Feed

The major cost of animal production
- Feeding cost = 60 - 70% in commercial livestock production
- Need to optimize feeding cost to sustain profitability
- Import bill for food = RM10 billion/year
- Import bill for feed = RM1.4 billion/year
- Import substitution to reduce foreign exchange losses
FEED

Feed is material which after ingested by animals, is capable of being digested, absorbed and utilized.
NUTRIENTS

- Nutrient is a substance obtained from feed and used in the body to promote growth, maintenance and repair.

- Essential Nutrient is a nutrient the body cannot synthesize for itself in sufficient quantity to meet its needs and therefore must obtain from feed.
NUTRIENT REQUIREMENTS DEPEND ON

• Type of animal
• Production rate
• Body weight
The Functions of Nutrients:

1. To form body structures
2. To provide energy
3. To serve as ‘regulators’ of body processes
Classification of Nutrients

1. Carbohydrates
2. Lipids
3. Proteins
4. Vitamins
5. Minerals
6. Water

Energy per se is not a nutrient
CARBOHYDRATES
Carbohydrates

Function:
Carbohydrate is the major and inexpensive source of energy for animals
The primary function of carbohydrates is for short-term energy storage (sugars are for energy).

A secondary function is intermediate-term energy storage (as in starch for plants and glycogen for animals).

Other carbohydrates involved as structural components in cells, such as cellulose which is found in the cell walls of plants.
PROTEIN

DEFINITION

Proteins are the basis for the major structural components of animal and human tissue. Protein as in carbohydrates and fat contains C, H, O but also N and cases, S. Without protein life cannot exist, cells synthesize protein during part or all their life cycle. When protein is hydrolyzed by enzymes, amino-acids (AA) are produced.
Each type of protein has its specific AA profile
Each species has its own specific protein
More than 200 AA has been described, only 20 of these are commonly found in protein
Protein is not a permanent tissue. It undergoes a constant breakdown and synthesis
MINERAL

- Minor component of animal diets
- Little or no value in terms of energy and protein supply
- Macro and micro elements
- Rare elements: Fl, Br, Ba, Cd, Cr, Ni, and Pb.
- Wide variation between species in the tolerance ranges
MINERAL DEFICIENCIES AND TOXICITIES

- 15 elements: Ca, Cl, Mg, P, K, Na, S, Co, Cu, I, Fe, Mn, Mo, Se and Zn
- Toxic: Cu, Mn, Mo and Se
- Symptoms varied with locations
- Depending on forages to meet requirements. Mineral content decline as forages mature.
Definition of vitamin

1. A compound of natural feed, but is distinct from carbohydrate, fat, protein or water
2. Occurs in minute quantities
3. Is essential for the development of normal tissue and health, growth and maintenance
4. When absent from the diet or not properly absorbed or utilized results in deficiency diseases
5. Cannot be synthesized by the non ruminants and must therefore be obtained from the diet
# VITAMIN

<table>
<thead>
<tr>
<th>Fat soluble</th>
<th>Water soluble</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, H, &amp; O</td>
<td>C, H,O+N, S &amp; Co</td>
</tr>
<tr>
<td>May be in pro-vitamin form</td>
<td>No pro-vitamin form</td>
</tr>
<tr>
<td>Regulation of metabolism of structural unit e.g. bone</td>
<td>Energy metabolism - as co-enzyme</td>
</tr>
<tr>
<td>Absorbed via lymph along with fat</td>
<td>Absorbed with water</td>
</tr>
<tr>
<td>Stored along with fat (Not require regular supply)</td>
<td>Not stored in body (Required regular supply)</td>
</tr>
<tr>
<td>Excretion via bile in feaces</td>
<td>Excretion via urine</td>
</tr>
<tr>
<td>Not synthesized by microbial except vit K</td>
<td>Some are synthesized by microbes</td>
</tr>
<tr>
<td>A,D,E &amp; K</td>
<td>B vitamins, C &amp; Choline</td>
</tr>
</tbody>
</table>
FATS

• Consist of a wide group of compounds that are generally soluble in organic solvents and largely insoluble in water.

• Fats are generally triesters of glycerol and fatty acids.

• Fats may be either solid or liquid at normal room temperature, depending on their structure and composition.
FATS

• “Oils” is usually used to refer to fats that are liquids at normal room temperature

• “Fats” is usually used to refer to fats that are solids at normal room temperature

• “Lipids” is used to refer to both liquid and solid fats, along with other related substances
FATS

• Fats or lipids are broken down in the body by enzymes called lipases produced in the pancreas
• Examples of edible animal fats are lard (pig fat), fish oil, and butter or ghee
• Examples of edible plant fats are peanut, soya bean, sunflower, sesame, coconut, olive, and vegetable oils.
WATER

Water is the most important of all nutrients but often overlooked in livestock.

