NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Veterinary Science Unit 10-Nutrition, Feeds, Feeding

* Nutrition & Energy
	+ In nature, all living organisms must be able to acquire the molecules from which their cells are built and energy in which to operate their cells.
	+ Plants, because of photosynthesis, can acquire all of their energy needs from the sun, water, and air through photosynthetic sugar production. (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
		- Animals, because they lack chloroplasts in their cells, cannot do this.
* Classes of Animals
* Four primary groups of digestive tracts exist among animals to process the energy captured in plants (or in other animals that eat those plants):
	+ Monogastrics \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Avian (birds): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Ruminant (cattle, deer): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Post-gastric fermenters/pseudo-ruminants (horse, rabbits): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Feeding Ruminants
* Ruminant Dietary Nutrition
* The most important job of a farmer or a rancher is to adequately provide for the nutritional needs of their cattle.
	+ All other needs are secondary to the daily need for proper nutritional care
	+ All other needs (with the exception of air) are not as immediate or pressing as the need for high quality food and water.
	+ An animal without quality food or water can very quickly die.
	+ An animal without quality food or water is a neglected and abused animal.
* Water Requirements
	+ Cattle without access to water on a summer day can die from heat stroke after only a \_\_\_\_\_\_\_
		- In winter, water is equally important
	+ Water is necessary for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* + Limiting water intake can depress animal performance more quickly and drastically than any other nutrient deficiency.
	+ Access to Water
		- Cows given free access to water will produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than cows allowed to drink only twice a day.
		- The same animal will consume different levels of water at different physiological states.
			* For example, a pregnant or lactating animal will consume more than an non-pregnant, non-lactating animal.
			* Source: [North Dakota State Univ.](http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm)
	+ Cleanliness
		- Stale water can cause reduced water consumption - all water troughs should be cleaned frequently.
			* Livestock should never be forced to drink dirty or contaminated water.
		- Dirty water is a host for disease organisms.
			* Disease can spread rapidly if animals drink from the same trough, so sick animals should be isolated from the trough and the trough cleaned and disinfected.
			* A good disinfectant is dilute bleach solution after the trough has been
			thoroughly cleaned.
		- Sprinkling baking soda into the fountain periodically may reduce algae growth.
	+ Have an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around automatic waterers.
		- Make the base wide enough so animals can easily put their front legs on it when they are drinking, but not their hind legs.
		- Animals will not normally place only their hind legs on this base and therefore will not defecate in the water.
			* Source: [North Dakota State Univ.](http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm)
	+ Checking for Dehydration
		- Signs of dehydration or lack of water are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- In cattle, the eyes will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- In lactating dairy animals, dehydration will cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- One way to check for dehydration is by skin tenting.
			* Pull the skin and hold a moment.
			* Release and count the seconds until the fold disappears.
			* On a dehydrated animal, the skin will stand for several seconds (like bread dough)
				+ Source: [North Dakota State Univ.](http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm)
* Feeding Requirements
* Feeding Challenges
	+ Feeding cattle is never simple – the needs of cattle change with age, with productivity, and with weather.
	+ Furthermore, each animal is different and no one feeding ration will equally meeting the needs of all animals in a herd even under similar circumstances.
	+ Feeds must be adjusted to the changing needs of cattle and re-checked regularly.
* Component’s of a Cow’s Diet
* A cow, like any living organism needs five key ingredients in her diet
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* To acquire these elements, a cow’s diet typically contains the following key ingredients\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Forages
	+ Forages are typically thought of as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ portion of a cow’s diet.
	+ Forages are not as energy dense as concentrates and most of the energy in a forage is in the form of cellulose.
		- However, immature forages
		can be more energy-dense
* Categories of common forages
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (alfalfa, hay, haylage) – These forages are excellent sources of protein, calcium, and other minerals if harvested and stored properly
		- As they mature, legumes and grasses decrease in energy and protein and increase in fiber (which reduces the digestibility of the food)
			* Terms: **hay** – cut and dired grass or alfalfa; **haylage** = fermented cut hay
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - an excellent source of energy for dairy cattle - cows will eat large amounts of this feed.
		- Corn silage requires protein and mineral supplementation to be balanced for high milk production.
			* Terms: **corn silage** – fermented chopped corn leaves/stalks
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – has the advantage of eliminating feed handling and manure hauling.
		- Additional grain is needed for high-producing cows.
		- As quantity and quality of pasture changes during the summer, cattle need to be supplemented with stored forages and other feeds

