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Feed Management for Small and Organic Operations



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This technical note was authored by Dr. Glenn Carpenter, National Leader, Animal Husbandry, NRCS (retired) and currently NRCS Agriculture Conservation Services (ACES), and Renee Leech, Animal Husbandry Specialist, NRCS, East National Technology Support Center (ENTSC), Greensboro, NC. Special thanks are extended to Gene Fults, Rangeland Management Specialist, NRCS, West National Technology Support Center, Portland, OR; Johanna Pate, National Grazing Lands Team Leader, NRCS, Central National Technology Support Center (CNTSC), Fort Worth, TX; and Thomas Hilken, National Grazingland Specialist, Tim Pilkowski, National Nutrient Management Specialist, Betsy Dierberger, National Agronomist, and Lindsay Haines, National IPM Organics Specialist, all NRCS, Washington D.C., for their contributions.

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Feed Management for Small and Organic Operations

Introduction

NRCS Conservation Practice Standard (CPS) Feed Management (Code 592) is the agency's practice for manipulating and controlling the quantity and quality of available nutrients, feedstuffs, or additives fed to livestock and poultry. When feed management is implemented, NRCS can help producers conserve natural resources by decreasing nutrients that could contribute to soil, water, or air quality degradation. In addition to decreasing nutrient contributions to soil, water, or air, feed management can also decrease feed costs by minimizing overfeeding of expensive protein and carbohydrate components of the feed. Feed management helps producers achieve reductions in manure nutrients. NRCS has a series of nutrient management technical notes on feed management for the different major species of livestock raised in the United States. See table 1. The technical notes are available at <https://directives.sc.egov.usda.gov/>.

Table 1: USDA NRCS Nutrient Management Technical Notes for Feed Management

Number	Title
190-NM-01	Effects of Diet and Feeding Management on Nutrient Content of Manure
190-NM-02	Feed and Animal Management for Beef Cattle
190-NM-03	Feed and Animal Management for Swine (Growing and Finishing Pigs)
190-NM-04	Feed and Animal Management for Poultry
190-NM-05	Feed and Animal Management for Dairy Cattle
190-NM-08	Animal Diets and Feed Management
190-NM-10	Feed and Animal Management for Horses

Many times, small or organic operations perceive that NRCS programs and practices are for larger scale and conventional operations; however, small and organic operations can benefit from NRCS programs, as well. Good feed management practices can have a positive effect on conservation no matter the size or production system of the operation. Feed management is defined as minimizing overfeeding of nutrients that become animal waste, feeding local and home-raised feedstuffs to minimize concentration of outside nutrients onto a property or into a watershed, minimizing feed wastage, and balancing pasture and range forage production to the anticipated number of animals to reduce or mitigate soil and water degradation and erosion. Implementing several best management practices on the operation equates to good conservation.

This technical note provides guidance for feeding practices and feed ingredients. Organic producers should always refer to the USDA National Organic Program rules or their organic certifier before adopting practices or incorporating ingredients into the livestock diet. This document is not meant to set limits or formulate feeds; the producer's feed supplier or a consulting nutritionist should be able to supply more information.

Management Practices

Phase Feeding, Split-sex Feeding, Grouping

Matching nutrients in the feed with the nutrient demand of the particular animal or group of animals based on the age, sex, or stage of production may reduce overfeeding nutrients and result in lower

nutrient levels in manure. Nutrients in manure often result in soil, water, and air pollution; minimizing or eliminating those nutrients prior to feeding reduces the likelihood that they will contribute to problems in the future. All types and sizes of operations can control the amount of feed and the nutrients in the feed provided to the animals.

Feeding Local

One major concern with animal agriculture is that producers often rely on feed ingredients that are produced far away from their operation. In this case, the imported nutrients in the manure contribute to a local concentration of nutrients that must be dealt with in the environment. For example, if corn and soybeans produced in the Midwest are fed in different parts of the country, deposition of excess nutrients can result on land distant from where the grains were originally produced. These excess nutrients can potentially reach a concentration that runs off or leaches into surface or ground water. If local or “home grown” feed ingredients are available and fed appropriately, they can reduce the movement of excess nutrients into the area of production and the problems associated with overfeeding.

Changing Form of Feed

Grinding grain increases the amount of surface area available for digestion, leading to increased feeding efficiency. This holds true even if the ground feed is then made into pellets or crumbles. The correct grind varies by animal type and by grain type, but 500 to 700 microns is generally accepted as correct, with a grind that is too fine leading to feed wastage and a grind that is too coarse decreasing efficiency. Chopping forage or ensiling feed into smaller pieces will do much the same thing. Enzymes and bacteria work on breaking down fiber in the ensiling process, making nutrients more available in the ensiled forage.

