Iowa FFA Agricultural Mechanics Career Development Event - 2006

State of Iowa
DEPARTMENT OF EDUCATION
Career Education Division
Grimes State Office Building
Des Moines, IA 50319

CONTESTANT NAMES _____
_____
_____
_____

CONTESTANT SCHOOL _____

WASTE MANAGEMENT
Team Problem Solving
(50 minutes)

You may refer to this ISU publication: *Livestock Industry Facilities & Environment (LIFE) Project - Home Study Lesson #3 – Manure Application* (January 1998). **DO NOT WRITE ON THE PUBLICATION.**

Part I

Complete the Manure Application Questionnaire.

Part II

Complete the Manure Application Worksheet.

EVALUATION SCORE SHEET

ITEM	POINTS POSSIBLE	EARNED
Part I		
#1	10	_____
#2	10	_____
#3	10	_____
#4	10	_____
#5	10	_____
Part II		
#1	10	_____
#2	10	_____
#3	10	_____
#4	10	_____
#5	10	_____
#6	10	_____
#7	10	_____
#8	10	_____
#9	10	_____
#10	10	_____
TEAM TOTAL	150	_____
INDIVIDUAL TOTAL (Team Total ÷ 3)	50	_____

Part I

MANURE APPLICATION QUESTIONNAIRE

1. Describe the best time to spread livestock manure, including desirable environmental conditions.

Need at least five (5) of these for the complete 10 points, 2 points each

- When not objectionable to the neighbors
- When wind is blowing away from neighbors and populated areas
- After morning traffic
- When the air is warming and rising
- When the air is low humidity
- When there are high winds
- Other answers as deemed acceptable by the judge

2. List two advantages and two disadvantages of injecting or incorporating livestock manure ***(2.5 points each)***

Advantages: (1) Reduce odor
(2) Prevent runoff
(3) Decrease nitrogen loss
(4) Other answers as deemed acceptable by the judge

Disadvantages: (1) Can't apply on frozen ground
(2) Greater power requirements
(3) Other answers as deemed acceptable by the judge

3. Give three reasons why proper livestock manure application is important ***(3 points each, 1 point for getting 3 right).***

(1) Decrease potential for environmental contamination
(2) Utilize nutrients properly and/or completely
(3) Build soil (tilth, structure, biological activity)
(4) Reduce odors
(5) Reduce soil compaction
(6) Other answers as deemed acceptable by the judge.

4. Name three types of manure application equipment. ***(3 points each, 1 point for getting 3 right)***

(1) Box-type spreader
(2) Tank wagon
(3) Umbilical applicator
(4) Irrigation

5. Answer these true/false questions. Circle your response. ***(2 points each)***

(a) Increasing the ground speed while spreading liquid manure in a field will increase the application rate.	T	F
(b) Incorporating manure into the soil will decrease the amount of nitrogen lost.	T	F
(c) The value of nutrients in manure almost always pays for the cost of applying manure to cropland.	T	F
(d) In order to uniformly apply manure, applicators must know how to determine application rates and how to calibrate application equipment.	T	F
(e) Manure application rate is based on need as solely determined by soil testing.	T	F

Part II

MANURE APPLICATION WORKSHEET

You are a swine producer with a 2,200-head finishing unit. Each year, the animals in your facility produce 725,000 gallons of manure that is stored in concrete manure pits. The manure contains 58 lbs of nitrogen (N) per 1,000 gallons, 40 lbs of phosphorus (P_2O_5) per 1,000 gallons, and 45 lbs of potassium (K_2O) per 1,000 gallons. You have available to you two 5,500-gallon tank wagons with sweep injectors to apply the manure to surrounding fields. The tanks are cylindrical.

Answer the following questions:

1. The diameter of each tank is 8 ft. How long is each tank given that each holds 5,500 gallons? (1 ft^3 = 7.48 gallons) **14.6** feet

2. You wish to fill each tank wagon in 10 minutes. What is the minimum capacity (in gallons per minute) of the manure pump that you would use? **550** gallons/min

3. The results of soil tests, your cropping conditions and your discussions with an agronomist indicate that the maximum allowable application rate for nitrogen is 135 lbs of N per acre. How many gallons of manure could you apply to each acre? **2328** gallons / acre

4. Your maximum allowable application rate for phosphorus is 60 lbs of P_2O_5 per acre. How many gallons of manure could you apply to each acre? **1500** gallons/acre

5. Your maximum allowable application rate for potassium is 45 lbs of K_2O per acre. How many gallons of manure could you apply to each acre? **1000** gallons/acre

6. What is the actual application rate you would use in gallons per acre? **1000** gallons/acre

You have done some additional soil testing and have changed the cropping system. From these new conditions, you have determined that you can apply the manure at a rate of 2,200 gallons per acre. Use this application rate in answering questions # 7 through #10.

7. How many acres are covered by the unloading of one tank wagon? **2.5** acres

8. How many acres are needed to apply all of the 725,000 gallons of manure each year? **330** acres

9. How many trips must each individual tank wagon make to apply all of the 725,000 gallons of manure if both are hauling? **66** # of trips per wagon

10. If each trip with a single tank wagon (loading, unloading and travel time) takes 40 minutes, how long (in hours) would it take to apply the 725,000 gallons with the two tank wagons? **44** hours