NATIONAL
ANIMAL
NUTRITION
PROGRAM

Feed Intake

Feed Intake

Feed intake influences body weight gain and milk production and lean tissue accretion, as well as reproductive functions, bone development, and eggshell quality. Feed is composed of nutrients for the animal, so a change in feed intake also affects nutrient intake. Understanding the factors that regulate feed intake is important in managing animal nutrition.

Factors Influencing Feed Intake

Body weight
The size of the animal is a key determinant of feed intake. A commonly used value to estimate metabolic body weight is (MBW = $BW^{0.75\ kg}$).

Production goals
Growth or lactation will increase feed requirements.

Hunger and Appetite
Animals eat because of hunger or appetite. Hunger is driven by physiological need, while appetite is satisfied by palatability.

Palatability
Palatability refers to how acceptable a feed is to the animal and is influenced by factors including appearance, taste, odor, texture, and form. Feed intake is also influenced by gut fill.

Feed form
Feed provided to animals can take various forms (e.g., mash vs. pelleted) and differ greatly in the particle size of individual ingredients, both of which affect feed intake. For example, chickens can be fed either pellets or mash feed, and, feeding pellets may increase feed intake by making feed consumption easier.

Water consumption
Water consumption and feed intake are tightly correlated. A decrease in water availability or quality may lead to decreased feed intake.

Temperature
Animals in cold environments will increase their feed intake in order to produce heat to maintain their body temperature, while animals in hot environments will have reduced feed intake by comparison, but their requirements will also increase. Aquaculture animals are poikiothermic (coldblooded) and cannot control body temperature.

Management
Factors including stocking density, facility design (e.g., placement of feeders and waterers), feeding frequency, and genetic selection of animals will all influence feed intake.

Nutrient density and dry matter
Nutrient density and the dry matter of feedstuffs (discussed below) heavily influence feed intake.

Nutrient Density

Feed ingredients in a diet will always add to 100% by definition, but nutrient density can be adjusted by using ingredients with varying nutrient compositions. Two example diets are shown below. By using corn, which has more energy than wheat, and increasing oil, an ingredient with higher energy, Diet 1 is more calorically dense than Diet 2, meaning that an animal consuming 1 kg of Diet 1 will consume more calories than an animal consuming 1 kg of Diet 2.

Ingredient Composition	kcal kg	Diet 1 %	Diet 1 kcal/kg	Diet 2 %	Diet 2 kcal/kg
Corn	3,380	60	2,028	0	0
Wheat	3,076	0	0	62	1,907
Oil	8,790	4	352	2	176
Soybean meal	2,250	24	540	24	540
Other ingredients	0	12	0	12	0
Total			**2,920 kcal/kg**		**2,623 kcal/kg**

Adjusting Feed Intake to Nutrient Density

Animals fed ad libitum typically adjust their feed intake to meet a nutrient requirement within limitations. For example, broiler chicks attempt to meet their amino acid requirement by eating more or less feed based on its density—thus, if a diet has a low amino acid density, the chicks will eat more, while if the feed has higher amino acid density, the chicks will eat less. Older chickens and other food producing animals have similar responses, where they adjust their feed intake to meet their energy needs.

Example #1:

Influence Of Digestible Lysine Concentration On Meeting Daily Requirement Of Broiler Chicks

Lysine is an important amino acid for chickens, and diets are formulated so that other amino acids can change proportionally with lysine. Therefore, a change in the lysine concentration will affect the concentration of all other amino acids. In this example, diets varying in digestible lysine concentration (1.15% vs. 0.95%) are used to meet the daily lysine requirement of 0.4025 g.

- If a 7-day old chick was fed a diet containing 1.15% digestible lysine and consumes 35.00 grams of feed in a 24-hour period, that results in an intake of 0.4025 grams of digestible lysine:

  Digestible lysine intake (g) = 35 g feed X 0.0115 digestible lysine (% as decimal) = 0.4025 g lysine

- If the same 7-day old chick was fed a diet with 0.95% digestible lysine, they would increase their feed intake to 42.37 grams to try and maintain the same digestible lysine intake as the chick fed the high lysine diet:

  Digestible lysine intake (g) = 42.37g feed X 0.0095 digestible lysine (% as decimal) = 0.4025 g lysine

- Chicks fed both the low and high lysine diets will consume 0.4025 g digestible lysine, but the chicks fed the high lysine diet consume less feed to do so.

Example #2:

Steers will eat to meet their energy needs and adjust their feed intake based on caloric density.

Ruminants can be fed feedstuffs such as roughage, that have proportionately less energy than grains on a weight basis. Even though ruminants are able to use energy from forages and roughages, grains contain more utilizable energy on both an as-fed and dry matter basis, thus, the steer fed roughage will always have to eat more than the steer fed grain to maintain a similar body weight or production.

- A 700 kg steer fed 100% roughage containing 2,530 kcal/kg may consume 23.0 kg feed in a 24-hour period:

  Caloric intake (kcal) = 23 kg feed X 2,530 kcal/kg = 58,190 kcal = 58.190 Mcal

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- The same 700 kg steer fed 90% grain and 10% roughage diet would consume an average of 3,140 kcal/kg. This animal may consume 18.5 kg feed in a 24-hour period to have a similar energy intake:

  Caloric intake (kcal) = 18.5 kg feed X 3,140 kcal/kg = 58,090 kcal = 58.090 Mcal

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- The steers fed the roughage diet consumed a similar amount of calories as the steers fed the grain diet (58,190 vs. 58,090 kcal) by increasing their feed intake (23 vs. 18.5 kg/d).