Manure and Nutrient Management on Livestock and Poultry Farms

Purpose (Learning Objective): This module is designed to help students and beginning farmers comprehend manure and nutrient management concepts from the environmental risks to planning, application, and public relations. The nine sections together highlight the end goal of providing crops with adequate nutrients while protecting the environment and being a good neighbor. These concepts are reinforced through worksheets and an activity game in the format of the game show Jeopardy® which allows learners a fun way to use their knowledge and challenge others.

# Why is this important?

Livestock and poultry production is an important part of the food system in the United States. Beef, dairy, swine, sheep, goats, and poultry also provide significant economic value to rural communities. Over the years, manure and nutrient management has become more scrutinized as production shifts toward larger farms and manure is moved long distances from the farm of origin. New technology, research knowledge, and rising fertilizer prices have provided livestock producers with tools and motivation to manage and apply manure as accurately as possible.

Manure handling has evolved from small box-type spreaders with a few bushels of solid manure to large storage structures capable of handling millions of gallons of liquid manure. With large quantities of manure the risk of manure and nutrients reaching environmentally sensitive areas has increased. In many rural areas, urban expansion has resulted in houses being built near livestock operations. This close proximity can cause conflict during manure application as odor, traffic, and other nuisance issues can increase.

Proper handling and application techniques need to be followed to ensure crops are receiving a sustainable amount of nutrients and having these nutrients applied in an environmentally and socially acceptable way. Nutrient management planning has helped livestock producers document their manure handling and application system. This module will provide an overview of nutrient and manure management and how to safely and effectively apply manure.

# Prior to this activity/program:

High school/Jr. College Teachers: Student should have some background knowledge on local livestock and crop production. Students should also be familiar with local topography, soil types, and environmental features such as rivers, lakes, and ground water resources. Students should also be aware of current social issues and controversial issues surrounding livestock and manure production.

Extension Faculty/Staff:When hosting programs for livestock producers or custom manure applicators, try to gather information about attendees experience or familiarity with nutrient management planning. It is also important to help them determine if they need a nutrient management plan (NMP). Understanding their experience levels will help determine if an NMP is necessary or if general awareness of manure management is sufficient. With custom manure applicators or other professionals, consider submitting your program for certification for continuing education requirements.

# Suggested Presentation Outline (Estimated 30-50 minutes per section)

This module can be utilized in its entirety or individual sections can be presented as stand-alone topics. For each section, the suggested sequence is:

1. Print the fact sheet and provide to students for reading prior to the classroom activities.
2. Begin classroom activity by watching the video(s) associated with the fact sheet. (5-15 minutes)
3. Utilize the review question/answer sheets to stimulate discussion and gauge retention of the important concepts. Review the fact sheets and encourage students to highlight important areas or add notes as needed. (5-15 minutes)
4. Activity: Jeopardy-style game (*Note that some of the activity files combine content from 2 sections*). If desired, the students can be divided into teams that are allowed to work together on answers and compete against other teams for the most points. (20 min)

# Instructional Materials

The links provided download all materials associated with that section. You can download these sections or individual items by visiting the website in the footer.

Section 1 Nutrient Management Planning

* Learners will identify basic components of a nutrient management plan.
* Learners will identify on-farm nutrient sources.
* Learners will develop maps indicating manure application prohibited areas.

Download all materials for this section (22MB):

<http://www.extension.org/sites/default/files/Nutrient%20Mgmt%20Section%201.zip>

Includes: fact sheet in PDF and DOCx, Two videos in MP4, Game slides in PPT, and review worksheet.

*Section 2 Nutrient Management Regulations*

* Learners will list the purposes of the 590 Nutrient Management Standard.
* Learners will identify criteria for CAFO farms.
* Learners will identify purposes for manure management regulations.

Download all materials for this section (12MB):

<http://www.extension.org/sites/default/files/regulations%20section%202_0.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

Section 3 Impacts of Nutrients on Ground and Surface Water

* Learners will identify impact of nitrate and phosphorous on ground and surface water.
* Learners will define hypoxia.
* Learners will identify ways to reduce sediment from reaching surface waters.

Download all materials for this section (26MB): <http://www.extension.org/sites/default/files/water%20quality%20section%203_0.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

Section 4 Manure Storage, Agitation, and Handling

* Learners will identify types of storage structures.
* Learners will identity causes for odor around storage structures.

Download all materials for this section (26MB): <http://www.extension.org/sites/default/files/storage,%20agitation,%20handling%20section%204_0.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

Section 5 Safety around Manure Gases and Confined Spaces

* Learners will identify the four gases associated with manure storage systems.
* Learners will describe human symptoms of exposure to the four gases.
* Learners will identify precautions before entering a confined space.

Download all materials for this section (65MB): <http://www.extension.org/sites/default/files/Safety%20section%205_0.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

Section 6 Liquid and Solid Manure Application

* Learners will calculate the amount of nutrient available in a manure application.
* Learners will identify the different types of manure application.
* Learners will increase awareness of manure application technology.

Download all materials for this section:

<http://www.extension.org/sites/default/files/application%20section%206.zip> and

<http://www.extension.org/sites/default/files/YT%20Surface%20Manure%20Application.mov.mp4>

Includes: fact sheet in PDF and DOCx, four MP4 videos; Game slides in PPT, and review worksheet.

Section 7 Manure Spreader Calibration

* Learners will calculate solid manure spreader calibration.

Download all materials for this section:

<http://www.extension.org/sites/default/files/calibration%20section%207_0.zip>

Includes: fact sheet in PDF, MP4 video, and review worksheet.

