AGRONOMY 375
Exam II Key
April 3, 2009

6 pts. 1. a) Detassel ear parent (female) rows and specify a single pollen parent in male rows.

b) Manage the planting dates of ear and pollen parent lines so as to encourage synchrony between them at pollination (tassel and silk coordinating).

c) Flame one parent line to slow its growth where it is more rapid than its counterpart (synchronize silking and pollen release).

d) Manage the frequency of ear parent and pollen parent rows to accommodate the productive potential of the pollen parent.

e) Low altitude aircraft to assist pollen dispersal.

f) Isolate the seed field.

g) Remove rogue plants from the parent rows.

4 pts. 2. a) Less risk of frost injury

b) Less pre-harvest loss to ear drop & lodging

c) Less weathering, molding & insect damage

d) Option to sort out "off-type" ears at processing plant

e) Less damage to the seed (mechanical) if handled on ear when wet

f) More uniform drying at lower temperatures when dried on the ear

5 pts. 3. (120 days) (23.5 GDD per day relative maturity) = 2820 GDD relative maturity.

2 pts. 4. (Two answers)

a) Soil fertility levels (particularly P and K) will vary greatly among mangers.
b) N rate.
c) Timing of N application (Fall, Pre-Plant, Side dress).
d) Plant populations may be unique.
e) Planting date has a major impact on overall yield as well as on other factors such as population. On site testing of hybrids will bring out optimal combinations for unique management packages.
f) Use of N-Serve
g) Tillage and planting system (e.g. no-till, residue management, etc).

4 pts. 5. Early planting involves cool soils so shallow planting (just deep enough to cover the seed) will aid germination as soil warming occurs from the surface downward and soil moisture is not likely to be limiting.
Later planted seeds are less likely to be limited by cool temperatures and more likely to be limited by inadequate soil moisture so planting deeper is recommended in order to get to moisture. A good goal in such a case is to place the seed about ½ inch deeper than the upper margin of moist soil if possible but no deeper than 2 inches total.

10 pts. 6. a) Grain yield and profit potential increase as total season length increases to provide greater total interception of solar radiation.

b) Increased harvest index due to affect of low temperature early (vegetative growth) and high temperature mid- to late season (grain development). Increases harvest index contributes directly to increased yield.

c) Plant height is reduced due to the low temperature affect on early growth. This results in less potential for lodging and greater tolerance to high plant populations.

d) Pre-harvest losses are reduced as early-planted corn matures quickly and dries down early in the fall while temperatures are high and relative humidity is low.

e) Early planting results in a broad choice among alternative hybrids.

f) Early planting allows replanting with the first-choice hybrids.

g) Early planting generally results in an avoidance of high temperature and drought stress during pollination.

10 pts. 7. All of these strategies improve the efficiency of N fertilizer use by the crop. Without these precautions, the potential for N loss through leaching and/or denitrification is particularly high for Fall applications because of the extended time that the fertilizer nitrogen would be exposed to loss when fall applied.

a) Application of N as <u>ammonia only</u>, allows for maximum security from loss as ammonia reacts with soil moisture to produce ammonium (NH_4+), a cation which is held by a soil's exchange sites.
b) <u>At temperatures below 50 F</u> the conversion of ammonium (NH_4+) to Nitrite (NO_2-) (and ultimately to Nitrate (NO_{3-}) is slowed sufficiently to lessen the potential for N loss to acceptable levels.

c) At more <u>northern latitudes</u> soil temperatures generally reach the 50 C threshold earlier in the Fall and remain low longer in the Spring, thus slowing nitrification.

d) Fall N application is not recommended unless a soil has a <u>C.E.C. of at least 10 meq/100 grams</u> as a means of assuring adequate negative charge to retain ammonium which is a cation (positive charge).

e) <u>Well drained soils</u> demonstrate less potential for loss to denitrification as atmospheric oxygen is more readily available in pore spaces of these soils which are not waterlogged for extended periods.

7 pts. 8. At 20 ppm, the P1 Soil Test Level is in the maintenance range of 15 to 30 ppm so a full maintenance rate is recommended.

