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!

7 pts  1. How can a crop producer **measure** the efficiency of crop input use in a crop production system (how does he/she know how near optimum they are with the input mix)? Please explain.

7 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 (greater than 5 years).

5 pts.  3. Give an example of a positive interaction among inputs in a crop production system. Include a brief explanation of how this interaction can contribute to the attainment of maximum economic yield.
5 pts.  4. Describe the difference between an active and a passive symptom and a secondary symptom in diagnosing a crop problem. Give an example of each.
8 pts.  5. Describe GPS, GIS, and VRT and integrate them into one example which illustrates their use in working toward the achievement of Maximum Economic Yield.

4 pts.  6. a) What major considerations should be kept in mind to determine where within-field (not on a grid) should soil samples be collected to accurately represent P and K levels as a basis for routine fertilizer recommendations?

4 pts.  b) What soil sampling depth(s) is/are to be used for the routine determination of P and K soil test levels as a basis for P and K fertilizer recommendations for corn and soybean production?

Please use C.E.C. = 16 meq / 100 grams of soil where appropriate in answering questions 7, and 8. (Please also show your work).

3 pts.  7. a) What Critical Level (ppm) is recommended as an economic goal for Phosphorus soil tests for corn and soybean production in the U.S. Corn Belt?

2 pts.  b) What is the upper limit of the maintenance plateau for the Phosphorus soil test level in this situation?
4 pts.  c) What annual Buildup recommendation (pounds P\textsubscript{2}O\textsubscript{5} / acre) should be made to increase the soil test level from 12 to the Critical Level? (Buildup component only. Please do not include a maintenance component).

3 pts.  8. a) What Critical Level (ppm) is recommended as an economic goal for Potassium soil tests for corn and soybean production in the U.S. Corn Belt?

2 pts.  b) What is the upper limit of the maintenance plateau for the Potassium soil test level in this situation?

4 pts.  c) What annual Buildup recommendation (pounds K\textsubscript{2}O / 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).

5 pts  9. List five problems associated with poor soil drainage in a corn production environment in Indiana.

4 pts  10. Briefly describe the line transect method (what does it measure and how is the measurement conducted)?

4 pts  11. Please note two reasons that one might expect to see a greater rate of infiltration (by water into the soil) and therefore less runoff and erosion in a no-till field than in a moldboard plowed field. Assume that the previous crop is corn in both cases.
10 pts  12.  a) 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.

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

10 pts  13.  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  14.  Note four visible soil or crop symptoms of soil compaction.

5 pts  15.  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 Economic goals (also called Critical Levels) for P and K soil testing / fertilizer recommendations are targeted in such a way that there is a 10 to 40 percent
probability of a positive crop yield response to P or K fertilizer at even higher levels than the economic goal (Critical Level). Please explain this apparent contradiction. Why not simply add P and K fertilizer up to a level which is never limiting to yield?