Section 8 Manure Spill Response

* Learners will define what a spill is.
* Learners will identify resources to confine a spill or release.
* Learners will list the five steps for proper spill response.

Download all materials for this section:

<http://www.extension.org/sites/default/files/spill%20response%20section%208_0.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

Section 9 Public Relations and Manure Application

* Learners will identify stakeholders in their community.
* Learners will develop a manure application public relations plan.

Download all materials for this section:

<http://www.extension.org/sites/default/files/public%20relations%20section%209.zip>

Includes: fact sheet in PDF and DOCx, one MP4 video; Game slides in PPT, and review worksheet.

## Evaluation/Assessment:

Review questions and answers:

Worksheet: <http://www.extension.org/sites/default/files/Worksheet.pdf>

Answer sheet: <http://www.extension.org/sites/default/files/Answer%20sheet.pdf>

(These links include all sections. The review worksheets in each section contain questions only for that section.)

## Enrichment Activities/Independent Practice (Optional):

* Search for and download the “Manure Calculator” smartphone app in iTunes or Google Play (this app cost $.99 at the time of this module publication). Have students compare different calibration or nutrient application scenarios.
* Take students out to sample soil, sample manure, or calibrate a manure spreader on a farm.

Connections to SAE projects

**Entrepreneurship/Production**

* Create a nutrient plan for their farm or production area.

**Placement**

* Assist their employer in making a nutrient plan.

## Connections to FFA Awards/Contests

This module may be helpful for students preparing for Career Development Events such as prepared public speaking, extemporaneous public speaking, agricultural communications, agricultural issues, environment and natural resources, and others.

## Alignment with Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

**CS LifeKnowledge and Cluster Skills**

CS.01. Performance Element: Premier Leadership: Acquire skills necessary to positively influence others

CS.06. Performance Element: Examine the importance of health, safety and environmental management systems in organizations and their importance to performance and regulatory compliance

CS.07. Performance Element: Safety, Health, and Environmental: Demonstrate appropriate health and safety procedures for AFNR occupations

CS.07.01. Performance indicator: Apply safety/health practices to AFNR worksites

CS.08.02. Performance indicator: Use appropriate protective equipment and handle AFNR tools and equipment to demonstrate safe and proper use of the tools and equipment

**ABS Agribusiness Systems**

ABS.02. Performance element: Utilize appropriate management planning principles in AFNR business enterprises.

ABS.03. Performance element: Utilize record keeping to accomplish AFNR business objectives while complying with laws and regulations.

ABS.03.01. Performance indicator: Prepare & maintain files to accomplish effective record keeping

**AS Animal Science**

AS.08. Performance element: Analyze environmental factors associated with animal production

**ESS Environmental Service Systems**

ESS.01. Performance element: Use analytical procedures to plan and evaluate environmental service systems

ES.01.01. Performance indicator: Analyze and interpret samples

ESS.03. Performance element: Apply scientific principles to environmental service systems

ESS.04. Performance element: Operate environmental service systems to manage a facility environment

ESS.04.01.Performance indicator: Use pollution control measures to maintain a safe facility environment

ESS.06. Performance element: Use tools, equipment, machinery and technology to accomplish tasks in environmental service systems

ESS.06.01. Performance indicator: Use technological and mathematical tools to map land, facilities, and infrastructure

**Natural Resource Systems**

NRS.01. Performance element: Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments

**Plant Systems**

PS.02. Performance element: Prepare and implement a plant management plan that addresses the influence of environmental, mental factors, nutrients and soili on plant growth.

PS.02.03. Performance indicator: Develop and implement a fertilization plan for specific plants or crops

PS.03.04. Performance indicator: Apply principles and practices of sustainable agriculture to plant production

**Power, Structural, and Technical Systems**

PST.02.01. Performance indicator: Perform service routines to maintain power units and equipment

PST.05.03. Performance indicator: Use geospatial technologies in agricultural applications

# For More Information

eXtension Manure Nutrient Management <http://www.extension.org/8647>

* Calibration of manure application equipment <http://www.extension.org/16350>
* Manure Storage Safety <http://www.extension.org/19943>

Livestock and Poultry Environmental Stewardship Curriculum <http://www.extension.org/8964> We especially recommend Lesson 2 and Module D (contains lessons 30-36)

State Specific Nutrient Management Information <http://www.extension.org/14881>

eXtension Manure Storage and Handling <http://www.extension.org/8638>

Manure Spills and Emergency Planning (archived webcast) <http://www.extension.org/28679>

**Recommended internet search terms:**

manure nutrient management, nutrient management plan, manure safety, 590 nutrient management standard [insert your state here], phosphorus water quality, nitrate leaching, manure and water quality, US EPA nutrient management, comprehensive nutrient management planning, manure storage systems, manure spreader calibration, manure spill response, manure neighbor relations, manure application GPS

# Teaching Notes:

What will you keep, change, add or do differently the next time you teach this unit?

# Acknowledgements:

Authors: Jerry Clark, University of Wisconsin-Extension, Chippewa and Eau Claire Counties, [jerome.clark@ces.uwex.edu](mailto:jerome.clark@ces.uwex.edu)

Carl Duley, University of Wisconsin-Extension, Buffalo County, [carl.duley@ces.uwex.edu](mailto:carl.duley@ces.uwex.edu)

Ted Bay, University of Wisconsin-Extension, Grant County [ted.bay@ces.uwex.edu](mailto:ted.bay@ces.uwex.edu)

Dave Lucinani, University of Wisconsin-Extension, [dluciani@wisc.edu](mailto:dluciani@wisc.edu)

Reviewers: Multiple USDA NRCS staff