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 field?

Please use C.E.C. = 13 meq / 100 grams of soil where appropriate in answering questions 6, and 7. (Please also show your work).

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$_{205}$ / acre) should be made to increase the P1 soil test level from 11 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 this Indiana corn and soybean production setting?

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).
8 pts  8. Could even 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? Is the critical soil test level (economic goal) for these nutrients one that provides non-limiting conditions? Please explain.

4 pts  9. What general diagnostic information is conveyed by the random appearance of a crop injury symptom throughout a field vs. the appearance of a symptom in a regular pattern (e.g. every eighth row) in a field? Please explain.

4 pts  10. Given the following information, calculate the percent residue cover remaining after planting (please show your work).

| Residue Cover Remaining |     |
|------------------------|--|---|
| Corn residue after harvest | 90% |
| Overwintering at this northern Indiana location | 85% |
| Planter with 8 wave coulters | 80% |

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.

10 pts  12. How are crop residue (previous crop), soil drainage, slope, and latitude related to the successful adaptation of a tillage and planting system for corn production in Indiana? (Please be thorough in explaining your answer).
4 pts. 13. Note four visible soil or crop symptoms of soil compaction

4 pts. 14. Note four means by which soil compaction can be either prevented or remedied 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. What is the typical depth of placement for pattern field tile systems installed for subsurface drainage (not to include subsurface irrigation) in Indiana corn and soybean production systems?

3 pts. Note an advantage for such subsurface drainage systems as compared with surface drainage (e.g. grassed waterways) only.

5 pts. **BONUS** 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).