Energy Concentrates

* + Naturally, a ruminant would not need much more than grass in their diet (e.g. imagine the millions of buffalo that ate little other than grasses on the Great Plains).
		- However, the energy demands of domesticated cattle are much greater, requiring sources of supplemented energy.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are the most traditional source of energy concentrate.
	+ Breaking the seed coat increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Cows will eat more grain if it is coarse-textured and processed because it will be more palatable.
	+ Fine grinding of grain can increase digestibility , but can also lower milk fat percent and cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Too coarsely-ground feed will not be completely digested; up to 30% may pass completely through a cow undigested.
		- Examples of Feed Concentrates
* \_\_\_\_\_\_\_\_\_– corn is the most widely fed feed concentrate. Corn can be fed in several ways –
	+ 1. Whole ear – feeding a whole ear of corn provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but will also have proportionally less energy and is less digestible
	+ 2. Corn, shelled – shelled corn grain is the most commonly fed kind of corn. It is simply the kernels of corn fed straight to the cow. Because it is a dense source of energy, improper feeding can quickly lead to disorders.
	+ 3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – this is corn that is harvested with \_\_\_\_\_\_ moisture so that it can ferment in the silo. It can be harvested sooner, reduces the expense of drying it, is very palatable to the cow, and requires less labor to produce.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- a medium protein, high fat, high fiber, and high energy feed. It is a low-cost by-product of the cotton industry
	+ Whole cottonseed is white and fuzzy, while de-linted cottonseed is black and smooth in appearance.
	+ The amount fed should not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Corn-gluten – a relatively high fiber, medium energy, medium protein by-product of the corn wet milling industry.
* **Oats** contain 15 percent less energy but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than shelled corn.
	+ The advantage of adding oats to dairy rations is that it adds fiber and bulk, and may help maintain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **Molasses** (cane and beet sugar) is used primarily to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ The amount used should be limited to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the grain mix to avoid rumen disorders and prevent clogging of equipment
	+ **Fat** - several kinds of animal and vegetable fats or oils are available for feeding
	+ Total added fat in diets should not exceed \_\_\_\_\_\_\_\_\_\_\_\_\_(DM basis) with animal, vegetable or rumen inert fats individually not exceeding 2 percent.
* Protein Supplements
	+ The requirement for protein is dependent upon the age of the cow, stage of production, and level of production. Protein requirements, like energy, are additive during any point in the cows production cycle
	+ Cattle protein requirements are met by two basic sources, the feedstuffs that they consume and the microorganism that populate the rumen.
* Dietary protein component can be divided into two categories:
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* A Tale of Two Proteins
	+ The DIP component is the protein from the diet that is digested in the rumen, utilized by rumen microorganisms, and ultimately becomes bacterial (microbial) protein.
		- This is the protein that a cow gets from the bacteria; the cow is the ‘second’ one to get the protein.
	+ The UIP component is the protein fraction of the diet that is not digested in the rumen and that thereby "escapes or bypasses" the rumen. This is also called “bypass protein”.
		- The UIP protein may then be digested and absorbed in the small intestine – it bypasses the microbes and goes directly to the cow.
		- Together, the bacterial protein and UIP fraction comprise the metabolizable protein available for the cow to meet her protein requirement.
* Protein Supplements
* **Soybeans** are an excellent source of crude protein and fat for cattle.
