Principles of Ecological Agriculture
AGRI-340
Final Exam

Name: _____ **Student #** _____

Total marks = 100

Instructor: Caroline Begg
Reviewer: Katrine Stewart

April 23 2004
CC Ballroom 3 hours 9:00-12:00

Total number of pages in Exam = 3

Open-Book Exam
Answer All Questions in Examination Booklets

French/English dictionaries are allowed.

Questions can be answered in any order – Please do not hesitate to ask for clarification

Read the questions carefully, judge your time accordingly for each question, and answer the "easy" ones first. Include as much detail as you think is necessary to fully explain and answer each of the questions.

Answers can be in point form – as long as the "points" are explained. For example writing, "soil pH" is not enough while "high soil pH> 6 beneficial to bacteria" is enough.

(Value of question) **Questions**

(6)

1. Would you support the proposition that all producers should switch to "organic agriculture"? Explain your answer, either for or against, giving three (3) reasons in detail.

(8)

2. Explain what the advantages are to increasing either crop or animal biodiversity on the farm. Describe four benefits. Explain some of the constraints or problems you may have with a highly diverse (crop or animal) operation. Describe four (4) of the problems.

(5)

3. If you could buy enough land, either for a crop, animal or mixed production system, what are the criteria that would guide your choice of land? Explain and describe five (5) of the criteria you would use and rank them in order of importance from most important to least important.

(6)

4. Boundaries are an essential part of complex system theory. Describe three (3) different "boundaries" that could be used when examining a farm agro-ecosystem. Explain how each could be used in a certain context (when describing/examining the farm in terms of sustainability).

(10)

5. In horticulture (vegetable) crop systems the sequence of crops (through time) planted on the fields or beds is critical to the success of the operation. Give five (5) criteria you would use to choose the sequence of crops, explain why each is important and rank them from most important to least – also explain the ranking order.

(5)

6. On your organic farm, you produce a "value-added" product (for example yogurt, maple syrup or flour) or several vegetable crops. Describe all the possible ways you would use to market these products in a sustainable manner.

(5)

7. What are the characteristics of highly successful annual weeds and why are they such good competitors with our annual cereal crops - corn, wheat and rice?

(10)

9. The making of good quality compost is a complex procedure (art?). Describe the effect of the C:N ratio, bio-availability (quality) of the organic material and aeration on the production of compost. Describe where the nutrients can be lost and how the loss can be increased.

(4)

10. Why would a producer with dairy cows or sheep or beef cows choose to use rotational grazing? What are the advantages and disadvantages to rotational grazing?

(10)

11. What is the importance of a "good" crop rotation to the successful management of a certified organic farm? What crops should it include? In this question cover all the effects that a crop rotation has on soil structure, weeds, disease, soil organic matter, and soil fertility.

(10)

15. The increase in organic food production indicates a possible philosophical change in agricultural production but it primarily reflects the Consumer desire for "healthy, nutritious food". But there appears to be a knowledge-gap between what is "certified organic" and what the Consumer wants or understands. Describe what impact the consumers have on organic production systems, in terms of products, availability and price. Propose in detail three solutions that could solve some of these problems.

(6)

16. Explain how "Farm agro-ecosystems" differ from "natural ecosystems" in terms of 1) nutrient cycling, 2) populations of crops and animals and 3) stability

(15)

17. Nutrient Budgets

1) Calculate, for the 4 month growing season, the nitrogen and phosphorus (P_2O_5) release in kg/ha from soil humus mineralization using the following data

10,000 m2 = 1 ha
Soil humus contains 5% N and 1.25 % P
P_2O_5 = P * 2.289 (kg/ha)
Assume a 9-month mineralization period

Soil texture = sandy loam 0.15m
Soil bulk density = 1.35 t/m3
Soil humus at the start of the rotation = 4.5%

2) Calculate the nutrient budget for each of the following three crops. Use N and P values from part 1.

Year 2 tomatoes = 23,000 kg/ha (moist) = 23 t
Year 3 carrots = 27,000 kg/ha (moist) = 27 t
Year 4 broccoli = 31,000 kg/ha (moist) = 31 t

3) Assume that the compost you are adding **in the spring** contains the following **available** nutrients (the efficiency/mineralization has been calculated) **3.1 kg N/t, 4.1 kg P_2O_5/t, 7.3 kg K_2O/t**
If you are deficient in Nitrogen for a crop (from part 2), compost must be added

- In which years will you add compost and how much?
- In which years, after the addition of the compost will you be in excess of P and by how much?