Potential for Precision Seeding

Stewart Brandt NARF
Anne Kirk WARC
Chris Holzapfel IHARF
Bryan Nybo WCA
Lana Shaw SERF
Where will future yield increases come from?

- Since the 1950’s improved cultivars have accounted for about half of yield increases
- Improved fertility, pest management and management have accounted for the other half
- Breeding continues to advance yield potential, but how much more progress can we see with fertility and pest management
- Is there potential for precision seeding?
Precision Seeding

- Definition: *Placing of desired numbers of seeds at a precise depth and spacing.*

- *Seeding accuracy is not a substitute for other practices*
Benefits

- Plant Starts At Optimum Spot For Growth And Development
- Even Crop Emergence Across Field
- Reduced Seed Cost
- Greater Crop Uniformity
- Higher Yield
- Economic Benefit
  - i.e. More PROFIT
Interest in precision seeded corn began with introduction of high yielding hybrids
- Seed costs were high
- Crop was very responsive to management
Precision Seeded Corn

- Optimum population of 36000 plants/ac, reducing that to 24000 reduced yield by 10 bu/ac
- Reducing row space from 30 to 15 inches increased yield by 7 bu/ac
- Plants equally spaced increased yield 7-19 bu/ac
- Narrow (15”) rows partially compensated for uneven spacing within rows, but may require higher seed rate
Precision Seeded Corn

- Uneven seed depth results in uneven emergence and development
- Having a mix of early and late emerging plants decreased yield by 4 bu/ac compared with all early, and 17 bu/ac compared with all late.
- Overall, precision seeded corn increased yield by 15-20%
But Corn Isn’t Canola

- Small seed size
- Difficult and/or costly to ‘singulate’ seed
- Emergence % is variable
- ‘Self thinning’ occurs
- Lower yields
- Large capacity to compensate for low populations
Seed Rates for Canola

- Seed Rate; usually yields don’t differ much between 40-150 plants/sq M
- Seed at 5 lb/ac (125-200 seeds/sq M)
- Rates with large seeded hybrids?
- Shotgun approach to seeding
- Plant more than necessary and hope that enough survive to produce a good crop
Seeding Depth

- Critical to ‘seed to moisture but not so deep as to prevent emergence or reduce vigor
- Half to ¾ inch is ideal
Spacing Between Rows

- Relatively little yield difference between 8 and 12” rows
  - Wider rows may promote weed competition,
  - Wider rows may reduce disease
- Wider than 12” spacings are being evaluated
  - Reduced cost to manufacture and operate machines
  - Wider rows means plants are spaced closer together in widely spaced rows
Angadi 2001:
Reducing plant population from 80 to 40 plants/m² did not reduce grain yields when plant populations were uniform, but did where they were non-uniform.

40 uniformly spaced plants yielded equivalent to almost 50 non-uniformly spaced plants.
Spacing Within Rows

Angadi 2001:
As populations declined, having plants uniformly distributed became more important.
Precision Seeded Canola Study

- Compare a Valmar roller with the UltraPro (Seedmaster) roller.
- Uniformity of plant spacing
- Can we reduce seed rates?
- Can we increase yield?

Locations:
- NARF – Melfort
- WARC- Scott
- IHARF Indian Head
- WCA- Swift Current
- SERF- Redvers
Precision Seeded Canola

- UltraPro roller improves uniformity between rows, and possibly within; but does not ‘singulate’
- Designed for canola

- Compare roller types with rates of 10, 20, 40, 80, 160 and 320 seeds/sq M
- Evaluate plant density and spacing
- Crop maturity and yield
10 Seeds/sq M Melfort

Precision Roller

Valmar
20 Seeds/sq M Melfort

Precision Roller

Valmar
40 Seeds/sqM Melfort

Precision Roller

Valmar
80 Seeds/sq M Melfort

Precision Roller

Valmar
160 Seeds/sq M Melfort

Precision Roller

Valmar
Fall Plant Density (plants/M2)

Indian Head

- UltraPro
- Valmar
- Poly. (UltraPro)
- Poly. (Valmar)

R² = 0.9767

Melfort

- UltraPro
- Valmar
- Poly. (UltraPro)
- Poly. (Valmar)

R² = 0.7103
R² = 0.9767

Seed Rate (seeds/M2)
Canola Yield (kg/ha)

Indian Head

- UltraPro
- Valmar
- Poly. (UltraPro)
- Poly. (Valmar)

R² = 0.8599
R² = 0.9517

Melfort

- UltraPro
- Valmar
- Poly. (UltraPro)
- Poly. (Valmar)

R² = 0.8523
R² = 0.9442

Seed Rate (seeds/M2)
Relationship Between Spring and Fall Plant Densities

- **Spring Indian Head**
- **Spring Melfort**
- **Fall Indian Head**
- **Fall Melfort**
Relationships between fall plant density and yield
Some Preliminary Observations

- Planned to look at uniformity of spacing within rows
- May need to look more closely at spacing within and between rows
- Emphasis on plant density and spacing in spring
- Density and spacing at harvest may be more revealing
- What is impact of lodging in 2012
What is the Potential for Canola?

- Potential likely is high if we could accurately control plant populations
- Better uniformity between rows is part of the puzzle
  - Need to devise better ways to evaluate this
- High quality seed, better depth control, better protection of seed are other factors
- Need to understand why plants are lost, and how crop adjusts
The Canola Dilemma

- If half the seeds we plant never survive to maturity, maybe we need to seed multiple seeds in a ‘hill drop’ configuration
- Can we breed for reduced plant mortality
- What is needed is 1 seed = 1 plant at harvest.
Potential for Other Crops?

- Large seeded pulses may be a good candidate
  - Large seed is easier to control rate, and even singulate
  - % emergence is usually high
  - Ideal plant densities are low
- Cereals likely to be less responsive
  - Higher desired plant populations mean almost full rows, so spacing is already more uniform
  - Might make ‘controlled tillering’ work
If we want to realize the full potential of precision management (e.g., precision seeding) we need to know precisely how crops respond to management.
Acknowledgements