

## EXTENSION PROGRAMMING IN MANURE MANAGEMENT

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**ABSTRACT:** Manure management is a critical link in sustainable livestock production, protecting water, air, and soil quality. However, the 4-H livestock curriculum does not include manure management at all. There are over 150,000 4-H youth with livestock projects in the western U.S. with no manure management training. The addition of manure management into 4-H livestock curricula has the potential to have a significant environmental impact in both the short-term and the long-term as these future leaders and business people move into the workforce. We have developed a 4-H Manure Management curriculum that includes the following topics: Livestock and the Community, Animal and Human Health, Protecting Water Quality, Protecting Air Quality, Composting, Manure Utilization, and Economics of Manure Management. In addition, we have begun a hands-on, week-long composting school called the Rocky Mountain Compost School. The intended audience for this school is large-scale professional composters of all kinds of solid waste including animal manures and mortalities. The Rocky Mountain Compost School offers the growing compost industry a solid technical background in biological principles governing the compost process, environmental concerns, compost quality in relationship to its proposed end use, regulatory issues, and recent research findings that pertain to composting. These two educational programs target different audiences with the overall intention of improving manure and environmental management in the West.

**Key Words:** Manure, Environment, Composting

### Introduction

*4-H Manure Management Curriculum.* According to EPA regulations, almost every 4-H livestock project could be classified as an Animal Feeding Operation (AFO). Although we don't expect EPA to inspect 4-H projects, these projects do present an opportunity for education of future livestock producers in the essential practice of manure management.

Manure management practices are related to water quality degradation, air quality problems (such as odor and dust), and improved soil quality. Therefore, manure management is a critical link in sustainable livestock production. Use of manure on-farm as a soil amendment and fertilizer also improves the integration of agricultural enterprises and restores nutrient cycles.

Manure management is an integral part of livestock and equine operations. Regulations are in place to ensure that the environment is not adversely affected by the high numbers of stock often associated with modern dairies, feedlots, and horse boarding and training facilities. To keep

up with the current state of animal production, 4-H curricula need a manure management component. Teaching the concepts of Best Management Practices for manure utilization can begin early and be incorporated into the curriculum so that 4-H youth will fully understand the environmental principles behind the regulations, as well as, how to apply them to their own operations when they need to make decisions about farming and animal production.

In Colorado alone, there are more than 13,000 youth involved in 4-H livestock projects. The western states have more than 150,000 youth involved in 4-H livestock projects. Unfortunately, at this time, the 4-H livestock curriculum does not include manure management at all. Therefore, many 4-H youth may believe that manure management doesn't matter, since it is possible to be an excellent 4-H livestock project participant without knowing the first thing about manure management and environmental impacts of livestock.

*Rocky Mountain Compost School.* Composting animal manure transforms an odorous, heterogeneous by-product into an earthy-smelling, uniform, fine-textured soil amendment. Converting manure into high-quality compost opens up markets and an additional income stream to livestock producers, while simultaneously reducing manure disposal problems. In addition, the high temperatures achieved during the compost process kill most weed seeds and pathogens present in manures. However, these outcomes are dependent on knowledgeable composters who understand the principles at work and what measurable qualities the finished compost should have.

Composting is both a science and a practical art. Biological principles govern the composting process; therefore, there are many variables encountered by composters that must be evaluated in light of the basic biological principles at work. Developing the ability to apply biological principles to the situation at hand is a complex process. Opportunities for obtaining the technical information and skills to produce good quality compost from agricultural by-products are limited. We delivered the Rocky Mountain Compost School for the first time in May 2007 to provide compost training for large-scale manure composters working in conjunction with livestock producers. Participants came from several western states. Our goal is for this school to become the place to go for training for agricultural composters in the Inter-Mountain West and Great Plains states. The objective of this school is to train professional composters in the principles and practices of composting and in using the latest research results to improve their management and compost quality.

## Materials and Methods

*4-H Manure Management Curriculum.* The 4-H program emphasizes "learning by doing" with a focus on hands-on, experiential education. In every 4-H lesson, there are three components: do, reflect, and apply. We are using the same approach in our manure management curriculum so that youth can learn by doing. We developed a manure management curriculum that includes the following topics:

- Livestock and the Community
- Animal and Human Health
- Protecting Water Quality
- Protecting Air Quality
- Composting
- Manure Utilization
- Economics of Manure Management

The curriculum was presented to the CSU Extension Front Range 4-H Staff for input, and following detailed review by leading 4-H livestock agents, we made revisions to improve it. In addition, we pilot tested the curriculum at the Colorado State 4-H Conference in June 2006. We produced CDs of the curriculum which were distributed among all western states, and the curriculum is widely available on our website ([www.manuremanagement.info](http://www.manuremanagement.info)).

