

Developing Rations Using Nutritional Information and the Pearson Square

IN OTHER E-UNITS, feed ingredients, rations, and feed analysis are discussed. But how are the data used, and what steps are involved in using the Pearson square method? In this E-unit, we will explore how the data from feed analysis are used, what TDN is, how calories are used, and how a ration is developed using the Pearson square. Many nutritionists use these data every day to create rations for animals and meet nutritional needs. A properly developed diet is crucial to reduce production costs and maximize profits.



(Courtesy, USDA)

Objectives:



1. Explain how nutritional information is used.
2. Develop rations using the Pearson square.

Key Terms:



calorie
kilocalorie
megacalorie
Pearson square method
TDN

Using Nutritional Information

The greatest part of a ration is made up of protein and energy, for which animals have the highest demands to remain healthy, grow strong, and be productive. The amounts of protein

and energy are determined by the type of animals. Some animals might have a higher requirement for protein but a lesser one for energy, or vice versa.

Protein is reported as crude protein in a diet. On a feed analysis or feed tag, it is typically reported in grams or as a percentage. High levels of protein are typically fed to a young, pregnant, or lactating animal. This is to support the growth of a young animal or fetus. Protein promotes bone growth and development. Protein is derived from several sources, including grains, meal from by-products, and some roughages.

Energy is added to a ration from carbohydrates, fats, and select proteins. High-energy diets are commonly fed to animals growing rapidly, experiencing harsh environments, or working hard daily. Energy used to be reported as total digestible nutrients, or **TDN**. More advanced methods are used today.

Energy is now measured in rations using the calorie method, similar to the way human diets are evaluated. A **calorie** is measured by determining the amount of heat required to raise the temperature of 1 gram of water 1 degree Celsius. Calories provide digestible energy in a ration. Like humans, animals need a lot of calories to function each day. Because of the large number of calories commonly found in rations, they are broken down into smaller units when reported. Calories are reported as kilocalories or megacalories. A **kilocalorie** (kcal) is 1,000 calories. A **megacalorie** (mcal) is 1 million calories. Using the kcal and mcal has proven to be more accurate than using the TDN method when evaluating rations.



FIGURE 1. Grains, such as corn, supply high levels of energy to a diet. (Courtesy, USDA)

Calculating Rations Using the Pearson Square

The **Pearson square method** is a simple method of calculating a ration. It originally was used in blending milk products to a known fat percentage. In the feed industry, it is used as a simple calculation to determine the amounts of two ingredients to include in a diet. The two ingredients can be raw, such as corn and soybean meal, or blended feeds with known content. The calculation does a good job of meeting protein or energy needs but may result in vitamin or mineral deficiencies in the ration. The Pearson square method allows the blending of the two ingredients with different nutrient content to a desired content. For example, we are going



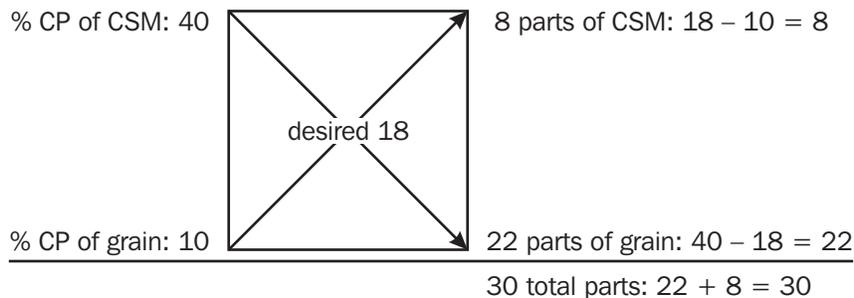
ON THE JOB...

CAREER CONNECTION: Animal Nutrition Professional

Many professionals work in the animal nutrition field. Jobs are available in product procurement, ration development, research, marketing, sales, and distribution. For anyone wishing to work directly with producers and animals, the sales and distribution field is the most popular. You would work for a co-op or feed company in a rural area. The job would require a high level of communication, dedication, and understanding of the industry. You would spend lots of time meeting with producers, identifying nutritional problems, and making recommendations for improvement. Many people working in feed sales and distribution have a two- or four-year education from a university. Salaries range from \$30,000 to \$45,000, depending on the quantity of sales and the size of territory you work in.

to blend cottonseed meal (CSM) with 40 percent crude protein (CP) and a grain with 10 percent CP to a desired level of 18 percent CP.

Pearson Square Example:



Answer:

8 parts of cottonseed meal and 22 parts of grain

Calculate as a percentage:

$$\text{CSM in mix} = (8 / 30) \times 100 = 26.67\%$$

$$\text{Grain in mix} = (22 / 30) \times 100 = 73.33\%$$

Check for Crude Protein:

$$26.67 \text{ (CSM)} \times 40\% = 10.67$$

$$\underline{73.33 \text{ (grain)} \times 10\% = 7.33}$$

$$\text{Total CP} \qquad \qquad \qquad 18.00$$

As you can see from the example, the two ingredients are listed on the left with their crude protein content. The desired crude protein content is placed in the middle of the square. The lesser value is subtracted from the greater value diagonally across the square. The values are reported in parts, not percentages. The total parts for the two ingredients are added together. At this point, fractions can be made using the calculated parts over the total parts of ingredients. Multiplying the value of each ingredient by 100 will determine the percentage. A check should be done to be sure your calculations are accurate. Take the percentage of each ingredient in the ration and multiply it by its original crude protein content. The sum of the answers should equal your desired crude protein content.

Summary:



The greatest part of a ration is made up of protein and energy, for which animals have the highest demands to remain healthy, grow strong, and to be productive. The amounts of protein and energy are determined by the type of animals. Some animals might have a higher requirement for protein but a lesser one for energy, or vice versa. A simple way to calculate ingredients for a ration is to use the Pearson square method. It uses basic math to create a ration with a desired amount of crude protein. The method does have its weakness. It does not account for vitamins or minerals.

Checking Your Knowledge:



1. How is protein reported in a diet?
2. What three nutrients add energy to a ration?
3. How are calories measured in a feed ingredient?
4. For what was the Pearson square method originally used?
5. How many ingredients can be used in a Pearson square calculation?

Expanding Your Knowledge:



Take a field trip to a feed processing plant in your area. This will allow for you to see all phases of the ration development process. Be sure to ask many questions about calculating diets, reporting nutrient content, and designing rations for special needs. If the plant has a laboratory, ask to see a feed analysis performed.

Web Links:



Learning About Proteins

http://kidshealth.org/kid/stay_healthy/body/protein.html

Corn Gluten Feed

<http://www.ingredients101.com/cgf.htm>