AGRONOMY 375

October 1, 2004

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!

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.

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).

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.
4. Describe the difference between a primary symptom and a secondary symptom in diagnosing a crop problem. Give an example of each.

5. a) What major considerations should be kept in mind to determine where within-field soil samples should be collected to accurately represent P and K levels as a basis for routine fertilizer recommendations? These factors may be used alone when not on a grid sampling pattern or they may be used to add more precision to grid sampling in areas where this greater precision is called for (i.e. to help interpret variation in yield within areas of a field).

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. = 18 meq / 100 grams of soil where appropriate in answering questions 6 and 7. (Please also show your work).

6. 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?

b) What Annual Buildup recommendation (pounds P\textsubscript{2}O\textsubscript{5} / acre) should be made to increase the soil test level from 11 to the Critical Level. (Buildup only. Please do not include a maintenance component).

7. a) What Critical Level (ppm) is recommended as an economic goal for Potassium soil tests for corn and soybean production in this situation (C.E.C. = 18 meq / 100 grams of soil)? Please show your work.
b) What Annual Buildup recommendation (pounds K$_2$O / acre) should be made to increase the soil test level from 100 ppm exchangeable K to the Critical Level? Please show your work. (Buildup component only. Please do not include a maintenance component).

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?

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

Describe GPS, GIS, and VRT and integrate them into one example which illustrates their use in working toward the achievement of Maximum Economic Yield.

Describe two early - growing season differences in the physical properties and 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.

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.

6 pts.  14. Herbicides are commonly used for the chemical control of weeds in crop systems. However, crop systems also generally include cultural and mechanical controls for weeds as well. Briefly give an example of a cultural weed control component for a corn or soybean production system.

4 pts.  15. a) To what depth (inches) should a PPI herbicide be uniformly incorporated to optimize herbicide effect for corn and soybean production?

   b) What is the general relationship between depth of tillage and the depth of herbicide incorporation for PPI herbicides applied by nozzles in front of a tandem disc?

5 pts.  BONUS  a) The economic goal or critical level of P or K is at the leading edge of the Maintenance Plateau in planning soil fertility for corn and soybean production. How wide is the maintenance plateau in terms of ppm for each of the following?

   Bray P1 =  ppm

   Exchangeable K =  ppm

b) How wide is the Drawdown Plateau in terms of ppm for each of the following?

   Bray P1 =  ppm

   Exchangeable K =  ppm