Intercropping Chickpea and Flax
Agri-Arm Research Update
January 2015

ADOPT Project
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Outline -

- Why Intercropping?
- Why this combination?
- Is it practical in a large scale?
- Is it worth the trouble?
- Are producers doing it?
Reasons to Consider Intercrops

- Agronomic Obstacles
  - Weeds, Disease pressure, Maturity
- Possibility of Over-Yielding
- Biodiversity
- Desire to complicate your life ??

An intercrop is a marriage of two crops. Not all marriages are compatible. Some are.
Obstacles to Intercropping

- So why are we not already intercropping, if it’s so great?
  - Both must be compatible with herbicide
  - Complicates seeding and harvest
  - Over-yielding is often elusive and inconsistent
  - Practical separation of harvested product
  - Market drives need to change and innovate
Chickpea-Flax Intercrop

Why this combo?

- High value chickpeas with big agronomic problems
  - Chickpea acreage very limited, despite good market
  - Disease problems – ascochyta blight, Indeterminate, prone to lodging
- Flax can act as ‘nurse crop’ for chickpea; flax yield is a bonus

Specifics:

- Low cost of flax seed keeps costs down
- Herbicide: Authority pre-seed registered on both
- Low levels of shattering prior to harvest for both
- Easily separated using rotary seed cleaner
Chickpea-Flax Intercrop
Why this combo?

Synergy

- Late competition affects chickpea maturity ??
- Lower chickpea disease pressure ?? (Aschochyta blight)
- Both are Arbuscular Mycorrhiza Fungi (AMF) associated
- Sharing fixed N through soil fungus ??
Objectives of research:

- Investigate the possibility that area of adaptation for chickpea can be increased
- Investigate the effect on yield and disease incidence
The yield was 1500 lb/ac of harvested chickpea.

3 seed rates of Kabuli Chickpea
3 seed rates of Desi Chickpea

Compared with

Monocropped Flax (high N)
Monocropped Flax (low N)
Monocropped Kabuli
Monocropped Desi

Locations in 2014:
Redvers, Indian Head, Scott,
Outlook, Swift Current

Locations in 2015:
Redvers, Indian Head, Outlook,
Scott
Materials and Methods – 2014, 2015

- CDC Alma Kabuli Chickpea
- CDC Cory Desi Chickpea
- Three target seeding rates for intercrops
  - 30 pl/m²
  - 40 pl/m²
  - 50 pl/m²
- Monocrop seeding rates were 40 pl/m² chickpea
- Flax
  - 40 lb/ac intercrop
  - 56 lb/ac monocrop
Desi Chickpea (40 pl/m2) and Flax

- Faster row closure
- Weed competition
- Canopy structure is altered
- Chickpeas are less branched, more upright
- Airflow and humidity in canopy is likely altered
Redvers 2013 – Trial Yields

Yield (kg/ha)

- Flax with N
- Flax no N
- DI 3
- DI 2
- DI 1
- D Monocrop
- KI 3
- KI 2
- KI 1
- K Monocrop

Chickpea: Red
Flax: Blue
Redvers 2014 – Trial Yields

Yield (kg/ha)
Redvers 2015 – Yield Results

- Flax with N
- Flax no N
- DI 3
- DI 2
- DI 1
- KI 3
- KI 2
- KI 1
- D Monocrop
- K Monocrop

Yield results for various crops and treatments, showing comparisons between Flax and Chickpea.
Redvers 2015 – Yield Results (kg/ha)

- Flax with N
- Flax no N
- DI 3
- DI 2
- DI 1
- KI 3
- KI 2
- KI 1
- D Monocrop
- K Monocrop

Chickpea
Flax

2016/4/20
The chart represents the Scott 2015 Yield Results (kg/ha) for various crop combinations.

- **Flax (56) + 60 kg/ha N**
- **Flax (56)**
- **Flax (40) + Desi (50)**
- **Flax (40) + Desi (40)**
- **Flax (40) + Desi (30)**
- **Flax (40) + Kabuli (50)**
- **Flax (40) + Kabuli (40)**
- **Flax (40) + Kabuli (30)**
- **Desi (40)**
- **Kabuli (40)**

The red sections indicate Chickpea yield, while the blue sections indicate Flax yield.
<table>
<thead>
<tr>
<th>Year</th>
<th>Variety</th>
<th>LER no N flax</th>
<th>LER N flax</th>
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</thead>
<tbody>
<tr>
<td>2014-15</td>
<td>Kabuli</td>
<td>1.3</td>
<td>1.1</td>
</tr>
<tr>
<td>Redvers</td>
<td>Desi</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>2015</td>
<td>Kabuli</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Redvers</td>
<td>Desi</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>2014</td>
<td>Kabuli</td>
<td>2.4</td>
<td>2.3</td>
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<tr>
<td>Redvers</td>
<td>Desi</td>
<td>3.1</td>
<td>3.0</td>
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<tr>
<td>2015</td>
<td>Kabuli</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Scott</td>
<td>Desi</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>2014</td>
<td>Kabuli</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Outlook</td>
<td>Desi</td>
<td>1.5</td>
<td>1.5</td>
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</table>
Disease incidence was reduced in intercrop plots.

