

Option 1: Fertilize with enough manure to meet nitrogen needs

From the calculations in Part I, we discovered that the pasture needs 1,200 pounds of nitrogen. This is exactly the amount of nitrogen contained in the manure produced on Old MacDonald's farm. So, let's assume that Old MacDonald uses all the manure to fertilize his pasture. This will completely satisfy the pasture's need for nitrogen and phosphorus. However, he still needs to fertilize his corn crop.

Because Old MacDonald used all the manure produced on his farm to fertilize his pasture, he must buy commercial fertilizer for his corn. He needs to buy both nitrogen and phosphorus.

- A. How many pounds of nitrogen would Old MacDonald need to buy? Hint: Look at your calculations in #1.
- B. How much would Old MacDonald have to pay to buy enough commercial nitrogen?
- C. How many pounds of phosphorus would Old MacDonald have to buy? Hint: Look at your calculations in #3.
- D. How much would Old MacDonald have to pay to buy enough commercial phosphorus?
- E. How much would Old MacDonald spend in all on commercial fertilizer for Option 1?

Option II: Fertilize with enough manure to meet phosphorus needs

Old MacDonald does not have to use all the manure from his farm to fertilize his pasture. From the calculations in Part I, we found that if Old MacDonald puts some of the manure on the pasture and some on the corn field according to the amount of phosphorus each field needs, he will need to buy only 150 pounds of phosphorus. However, he will then have to put nitrogen on both his pasture and his corn field. Will this method of distributing fertilizer be worth it? Let's find out.

- A. After spreading manure according to the phosphorus needs of each field, how many pounds of phosphorus would Old MacDonald need to buy?
- B. Find the total price that Old MacDonald would have to pay for commercial phosphorus.
- C. How many pounds of nitrogen would Old MacDonald have to buy? Hint: Subtract the amount of nitrogen he needs from the total amount of nitrogen.
- D. Find the total price that Old MacDonald would have to pay for commercial nitrogen.
- E. How much would Old MacDonald spend in all on commercial fertilizer for Option 2?

Making the Right Decision

- A. Which is cheaper for Old MacDonald, Option 1 or Option 2?
- B. How much would Old MacDonald save if he used the cheaper method?
- C. Which method of fertilization would lead to less excess phosphorus accumulation in the soil? (Remember that excess phosphorus in the soil is washed away by rainwater and leads to pollution in nearby waterways.)

Other Farmer-ly Considerations...

Manure also contains other nutrients such as manganese, calcium, sulphur, boron, and iron that plants need to survive. If Old MacDonald applies manure only to his pastureland (as was the case for nitrogen-based application), he might still have to buy and apply these additional nutrients to satisfy crop needs.

Manure application will also increase the health of the soil because manure contains organic matter that is used as food by worms and other organisms in the soil. The result is a healthier soil that grows healthier crops while, at the same time, reducing the environmental damage of excess nutrient runoff into lakes and streams.