(225 Bu/Acre) (0.37 Lbs P_2O_5/Bu) = 83.25 Lbs P_2O_5/Acre

2 pts. $\frac{83.25}{0.52}$ = 160.1 Lbs 11-52-0/Acre

7 pts. 9. a) Annual K_2O (pounds per acre):

At CEC = 16, the Critical Level is calculated as follows.

75 + [(2.5) (16)] = 115 ppm

At 150 ppm the K soil test is in the drawdown range of 146 through 165 ppm

The drawdown calculation is as follows:

Full Maintenance Rate is [(225 Bu / acre)(0.27 Lbs. K_2O / Bu)] + 20 = 80.8 Lbs. K_2O/ acre

Drawdown Rate is

80.8 Lbs. K_2O / acre - [(80.8 Lbs. K_2O / acre) X $\frac{(150 \text{ ppm} - 145 \text{ ppm}))}{20}$]

= 60.6 Lbs. K_2O / acre

2 pts. b) Total annual pounds 0-0-60 per acre.

60.6 Lbs. K_2O per acre / 0.60 = 101 Lbs. 0-0-60 per acre

7 pts. 10. a) 110 + [1.36 (225 - 100)] – 30 previous crop soy credit = 250 Lbs fertilizer N/Acre

2 pts. b) 250 Lbs N/Acre
-17.6 Lbs N/Acre from 160.1 Lbs. 11-52-0 per acre

232.4 / .82 = 283.4 Lbs. NH3 per acre

4 pts. 11. PSNT may be quite valuable where there is relatively high uncertainty as to the level of plant available N present in the soil just prior to side dressing. Examples of such situations include;

N applied in the Fall of the Spring followed by unusually warm, wet conditions over a prolonged period. Under these conditions there is a high potential for N loss through denitrification and leaching.

On soils with high organic matter levels or on soils which have received heavy applications of livestock waste. Under these conditions significant amounts of N are mineralized from the organic sources but the amount of N made available can be quite variable. PSNT will allow a snapshot in time to determine side dress needs with greater precision.

8 pts. 12. (Two answers)

a) Cost effective, efficient, least potential for environmental contamination. Side-dressing results in very low levels of loss and maximum N availability to the developing crop.

b) Allows N rate adjustment as conditions dictate in the spring.

c) Allows switch to soybeans where losses are extreme.

d) Best option for soils with low CEC (less potential loss).

4 pts. 13. (Two answers)

a) Any root restrictive conditions e.g.
Early planting date (cool soils)
No-till soils with heavy surface residue
Poor soil drainage
Dry soils

b) Low to very low soil test levels

c) Low rates of fertilizer application (especially where soil test levels are relatively low).

4 pts. 14. Before May 1 plant when soil temperatures at seed depth are at or above 50F (e.g. 50 at 2 inch depth at 7 a.m.)

After May 1 plant when sufficiently dry (good soil to seed contact and acceptable levels of soil compaction).

4 pts. 15. a) Average seed to seed spacing is 35 / 5 = 7 inches.

(1 seed / 7 in.) (12 in. / ft.) (17,424 ft. / acre) = 29,870 seeds/ acre

4 pts. b)

	x	x^2	
1 - 7 =	6	36	70 / r - 1 = 70 / 4 = 17.5 = s^2
8 - 7 =	1	1	
5 - 7 =	2	4	
12 - 7 =	5	25	s = 4.2 inches
9 - 7 =	2	4	
		70	

4 pts. c) 3 bu / acre yield penalty for each inch of standard deviation greater than 2.

4.2 - 2.0 = 2.2 inches of standard deviation greater than 2.

(2.2) (3) = 6.6 bushels per acre as the potential yield penalty.

5 pts. BONUS

a) Use full labeled rates of herbicides.
b) Rotate herbicide modes of action (no more than two consecutive applications of one mode of action).
d) Use integrated approach to weed control (cultural, mechanical, and chemical).
e) Scout for and remove herbicide resistant weeds before they can produce seed.
f) Clean field equipment before transporting from field to field when resistant weeds are present.
g) Combine modes of herbicide action (either concurrent of sequential).
h) Rotate crops.
i) Use weed free seed.