Chickpea Aschocyta Incidence on Aug 30 (% severity):

- 51% for monocrop plots
- 17% for intercrop plots

Significant difference
Horizontal leaf structures seal in humidity

Lodging was 2.5 in monocrops and averaged 1.5 in intercrop

Monocrop Desi
Ongoing Goals

Identify combinations of production practices that work best for desi and kabuli intercrops with flax.

Seeding rate of flax needs to be investigated.
Nitrogen dynamics are unknown

SPG is funding an N15 study led by Dr. Fran Walley

- Apply N15 and sample biomass from Chickpea intercropping trials
- Two years of field trial finished, data not yet available
Will producers do it? Yes

2013  One Producer, one trial site
2014- One Producers, several trial sites
2015 - At least 3 Producers, hundreds of acres, several trial sites
2016 – Producer Interest but no funding for trials (some will go ahead regardless)
Colin Rosengren – production field, Midale area
Several hundred acres - desiccating
Is this Practical? Yes

Seeding

- Ideally - one pass with airseeder
  - Run chickpeas instead of fertilizer in side band
    - Seed flax normally
    - Allows deeper placement of chickpea, shallower flax
  - Or
  - Get fancy – Alternate rows
    - Alternate row may be best
    - Requires alterations on airseeder
Best Advice So Far

- Use Authority herbicide unless organic producer
- Cereal stubble good – canola stubble bad
- Seed chickpeas deeper than flax and at same time
- Talk to producers who have tried it to work out combine settings
Is this Practical? Yes

Harvesting

- Dessication may still be necessary
- Plants are more upright = faster combining
- Chickpeas thresh the flax bolls
- Set combine for chickpea, but turn down air
Is it worth the trouble?

- Overyielding (Land Equivalency Ratio) says yes
- Improved agronomics says yes
  - Less disease pressure
  - Less lodging
  - Improved maturity
Is it worth the trouble? Likely

- Extra time during harvest to set up separation of product
- Canola volunteers are not controlled
- Dollars will make that decision
- No N fertilizer is required and minimal pesticides are called for
- Frees up operator time also
<table>
<thead>
<tr>
<th>Chickpea</th>
<th>Desi Intercrop</th>
<th>Desi Monocrop</th>
<th>Kabuli Intercrop</th>
<th>Kabuli Monocrop</th>
<th>Flax (black soil zone)</th>
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<tbody>
<tr>
<td>Yield</td>
<td>1200lb/ac</td>
<td>1100 lb/ac</td>
<td>1400 lb/ac</td>
<td>1300 lb/ac</td>
<td>24 bu/ac</td>
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<td>Revenue</td>
<td>$315 + 150 = $465/ac</td>
<td>$297</td>
<td>$490 + 150 = $640/ac</td>
<td>$455</td>
<td>$300</td>
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<tr>
<td>Seed costs</td>
<td>36 + 11</td>
<td>36</td>
<td>69 + 11</td>
<td>69</td>
<td>11</td>
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<tr>
<td>Fertilizer</td>
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<td>13</td>
<td>13</td>
<td>13</td>
<td>49</td>
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<td>Herbicide/Fungicide</td>
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<td>36</td>
<td>36</td>
<td>53</td>
<td>14</td>
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<tr>
<td>Inoculant</td>
<td>11</td>
<td>11</td>
<td>25</td>
<td>25</td>
<td></td>
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<tr>
<td>Total Input Cost</td>
<td>107</td>
<td>96</td>
<td>143</td>
<td>160</td>
<td>74</td>
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<td>Return over inputs</td>
<td>350</td>
<td>200</td>
<td>500</td>
<td>300</td>
<td>230</td>
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</tbody>
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Chickpea-Flax Intercropping

- Research and producer experience indicates there is exciting potential here.
- Reduced need for inputs combined with increased crop value = win win for farmers
- No N fertilizer is required and minimal pesticides are called for
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