*Rocky Mountain Compost School.* The Rocky Mountain Compost School is an annual, weeklong school ([www.rockymountaincompostschool.info](http://www.rockymountaincompostschool.info)) designed to provide scientific and technical information to commercial composters who agricultural residuals. The Rocky Mountain Compost School has drawn professional composters from Idaho, Washington, and Wyoming, in addition to Colorado. We currently have a research composting facility at CSU's Agricultural Research, Development and Education Center, located on I-25 a few miles north of Fort Collins. We have classroom, laboratory and field facilities at this site to have a maximum of 20 participants in each school session. This school supports the existing composting industry and provides the necessary training and education to composters so that the industry can grow in size and technical expertise, producing more and better quality composts.

The Rocky Mountain Compost School offers the growing compost industry a solid technical background. With this in place, there is a mechanism for composters to become knowledgeable about biological principles governing the compost process, environmental concerns, compost quality in relationship to its proposed end use, regulatory issues, and recent research findings that pertain to composting.

The format of the school includes classroom teaching, laboratory exercises that are designed to learn about composting processes, hands-on composting exercises at the composting research site, and field trips to commercial compost sites. In adult education, it is critical to use hands-on learning techniques and a variety of teaching methods to reach different types of learners. With that in mind, the Rocky Mountain Compost School is taking a creative and innovative approach to compost education. We are focusing on experiential learning techniques in both

field (making compost) and lab (evaluating compost) exercises. We also use both individual and group exercises to enhance the learning experience.

The Rocky Mountain Compost School came out of a partnership between the Rocky Mountain Organics Council (a group of producers and providers of compost and soil amendments) and Colorado State University. These connections with the composters themselves provide us at CSU with a much better understanding of the needs and priorities within the composting industry. We aim to expand our partnerships with professional composters throughout the region.

## Expected Outcomes

*4-H Manure Management Curriculum.* In the short-term, we are enhancing awareness of environmental issues related to livestock production and increasing knowledge of manure management practices among extension 4-H agents and volunteer leaders. In the medium-term, we aim to improve the skills of 4-H agents and leaders, in particular, to increase their ability to provide educational programs in manure management to 4-H youth.

In the long-term, we anticipate that 4-H agents and leaders will use the curriculum and encourage youth participating in 4-H livestock programs to complete the manure management training. We expect that agents and leaders will be able to document behavioral changes in participating youth. Behavioral changes may include an increased number of youth who are composting manure, changes in the corrals to prevent manure contaminated runoff, and utilization of manure at agronomic rates.

When the principles of good nutrient management are introduced early in a youth's life, they are more likely to practice these principles in their adult years. Livestock producers who utilize methods for handling manure that do not reflect Best Management Practices may choose not to change their management techniques in order to protect the environment. However, 4-H youth are more likely to practice what they have learned from reliable sources such as 4-H curricula, and may influence their elders as well. The inclusion of manure management in livestock 4-H curricula has the potential to have a significant environmental impact as these future leaders and business people move into the workforce.

*Rocky Mountain Compost School.* The outputs of this project include: the delivery of an annual weeklong, hands-on workshop for professional, large-scale composters, and partnership with the Rocky Mountain Organics Council and composters throughout the region. The outcomes of this project range from short-term to long-term outcomes. In the short-term, we are increasing both knowledge and skills of composters, so that they have the necessary foundation and motivation to optimize their composting practices. The short-term impacts are assessed using pre and post testing of the participants in order to quantify the knowledge gained. This also helps us to evaluate and improve our teaching for the next school.

The medium-term outcomes are changes in what the participants actually do, for example, increased amounts of composting, greater diversion of wastes of a wide variety, changes in management to optimize compost quality, and changes in policy to encourage manure composting. These action outcomes are assessed through email and phone follow-up contacts 6 months after each compost school.

The long-term impacts will be environmental, economic, and social. More manure will be composted and sold as a soil amendment. Increasing soil organic matter content increases water use efficiency and reduces irrigation requirements. As composting becomes a more common aspect of our culture, social values will change, too, leading to increased recycling of other types of wastes, as well.

### **Acknowledgments**

The authors appreciate the support received from the USDA-Western Sustainable Agriculture Research and Education Program and the Stepp Foundation.