Feeding Waste Products

With the exception of about six major grains grown for feed (corn, wheat, oats, rice, sorghum, and barley), most feed commodities are waste products from another industry (even soybean meal was a waste product of the soy oil industry until livestock producers realized its importance as a protein source). Waste products for feed include everything from cotton seed to whey (cheese production), to grape pumice (wine production), to brewers and distillers’ grains (beer and liquor production), to bakery waste and cookie meal (baking industry), and many others. Almost every major food production industry has a waste product that can be fed to animals.

In many cases, producers wonder if they can feed local grocery and restaurant waste. This generally comes under the purview of State and local regulations, and many times it requires that the product is cooked prior to feeding. Because of the difficulty of ensuring the makeup of waste products, it is much more difficult for organic producers to integrate waste products into the diet of their animals, even if the waste product was originally marketed as “organic.”

Under the Federal Swine Health Protection Act (1980), producers must be licensed to feed their pigs human food waste that contains or has had contact with meat, poultry, or fish. The Act allows each State to determine whether garbage feeding is allowed within their State. The requirement applies to all garbage collected from food production establishments, such as restaurants, school cafeterias, and food processing plants. To kill harmful viruses or bacteria, this food waste must be cooked to 212°F for 30 minutes before feeding it to pigs. Licensed producers receive routine inspections from USDA Animal and Plant Health Inspection Service (APHIS) or State employees to make sure that garbage fed to swine

undergoes proper cooking and handling to prevent possible disease transmission. To learn more about garbage feeding and the licensing process, contact local, State, or Federal animal health officials.

Feed Wastage

In most cases, the cost of feed is by far the highest component of the total cost of production on animal operations—in many cases 70 to 80 percent. If a large amount of feed is wasted it can have a large negative impact on the financial outcome of livestock production and the farming operation. Many times, technology as simple as adding a board to the top of the feeder bunk or a screen in a feeder pan will slow or stop the animal from wasting feed. See figure 1. If hay bales are fed in the field, bale feeders that keep the hay contained and prevent trampling and contamination with manure and dirt can minimize the wastage, which often amounts to 40 percent or more. See figure 2.

Figure 1. Wasted Feed in Front of a Feeder Bunk¹



Figure 2. Cattle Consuming Hay from a Bale Feeder¹



¹Source: USDA NRCS

Rather than being used for meat, milk, or egg production by livestock, the animal and the farming operation get no benefit from wasted feed, and the nutrients in the wasted feed must be managed in the environment. These wasted nutrients can become a problem if they contaminate watercourses or if their breakdown in the soil contributes to greenhouse gas production.

Producers should strive to minimize spillage of feed and water on the ground or into the manure management system. There are a variety of feed and watering systems that can be used with variable impacts on feed and water spillage. Wet-dry feeders for swine can reduce the volume of water spillage and the volume of liquid manure for storage by 30 to 50 percent primarily due to improved water utilization. Specialized feeder designs and adaptations that can be used to minimize wastage are available for all livestock types.

Climate

Adjust the livestock diet to meet specific climatic conditions, such as temperature, wind, and precipitation, or adjust the building climate to optimize nutrient utilization. Higher energy feeds during cold periods, or minimizing energy to some extent during warm weather, can make animals comfortable and ultimately produce better.

Diet Manipulation Factors

Diet formulation and ingredient selection considerations include formulation based on feed-available nutrients, genetic factors, use of specialty feeds, and water supplies.

Available Nutrients

If the biological availability of nutrients in feed ingredients is known, diets can be formulated more accurately to supply needed nutrients and reduce excess nutrient excretion from overfeeding. Consider the following recommendations.

- Reduce supplemental phosphorus (P) and add phytase to swine and poultry diets to reduce P excretion. Remove all supplemental P in beef cattle diets and most of the supplemental P in dairy cattle diets to reduce P excretion.
- Reduce dietary protein content and add supplemental amino acids, such as lysine, to swine and poultry diets. Reduce protein and select nitrogen (N) sources for cattle that can be absorbed more effectively. Each of these practices will reduce N excretion in the manure.

Genetics

Understanding the genetic capability of the animals producing meat, milk, and eggs is critical to adjusting the diet formulation to provide adequate nutrients. Feed intake levels and responses to environmental conditions, such as climate, disease pressure, and the housing system, are also important for formulation adjustments. Animals that have been bred for high growth and production can utilize a highly formulated feed whereas this feed would oversupply nutrients to other breeds—with the excess nutrients being released into the environment.

Specialty Feeds

Providing specific feed ingredients (e.g., high-oil corn, nutrient-dense corn, low-phytate corn, and soybeans) helps achieve a proper balance and increases availability of nutrients.

