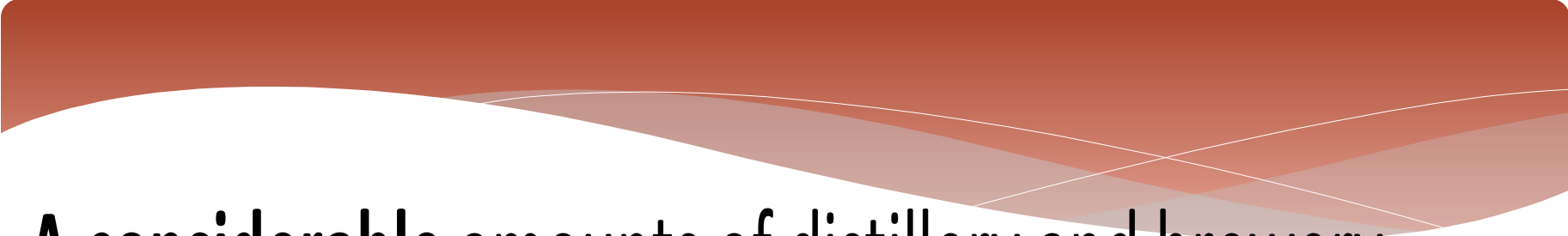


ANIMAL FEED INGREDIENTS
RAPID AND ACCURATE CONTROL

Milling and distillery byproducts

The milling of cereal grains for production of flour and starch results in production of some byproducts that are used in feed.





A considerable amounts of distillery and brewery products is available for use in animal feeds.

It is the dried extracted residue of barley malt alone or mixed with other grains resulting from beer industry.

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Feed preparation

There are different processes used before preparing the diets.

Some methods may provide a more favorable particle size and density that facilitates more optimal passage through the GI-tract.

In order to obtain maximum digestibility, cereal grains should be crushed, or ground depend on kind of animal.

Feed mixing

Feed ingredients generally are mixed together in available mixer in the proper ratios.



Pelleting

Pelleting is accomplished by grinding the feed ingredients or feedstuffs and then forcing them through a die.

Pellets can be made in different shapes, diameters, lengths, and degree of hardness.



Pelleting advantages:

- Using different kind of feed ingredients.
- Adding a feed supplements to the diet.
- Using a mixture of cereal grains and chopped forage or ground hay.
- Using a liquid additives such as molasses.
- To prevent sorting with little loss.

Cereal grains feeding methods

Concentrate diets are a mixture of different kind of grinding cereal grains, milling byproducts, and some additives.

These diets are usually used to face the requirements of the animal, primarily lactation, pregnancy, growing, and egg production.

Or when the forage consumed is very poor in quality.

Feeding methods are different, depend on :

- Animal species.
- Diet formulation.
- Age of the animal.
- Farm management.

In general the feeding methods are:

- Manually ; When the farmer give the diet to the animals by him self, using different kinds of feeders.



- Automatically; there are different kind, depending on the animal species, age, and farm capacity.



Feed supplements

Feed additives may be defined as feed ingredients of a nutritive and non-nutritive nature that stimulate:

- growth or production
- Improve the efficiency of feed utilization
- Beneficial to the health or metabolism of the animal.

Many different type of feed additives have been fed to domestic animals at one time or another.

Feed supplements may be used when some nutrients in the basal diet are insufficient to meet animal demands.

Types of feed supplements:

- 1-Protein concentrates.
- 2-Fats and oils.
- 3-Non-Protein N
- 4-Minerals and Vitamins
- 5-Non-Nutritive feed
- 6-Probiotics
- 7-Hormones

1- Protein Concentrates:

Protein is one of the critical nutrients, particularly for young, growing animals and high producing adults.

It is more expensive than E feeds, so optimal use is essential in any practical feeding system.

This is very important for nonruminant animals, the quality of protein from a given source rarely is adequate to sustain adequate production.

Protein supplements (more than 20%CP) are available

from two sources:

- Animal sources
- Plant sources



Protein of animal origin include:

- Meat, Meat and Bone, and Blood Meal; these animal Byproducts are used almost for swine, poultry, and pet diets.

The quality of this proteins varies considerably depending upon the contents, methods, and temperatures used in processing.

Blood meal is a high-protein source (80-85%CP), but it is quite deficient in isoleucine.

- Poultry byproducts; feather meal is the best source of CP (85%), also the byproducts of the poultry slaughter house are very common.
- Milk products; Dried skim or whole milk are very good protein source, but more expensive. These products are used as milk replacers or in starter diets for young pigs or ruminants.
- Marine protein; fish meal are excellent sources of CP and AAs, especially high in EAAs, and highly digestible. It is a good source of the B-vitamins and most of the minerals.

