Agronomy 375
EXAM II
KEY
November 5, 2004

4 pts. 1. Reduced tillage.
Excessive rates (including overlap of application pattern).
Cool and/or dry weather.
Late planting date.
Extremes of soil pH (high or low).
Crop under other stress (e.g. heat, drought, cold, soil compaction, etc.) is at
greater risk of herbicide carryover injury.

6 pts. 2. a) Delay planting of inbred B by 45 GDD to coordinate pollen release and silk
receptivity.

b) Plant inbred A and B at the same time but flame inbred B early in the
season (e.g. at about 2 or three leaf stage to slow its growth relative to
inbred A (synchronize silking and pollen release).

c) Plant inbred A and B at the same time but mow inbred B early in the
season (e.g. at about 2 or three leaf stage to slow its growth relative to
inbred A (synchronize silking and pollen release).

5 pts. 3. a) Harvest on the ear allows the sorting and removal of off type ears at the seed
plant.

b) Ear harvest allows for more uniform air movement (lower possibility of seed
damage) during artificial drying at the seed plant.

c) Harvest early (at high moisture) allows field damage to be avoided (e.g.
frost, ear drop, insect damage, mold).

d) Harvest on the ear lessens damage potential (high moisture corn is
otherwise especially prone to mechanical damage).

5 pts. 4. (120 days) 23.5 GDD per day relative maturity) = 2820 GDD relative
maturity.

10pts. 5. 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 temperatures 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 improved tolerance to higher plant populations which could be used to enhance yield potential.

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-planted corn will likely require less expense for artificial drying as it matures more quickly and therefore dries down earlier in the fall while temperatures are high and relative humidity is low.

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

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

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

2 pts. 6. 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 sidedress needs with greater precision.

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 ammonia only, allows for maximum security from loss as ammonia reacts with soil moisture to produce ammonium (NH₄⁺), a cation which is held by a soil’s exchange sites.
b) At temperatures below 50 F 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 northern latitudes 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 C.E.C. of at least 10 meq/100 grams as a means of assuring adequate negative charge to retain ammonium which is a cation (positive charge).

e) Well drained soils 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.

10pts. 8. 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).

7pts. 9. a) \[110+[(1.36)(190-100)] = 232.4 \text{ Lbs N/acre} \]

\[-30 \quad \text{Previous crop credit (soybeans)} \]

\[\frac{202.4 \text{ Lbs fertilizer N/ Acre}}{202.4 \text{ Lbs fertilizer N/ Acre}} \]

2pts.  b) \[202.4 \text{ Lbs fertilizer N per acre} - 18 \text{ Lbs N per acre as DAP} = 184.4 \text{ Lbs N as sidedress} \]

\[184.4 \text{ Lbs. N per acre} / .82 = 224.9 \text{ Lbs. NH3 per acre} \]

7pts. 10. \[(190 \text{ Bu / Acre}) (0.37 \text{ Lbs P}_2\text{O}_5 / \text{ Bu}) = 70.3 \text{ Lbs P}_2\text{O}_5 / \text{ Acre} \]

2pts. \[70.3 / 0.46 = 152.8 \text{ Lbs. 0-46-0 / Acre} \]

7pts. 11. \[[(190 \text{ Bu / Acre}) (0.27 \text{ Lbs. K}_2\text{O / Bu})] + 20 = 71.3 \text{ Lbs. K}_2\text{O / Acre} \]

2 pts. \[71.3 / 0.60 = 118.8 \text{ Lbs. 0-0-60 / Acre} \]
4 pts. 12. a) Early planting date (cool soils)
   b) No-till soils with heavy surface residue
   c) Poor soil drainage
   d) Very low soil test (e.g. $P \leq 15$ ppm for corn, $K < 75$ ppm)
   e) Low rates of fertilizer application (especially where soil test levels are
      relatively low).
   f) Dry soils.

5 pts. 13. Planting depth should be increased (e.g. down to no more than 2 inches) to
reach moisture as planting is delayed and the surface soil dries. Planting at a
more shallow depth (e.g. 1 to 1.5 inches) for is recommended for early
planting as the soil is warmer nearer the surface and soil moisture is readily
available.

3 pts 14.a) Average seed to seed spacing is $30 / 5 = 6$ inches.
            $(1 \text{ seed} / 6 \text{ in.}) (12 \text{ in.} / \text{ft.}) (17,424 \text{ ft.} / \text{acre}) = 34,848 \text{ seeds / acre}$

3 pts.  b) $x \quad x^2$
        3-6 = 3  9 Sum of squares of differences / $r-1 = 172 / 4 = 43 = S^2$
        2-6 = 4  16
        17-6 = 11 121
        7-6 = 1  1 $s = 6.56$ inches
        1-6 = 5  25

3 pts.  c) $3 \text{ bu / acre yield penalty for each inch of standard deviation greater than 2.}$
            $6.56 - 2.0 = 4.56$ inches of standard deviation greater than 2.
            $(4.56) (3) = 13.68$ bushels per acre as the potential yield penalty.

3 pts.  d) - Slow down speed of operation.
            - Repair or replace worn parts.
            - Align and adjust planter components in contact with the soil (e.g. openers,
              coulter, row residue management hardware, presswheels).
            - Use larger, flatter grades of seed and / or use uniformly graded seed.

5 pts. BONUS (Please choose only one.) Option I. $(1240 \text{ ft.}) (20 \text{ ft.}) = 24,800 \text{ sq. ft.}$

24,800 sq. ft. per test strip / 43,560 sq. ft. per acre = 0.57 acres per test strip

$47.3 / 1 - 0.81 = 58.4$ lbs. at 20% per bushel at 15.5%

$6,657.6 / 58.4 \text{ lbs.} = 114$ bushels at 15.5%

$114 \text{ bushels} / 0.57 \text{ acres} = 200 \text{ bushels per acre}$
BONUS Option II. The yield penalty for poor precision in seed spacing would likely be greater where ideal growth conditions (e.g. soil moisture, temperature, plant population, soil fertility, low levels of disease, insect and weed pressure) prevail.

The yield penalty for poor seed spacing precision would likely decrease where other yield influencing factors (soil moisture etc.) are more limiting.