Organic Feed

USDA National Organic Program livestock and poultry standards apply to animals used for meat, milk, eggs, and other animal products sold, labeled, or represented as organic. Producers must feed livestock agricultural feed products that are 100 percent organic, and they may also provide allowed vitamin and mineral supplements.

Water Supplies

Water supply sources can make a significant contribution to mineral intake of the animal. Routinely analyze water sources and account for any contribution of minerals from drinking water when making necessary adjustments to the diet formulation. In some parts of the country, water passing through limestone can add significant amounts of calcium to the animal's diet. In other parts of the country, ground water may have high levels of salt or alkaline compounds that can also impact animal production. See figure 3.

Water supply sources high in bacterial counts or contaminated with chemicals can impact animal performance. Water from a pond that has developed a population of toxic algae can severely restrict or even kill animals. There have been instances where cattle with access to an open drain drank water containing chemicals that killed the bacteria in the rumen thus causing animal death despite having full access to feed. See table 2 for daily water consumption for various species of livestock.

Figure 3. Cattle Drinking from a Water Trough¹

¹Source: USDA NRCS

It may be important to monitor or consider the temperature of the water supply. Some animals (horses in particular) are very sensitive to cold water in the winter and will not drink unless water is at optimum temperature. This can cause the animal to colic and die. The opposite may also be true; water that is too warm may not be attractive and cause the animals to drink less than they need to meet their needs.

Table 2. Expected Daily Water Consumption of Various Species of Adult Livestock in a Temperate Climate¹

Animal	Consumption (gallons/day)²
Beef cattle	6–18
Dairy cattle	10–30
Sheep and goats	1–4
Horses	8–12
Swine	1.5—3
Poultry	Approximately twice the weight of food eaten

¹ Source: USDA NRCS Range and Pasture Handbook

² Upper limits can be greatly affected by temperature

Matching Range and Pasture Forage Production to Livestock Numbers

Too many animals on a given area of land can lead to problems with overutilization, soil compaction, soil erosion, and several other resource conservation concerns. Determining the correct balance between the number of animals and available forage production is essential to good grazing management. A cow-calf pair might do very well on 3 acres in the rainy eastern part of the United States, whereas they might need 50 acres in the arid West. The recent interest and resulting increase in the number of hobby and small farms has often led to overutilization—too many animals on too little land—simply because the producer does not know appropriate stocking rates. Recommended procedures to determine number of acres needed to match a producer's livestock herd size are in the NRCS National Range and Pasture Handbook. See figures 4 and 5.

Figure 4. Sheep on Overutilized Pasture¹¹Source: USDA NRCS**Figure 5.** Overgrazed Versus Correctly Managed Range¹

There has also been interest and growth in farms raising pastured pork and pastured poultry. Neither of these animals can meet a significant amount of their nutritional needs from grazing on pasture—probably not more than 25 percent. However, both types of livestock can cause degraded land conditions if not frequently moved within the pasture. Pastured swine root with their snout in search of worms, insects, and roots and can cause resource damage to pasture in a short time if space per animal is inadequate, the animals are not frequently moved, and resources are not closely monitored. Pastured poultry tend to scratch and peck constantly in search of seeds or insects. If there is inadequate space per animal, they are not frequently moved, and resources are not closely monitored, these animals can also damage pasture. Both livestock types can be destructive and can cause resource degradation because of their dependence on concentrated feedstuffs rather than forage and their natural behavior and instincts. However, some producers do successfully raise pastured swine and poultry through stringent management practices, including close monitoring of vegetation, soil, and water resources.

Figure 6. Pastured Swine¹¹Source: USDA NRCS**Figure 7.** Pastured Poultry¹

Summary

NRCS has many programs that can provide technical and (possibly) financial assistance to help producers adopt agricultural practices that improve the production of their operation—while protecting

the environment and the Nation’s natural resources. The simple acts of feeding local grains and forage, minimizing waste, or adopting practices to protect soil and water quality and quantity can have a positive effect on the production and profitability of the operation—while meeting conservation goals and objectives.

References

USDA Agricultural Marketing Service. n.d. “National Organic Program.” Washington, D.C. Accessed December 30, 2021. <https://www.ams.usda.gov/about-ams/programs-offices/national-organic-program>

USDA NRCS. 1997. Range and Pasture Handbook (Title 190). Washington D.C.
<https://directives.sc.egov.usda.gov/>

USDA Animal and Plant Health Inspection Service. n.d. “Swine: Other Programs, Swine Health Protection Act.” Washington, D.C. Accessed December 30, 2021.
<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/swine-disease-information/other-programs>.