	+ Cows should be adjusted to beans gradually to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reduces anti-protein factors and urease activity and increases UIP value of the soybeans.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is dried blood from animal processing plants.
	+ Bloodmeal is high in true protein, UIP and the amino acid lysine.
	+ Do not feed in diets high in moisture, as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Brewers grain**, a by-product of the fuel ethanol and beer industries, contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ On a dry matter basis, brewers grains are high in protein and a fair source of energy.
* **Cottonseed Meal** – made from oil of whole cottonseed, this produce is very palatable to cows but varies in protein content.
* **Fishmeal** includes bones, head, trimmings, and fish parts. Fish oil is high in protein but reduces fiber digestion in the rumen.
* Understanding Nutrients: Vitamins
* I. Vitamins
	+ A) Organic substances necessary in small amounts
	+ B) Required for normal growth and maintenance of life
	+ C) Function \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in metabolic processes
	+ D) \_\_\_ essential vitamins
* II. Types of Vitamins
* A) Fat Soluble
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* B) Water Soluble
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* III. How Animals Obtain Vitamins
* A) Complex ruminants synthesize vitamins in the rumen
* B) Sources of Vitamins
	+ 1. Vit A = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ 2. Vit D = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ 3. Vit E = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ 4. Vit K = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ 5. Vit C = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Understanding Nutrients: Minerals
	+ **Animal Minerals**
		- ***Inorganic*** substances that animals need in small amounts
		- ***Major (macro***)--Needed in \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- ***Micro Minerals***- Needed in \_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Major/Macro Minerals
	+ Calcium
		- **1. Functions**
			* a.
			* b
			* c
			* d.
		- **2. Deficiency symptoms**
			* a.
			* b
			* c
			* d
		- **3. Sources**
			* a.    Grains, grain by-products, straw, dried manure, grasses, protein supplements from plants
			* b. Forages (grasses, legumes)
			* c. Fish meal, milk, citrus pulp
		- **4. Calcium Toxicity**
			* a. Decreased absorption of other minerals
			* b. Calcification of soft body tissues
			* c. Kidney stone formation
		- Major/Macro Minerals
	+ **Phosphorus**
		- **1. Functions**
		- a.
		- b
		- c
		- d
		- e
		- f
		- **2. Deficiency symptoms**
		- a.
		- b
		- c
		- d
		- e
		- **Sources**
		- a. Feeds such as wheat bran, meat scraps, tankage, fish meal, dried skim milk
		- b. Legume and grass pastures
		- c. Cereal grains and by-products
		- d. Mineral supplements
	+ **Salt (sodium and chlorine)**
		- **1. Functions**
		- a.
		- b
		- c
		- d
		- e
		- **2. Deficiency symptoms**
		- a.
		- b
		- c
		- d
		- e
		- **3. Sources**
		- a. Hay salt (loose)
		- Salt block
		- **4. Toxicity**
		- Cause—Restricted water with salt intake
		- Symptoms—Staggering gait, blindness, nervous disorder, hypertension
	+ **Potassium**
		- **1. Functions**
		- a.
		- b
		- c
		- d
		- **2. Deficiency symptoms**
		- a.
		- b
		- c
		- d
		- **3. Sources**
		- a. Forages
		- Grains and concentrates
		- **4. Toxicity**
		- a. Diarrhea
		- b. Tremors
		- c. Heart failure
	+ **Magnesium**
		- **1. Functions**
		- a.
		- b
		- c
		- d
		- e
		- **2. Deficiency symptoms**
		- a.
		- b
		- **3. Sources**
		- a. Most rations contain enough
		- b. Can be mixed with salt or supplement
		- c. If diet is low, magnesium will be pulled from bones
	+ **Sulfur**
		- **1. Functions**
		- a.
		- b
		- c
		- d
		- **2. Deficiency symptoms**
		- a.
		- b
		- **3. Sources**
		- a. Forages—Especially legumes
		- b. Water

Micro Minerals

**Iron**

1. **Functions**
	* 1. Hemoglobin formation
		2. Oxidation of nutrients in cells
2. **Deficiency symptom**—\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Sources**
	* + 1. Grains
			2. Forages
			3. Trace-mineralized salt with iron

**Manganese**

**1.Functions**

a.