Animals will succumb to water deprivation sooner than to starvation.
Importance of water to livestock:

>90% of all molecules in body are water
70% of body weight
Varies by species
Ruminants less prone than people to stress
Lubrication of joints
Eyesight
Reproduction
Growth
Regulation of body temperature
Two basic functions of water

1. Body metabolism

2. Body temperature regulation
Classifications of Feed

• Roughages contain more than 18% crude fiber and less than 60% total digestible nutrients (TDN).
• Concentrates generally contain less than 18% crude fiber and more than 60% TDN.
• Feeds that have more than 80% dry matter (DM) are air-dry, while higher than 80% they are called high moisture feeds.
Roughages

• The two types of roughages are grass and legume.
• Legumes have nodules on their roots that have bacteria whom fixate nitrogen.
• Legumes include, leucaena, gliricidia, stylo, centro, sesbania and mulberry.
• Grass roughages include napier, guinea, signal, para, setaria, paspalum and axonopus
RUMPUT GAJAH

(PENISETUM PURPUREUM
CV COMMON)
PETAI  BELALANG

(LUCAENAE LEUCOCEPHALA)
CENTRO

(CENTROSEMA PUBESCENS)
Rumput kerbau
Concentrates

• The three kinds of concentrates include grains, supplements and byproduct feeds.
• Common grains are corn, oats, barley, sorghum and wheat.
• Supplements are protein feeds, minerals and vitamins.
• Supplements are either from an animal or vegetable origin.
Grain feed
Concentrates

• Animal origin supplements include meat scraps, meat and bone meal, fishmeal, dried skim milk and blood meal*.

  *The dried and powdered blood of animals, used in animal feeds and as a nitrogen-rich fertilizer for plants.

• Vegetable origin protein supplements include palm kernel meal, copra (coconut meal) soybean meal, peanut oil meal, corn gluten, sesame oil, sunflower meal and linseed meal.
Concentrates

• Urea is a non protein supplements, neither animal nor vegetable origin. Used primarily in feeding ruminants.
• Minerals are generally some combination of calcium and phosphorus with trace minerals added.
• Vitamin supplements are necessary to provide vitamins in a lacking ration.
• Salt blocks may also have trace minerals added.
Concentrates

- Byproduct feeds from the milling and brewing industries are also used in feeding.
- Byproduct feeds include wheat bran, rice bran, molasses, brewer’s grain, beet pulp, and bean sprouts.
Palm Kernel Cake
SOYBEAN WASTE
SAGO WASTE
PINEAPPLE WASTE
Molasses
FEEDSTUFFS

Ground maize
PKC Expeller
Rice bran
SBM
Mineral
HIGH ENERGY FEEDSTUFFS

- Sago waste
- Tapioca waste
- Rice bran
- Molasses
- Wheat bran
- Ground waste
HIGH PROTEIN FEEDSTUFFS

- Palm kernel cake
- Soybean meal
- Copra cake
- Brewer’s grain
- Fish meal
Underutilized feedstuffs

- Grains roughages, to this day remain the best feedstuffs for growth, reproduction and maintenance of animals.
- Crop residues are one of the most widely used sources of maintenance rations used today, however, they will need to be supplemented with protein, vitamins and minerals.
CORN STOVER FOR SILAGE MAKING
CROP RESIDUES

• Mainly fibrous materials – by-products of crop cultivation
• Generally low in CP (3.3 – 13.3% DM)
• Most deficient in fermentable energy
• Low mineral digestibility
• Examples: Rice straw, OPF, bagasse etc.
OIL PALM FRONDS (OPF)
Round hay baler
POULTRY FEED
PYSICAL FORM OF FEED

• Mash
  - balance diet, dry & dusty (easily get wet)

• Pellet
  - mash $\rightarrow$ compressed $\rightarrow$ pellet
  - high feed intake, less wastage
  - high cost
  - high consumption of waste $\rightarrow$ wet dung

• Crumble
  - ground pellet
Types of feed

• Broiler starter crumble/mash
  – high energy /high protein diet
  – 0-4 weeks of age

• Broiler finisher pellet
  – Grade I - high efficient broilers
  – Grade II - less efficient/heavier market
  – 4 weeks to market age
Types of feed

• Poultry starter mash
  – meant for all chickens for meat production
  – 4-6 weeks depend on breeder’s recommendation

• Poultry grower mash
  – pullet growing
  – 4-6 weeks to sexual maturity
Types of feed

• Poultry layer mash
  – for efficient production of table eggs

• Poultry breeder mash
  – for efficient production of hatching eggs
  – Light breed - layer breeder
  – Heavy breed - broiler breeder
Feed store