

# **Agronomy 212 – Crop Growth, Management, and Productivity**

## **Learning Objectives**

### **Spring 2009**

#### **Exam 1**

#### **Farming Regions**

1. Identify U.S. farm resource regions outlined by USDA and list the major agricultural commodities for each region.
2. Describe the distribution of U.S. farms and land in farms by region.
3. Identify farming regions within the North Central U.S.
4. Identify the following farming regions of Iowa and characterize the relative amount of land area used for row crop production in each region – 1) western livestock, 2) cash grain, hogs, and poultry, 3) southern pasture, 4) dairy, and 5) eastern livestock.
5. Describe the ranking of North Central states including Iowa in cash receipts from crops, livestock, and total agricultural products.
6. List the eight main factors that determine farming regions. Evaluate the contribution of each factor in determining the farming regions of Iowa and the U.S.

#### **Corn – Importance and Use**

1. Describe the importance of corn relative to other grains, and to the world and the United States.
2. Identify the following corn types, their characteristics, and primary uses – dent, flint, pop, sweet, and flour.
3. Identify high lysine, high oil, high protein, waxy, high amylose, and low phytate as specialty types of dent corn.
4. Characterize the chemical constituents (carbohydrate, oil, protein) of a corn kernel and their utilization.
5. Identify amylopectin and amylase by their chemical structures.
6. Describe the relative importance of the U.S. to world corn production. Identify and rank other important corn producing countries.
7. Identify the top six corn exporting countries, the market share for each, and the percent of production exported by each.
8. Describe the corn production region of the U.S and identify states in the major growing area (Corn Belt).
9. Identify the top five states in corn production. Determine the percent of U.S. and world corn produced in these five states.
10. Describe the trends in corn yield since 1920. Describe the bushel per year and percent per year trend in corn yield from 1900 to the present.
11. Describe the relative amount of U.S. corn fed to animals, exported, or used for food, seed, and industrial purposes. Describe trends in corn use over the last decade.
12. Identify the amount of corn fed to beef cattle, dairy cattle, pork, and poultry and describe trends in animal feeding during the last decade.
13. Describe the trends for corn fed within and outside the Corn Belt over the last decade.
14. Describe the following uses of corn – high fructose sweetener, fuel alcohol, beverage alcohol, food starch, industrial starch, pharmaceuticals, de-icer, and polylactic acid.
15. Describe the trends in U.S. corn exports, since 1950.
16. Identify the major regions of the world that import U.S. corn. Describe the importance of Mexico, Canada, and Asian countries to U.S. corn exports.

#### **Corn - Development and Selection of Genetics**

1. Characterize genotype, environment, and genotype by environment interaction as determinants of yield.
2. Identify data sets that represent interactions between genotypes and environments.
3. Identify crop species that are commercially available as hybrids.
4. Describe hybrid crop development.
5. Explain why seed cannot be saved from crop hybrids and planted the next year without a yield loss.
6. Characterize the yield benefits of hybrids over open-pollinated or self-pollinated varieties.
7. Describe the corn traits improved through conventional breeding techniques.
8. Define transgenic plants.

9. Outline and describe the development of transgenic plants.
10. Describe the role of particle guns, agrobacterium, direct injection, and electroporation in gene transfer.
11. Describe the two main physiological mechanisms used to give transformed plants herbicide resistance.
12. Characterize the changes in the cost of corn, soybean, and wheat seed from 1975 to present. Describe how hybridization and plant transformation have contributed to these changes.
13. Define full-season, early, and mid-season hybrids and explain their use in corn production systems.
14. Outline the process for selecting high performance crop genetics at a good price.
15. List sources of information for selecting superior crop genetics. Characterize the reliability of each source.
16. Outline the procedures and describe the data release for the Iowa Corn Performance Test.
17. Calculate adjusted gross value for corn hybrids in a performance test.
18. Describe the use of crop performance tests for selecting genetics and the interpretation of test data using statistical analysis.
19. Calculate the better buy between two hybrids when given yield data, seed costs, and planting rate.

## Corn - Planting

1. Describe the goals of the planting operation and the influence of timely planting on profitability.
2. Explain factors impacting the optimum date for planting of corn and other full-season summer annual crops.
3. Describe the critical spring planting period for corn in the central Corn Belt.
4. Calculate the spring freeze risk for a corn crop and locality from the mean date of last 28°F spring freeze, freeze probabilities, and knowledge of corn development.
5. Characterize corn yield response to planting date for the period from April 10 to June 10 and calculate the potential corn yield loss from a planting date after May 1.
6. Describe reduced stress risk at pollination and longer day length during grain fill as the major advantages of early corn planting. Identify other advantages to early planting of corn.