b

c

d

e

**2. Deficiency symptoms**

a. Swollen and stiff joints b. Abnormal bone development

c. Sterility d. Delayed estrus

e. Reduced ovulation f. Abortion

g. Deformed, weak or dead offspring

h. Appetite loss, slow gain i. Rough hair coat

j. Pinkeye

 **3. Sources**

a. Trace-mineralized salt

b. Most rations are sufficient

Copper

**1. Functions**

a.

b

c

d

e

f

g

**2. Deficiency symptoms**

a. Severe diarrhea b. Slow growth (caused by anemia)

c. Swelling of joints d. Bone abnormalities

e. Weakness at birth f. Breathing difficulty

g. Lack of muscle coordination

h. Sudden death

 **3.          Sources**—Most livestock feeds have more than needed

**4. Toxicity**

a. Levels—Above 50 ppm

b. Symptoms—Anemia, jaundice

**Zinc**

1**. Functions**

a.

b. c.

d. e.

f. g

**2. Deficiency symptoms**

a. Parakeratosis (rough, thick skin in swine)

b. Thick skin on neck, muzzle, back of ears (cattle)

c. Slow wound healing d. Poor appetite, slow growth

e. Swelled hocks and knees, stiff gait

f. Inflammation of nose and mouth tissues

3. **Source**—Trace-mineralized salt

**Molybdenum**

**1. Functions**

a. Enzyme xanthine oxidase

1. Stimulates rumen organisms

**2. Source—**Most normal rations are adequate

**3. Toxicity**

a. Diarrhea b. Poor growth

c. Loss of hair color d. Bleached mucous membranes

e. Lameness f. Joint abnormalities

g. Osteoporosis h. Death

**Selenium**

**1. Functions**

a.

b.

**2. Deficiency symptoms**

a. White muscle disease

b. Retained placenta in ruminants

c. Low fertility in ruminants

d. Diarrhea

**3. Sources**

a. Selenium injections

b. Roughages

c. Mixed into ration (not authorized by FDA for all animals)

 **4. Toxicity**

a. Acute–Intake of accumulator plants over short period

(1) Labored breathing

(2) Abnormal movement and posture

(3) Prostration

(4) Diarrhea

(5) Death

b. Chronic—Blind staggers—intake of limited amount of accumulator plants over a longer period of time

(1) Impaired vision

(2) Wandering

(3) Stumbling

(4) Death

**Cobalt**

1**. Functions**

a.

b.

**2. Deficiency symptoms**

a. Poor appetite/general malnutrition

b. Weakness

c. Anemia

d. Slow growth

e. Decreased fertility

1. Lower wool and milk production

**3. Sources-** supplement

**Iodine**

1. **Function--**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2**. Deficiency symptoms**

a. Goiter

b. Weak or dead offspring

c. Offspring born without hair

d. Infected navels at birth

**3. Sources**

1. Iodized salt
2. Ration supplement

  **Fluorine**

**1. Functions**

a.

b.

**2. Deficiency-** is rare; supplementing the ration is not recommended

**3. Sources**

a. Water

b. Forages

**4. Toxicity** (an accumulative poison)

a. Tooth enamel loss b. Uneven, excessive wearing of teeth

c. Bones--thick, soft, weak d. Lameness

e. Poor appetite, poor gains, weight loss

f. Rough hair coat g.         Lowered milk production

* PEARSON SQUARE -Balancing a Ration
* Pearson Square
* Useful tool for simplifying and balancing of rations
* It shows the proportions or percentages of two feeds to be mixed together to give a percentage of the needed nutrient
* Pearson Square

 2000# of feed is needed to feed a 100# growing hog.

* A feeding standards table shows that an 18% crude protein ration is needed.
* Corn and Soybean Meal (SBM) are selected as feeds.
* Pearson Square
* A feed composition table shows

Corn has 8.9% crude protein

SBM has 44.4% crude protein

* Pearson Square
* How much corn and soybean meal need to be mixed together for 2000# of feed?

-HERE YOU WILL NEED TO COMPLETE and write the steps down so that you understand, in our lab we will be making rations.