

Name _____

AGRONOMY 375

October 3, 2008

Exam 1

There are 15 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 5 years).
- 12 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) Twist Chisel tilled field?
- b) No-Till coulter planted field?
- 4 pts. 6. a) What Critical Level (ppm) is recommended as an economic goal for Phosphorus P1 soil tests for corn and soybean production in Indiana?
- 4 pts. b) What annual Buildup recommendation (pounds P_2O_5 / 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 corn and soybean production on a soil with a C.E.C. of 16?
- 4 pts. b) What annual Buildup recommendation (pounds K_2O / acre) should be made to increase the soil test level from 80 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 are the upper limits of the P1 soil test maintenance plateau and the draw down plateaus respectively for corn and soybean production?

Corn and Soybean P1 Maintenance Plateau Maximum = ppm

Corn and Soybean P1 Drawdown Plateau Maximum = ppm

b) What is the upper limit of the K soil test maintenance plateau for corn and soybean production for a soil with a CEC of 16 as in question 7 above?

Corn and Soybean K Maintenance Plateau Maximum = ppm

Corn and Soybean K Drawdown Plateau Maximum = ppm

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.

3 pts. 9. Please distinguish between active and passive symptom expression with respect to cause and effect crop diagnostic relationships (provide an example of each).

3 pts. 10. Please distinguish between primary and secondary with respect to cause and effect crop diagnostic relationships (provide an example of each).

- 4 pts. 11. Briefly describe the line transect method noting what it measures and how the measurement is conducted.
- 6 pts 12. Please note three factors which lessen soil erosion due to the movement of runoff water in a conservation tillage corn production system (e.g. no-till coulters planted) versus a conventional corn production system (e.g. moldboard plow plus 2 X field cultivation prior to planting). Assume the previous crop is corn in both systems.
- a)
- b)
- c)
- 8 pts 13. 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 also explain why these differences exist and note how they influence early root development by corn or soybean plants.
- 8 pts 14. a) Briefly describe how latitude, soil drainage, and previous crop inter-relate via a key factor which can strongly influence the corn, yield potential and adaptability of different tillage/planting systems in Indiana.
- 3 pts. b) Describe an environment / tillage- planting system combination in which this key factor would be strongly limiting to corn yield.

3 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. 15. Note four visible soil or crop symptoms of soil compaction

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

5 pts. **BONUS** 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 it is more profitable 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 P and K soil fertility goals for a management zone within a field?