Plant protein concentrates

Soybeans and cottonseed are the main source of plant protein concentrates, with smaller amounts from peanuts, sunflower, legume seeds, and other sources.

The oilseed meals are high in CP (over 40%) .

About 90% of N is present as true protein, highly digestible and good BV, but lower than animal P sources.

Most meals are low in cysteine, methionine and lysine.

The E content varies, depending on processing methods.

- **Soybean meal**; contain 15-20% oil, in processing, the meal is toasted, to improve the BV of the P by destroying various inhibitors.

The CP content is standardized at 44-50% by dilution with soybean hulls.

It is highly favored feed, digestible, and E value, which results in excellent performance when used for different animal species.

- **Cottonseed meal**; is a good P, and may standardized at 41% CP.

The protein is low in cysteine, methionine, and lysine, and the meal is low in Ca and carotene.

The CSM contains a yellow pigment, gossypol, which is relatively toxic for nonruminants (young pigs and poultry).

- **Other** plant protein sources; coconut or copra meal, the residue after extraction and drying the coconut meat.

The CP content is low (20-26%) and variable digestibility.

2- Fats and oils

Surplus animal fats and some time vegetable oils are used in commercial feed formulas.

Animal fats are derived by rendering of beef, swine, sheep, or poultry tissues.

Vegetable oils, may be used, for limit extent, in poultry feeding.

Supplementation is not required except when low-fat E sources are used.

Adding fat at low to moderate levels sometimes can:

- Increase total E intake through improved palatability
- Consume E to meet animal demand.
- Reduce bloat in ruminants.

In swine and poultry diets, 5-10% fat is often added to creep diets for pigs or to broiler rations.

3-Non-Protein N

NPN includes any compounds that contain N but are not present in the polypeptide form of protein.

- Organic NPN compounds include NH_3 , NH_2 , AAs.
- Inorganic NPN include salts such as NH_4Cl , and $(\text{NH}_4)_2\text{SO}_4$.

NPN, especially urea, is primarily of interest for feeding of ruminants.(?)

Where livestock management is good and feed is formulated and mixed properly, urea can provide a N required.

3-Minerals and vitamin supplements

They are vital to the animal, and some diet is required to meet needs.

All minerals are needed in an animal's diet, but needed supplementary minerals will vary according to:

- Animal species
- Age
- Production
- Diet
- Mineral content of soils and crops



Generally, those macro-minerals of concern include common salt (NaCl), Ca, P, Mg, and S.

The trace elements, Cu, Fe, I, Mn, and Zn, and in some places, Co and Se.



Nearly all feedstuffs contain some vitamins, but in varies level because it is affected by:

- Harvesting
- Processing
- Storage conditions
- Plant species and part (seed, leaf, stalk)

As a rule, vitamins are destroyed quickly by heat, sunlight, oxidizing conditions, or storage condition. For adult ruminants only A, D, and E are of concern.

3- Non-Nutritive feed additives

The commonly used of feed additives, many are antimicrobial agents-compounds that include:

Antibiotics, Antibacterial agents, Antifungal agents.

Hormonelike substances may be used as growth stimulators, improved feed efficiency and health.

Recently, some of the medical plants are used as antibacterial, growth promoters and diet palatability, such as piper, thyme, ganger, mint.

3-Probiotics

These are live bacteria that may be added to the diet in an attempt to control intestinal infection in animal and enhanced nutrient utilization.

Selected cultures of *Lactobacillus* species have been used to control salmonellosis in poultry.

Some reports indicate reduced mortality and increased growth in swine fed a mixture of *Bacillus pseudolongum* and *L. acidophilus*.

3-Hormones

Many different hormones have been fed or injected into animals with the intent of increasing growth or milk production or to modify normal fattening processes.

Several products containing various combination of estrogens and progesterone or estrogen and testosterone are used to promote growth.

There is little current interest in the use of such products, and they are no longer approved for use with lactating dairy cows.

Supplementary Block

It is kind of supplement diets, which consist of different ingredients of feed stuffs (grains and good hay), mixed with minerals, vitamins, and molasses.

After well mixing, they are pressed in a block shape.



Example:

Feed block used as feed supplement

Components	%
Wheat hull	30
Rise brain	20
Urea	5
Poultry west	12
Cotton seed meal	7
Grain milling residue	8
Lime stone(ground)	12
CaSO ₄	1
Food salt(NaCl)	5



Chemical analysis

Nutrients	%
DM	89.69
CP	16.14
EE	1.82
CF	19.98
Ash	23.8