

Name _____

AGRONOMY 375

September 30, 2005

Exam 1

There are 16 questions. One bonus question is also included at the end of the exam. A total of 100 points is possible.

Best wishes for your success !

- 6 pts. 1. How does a producer know how near optimum efficiency they are with the input mix for a portion of a field in a crop production system? Please explain.
- 6 pts. 2. Is management to optimize crop input use efficiency (as referred to in question 1 above) profitable **and** consistent with good environmental stewardship and sustainability? Please explain. Assume crop management for the long run (i.e. greater than 10 years).
- 8 pts. 3. Describe GPS, GIS, and VRT and integrate them into one example which illustrates their use in working toward the achievement of Maximum Economic Yield.

- 6 pts. 4. If not soil sampling on a grid, what two major considerations should be kept in mind to determine where within a field soil samples should be collected to accurately represent P and K levels as a basis for routine fertilizer recommendations ?
- a)
- b)
- 4 pts. 5. What soil sampling depth is to be used for the determination of P and K soil test levels as a basis for routine P and K fertilizer recommendations in each of the following;
- a) Conventionally tilled field?
- b) No-Till coulters planted field?
- 4 pts. 6. a) What Critical Level (ppm) is recommended as an economic goal for Phosphorus P1 soil tests wheat production in Indiana?
- 4 pts. b) What annual Buildup recommendation (pounds P_{205} / acre) should be made to increase the P1 soil test level from 12 ppm to the Critical Level . (Buildup component only. Please do not include a maintenance component).
- 4 pts. 7. a) What Critical Level (ppm) is recommended as an economic goal for Potassium soil tests for wheat production on a soil with a C.E.C. of 15?
- 4 pts. b) What annual Buildup recommendation (pounds K_{20} / acre) should be made to increase the soil test level from 90 ppm exchangeable K to the Critical Level? (Buildup component only. Please do not include a maintenance component).

- 4 pts. 8. The economic goal or critical P1 or K soil test level is at the leading edge of the Maintenance Plateau in planning soil fertility for crop production.
- a) What is the upper limit of the P1 soil test maintenance plateau for wheat production?
ppm
- b) What is the upper limit of the K soil test maintenance plateau for wheat production for a soil with a CEC of 10 as in question 7 above?
- 4 pts. c) Could higher crop yields be gained by raising P and K soil test levels to a position even higher than the economic (critical) P and K soil test level for a given soil? If so, why not increase P and K soil test levels up to a point where corn and soybean yield are never limited with regard to soil test levels of those two nutrients? If not, why not? Please explain.
- 4 pts. 9. Please distinguish between active and passive symptom expression with respect to cause and effect crop diagnostic relationships (provide an example of each).
- 4 pts. 10. Briefly describe the line transect method noting what it measures and how the measurement conducted.

10 pts 11. Describe two early - growing season differences in the physical properties of the upper soil profile (e.g. top few inches) under a no-till and a conventionally plowed field in a poorly-drained central Indiana soil.

Please explain why these differences exist and note how they influence early root development by corn or soybean plants.

6 pts 12. a) Briefly describe how latitude, soil drainage, and previous crop inter-relate as via a key factor, which can strongly influence the corn, yield potential and adaptability of different tillage/planting systems in Indiana.

2 pts. b) Describe an environment / tillage- planting system combination in which this key factor would be strongly limiting to corn yield.

2 pts. c) Describe management variations in this environment /tillage - planting system which could be used to lessen the negatives described in question b) above.

4 pts. 13. Note four visible soil or crop symptoms of soil compaction

- a)
- b)
- c)
- d)

- 4 pts. 14. Note four means by which soil compaction can be either prevented or corrected in a crop production system?
- a)
 - b)
 - c)
 - d)
- 5 pts. 15. List five problems associated with poor soil drainage in a corn and soybean production environment in Indiana.
- a)
 - b)
 - c)
 - d)
 - e)
- 2 pts. 16. a) What is the typical depth of placement for pattern field tile systems installed for subsurface drainage in Indiana corn and soybean production systems?
- 3 pts. b) What is indicated by a mottled appearance in the top 13 to 18 inches of a soil profile. Please explain (include a note as to the bearing which this observation might have on crop management decision making).
- 5 pts. **BONUS** Critical Level (Economic Goal) and Maintenance Plateau. What factors might a crop manager consider when choosing where within the maintenance plateau to target soil P1 and K test levels for corn and soybean production? How does the crop manager know whether to stay on the low end of the plateau close to the Critical Level (Economic Goal) or to move up to mid range or the high end of the plateau when determining specific soil fertility goals for a management zone within a field?