# Evaluation of Pulse Crop Diversification Potential
# In
# South Central Alberta

Project #2000CR17

## Final Report
## 2003

**Farming For the Future**
**On Farm Demonstration Project**

Alberta Pulse Growers Commission - Zone 2

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**Alberta Agricultural Research Institute**
**On-Farm Demonstration Program**

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| Project Number: | #2000CR17 |
| Project Name: | "Evaluation of Pulse Crop Diversification Potential in South Central Alberta" |
| Project Coordinator: | Mark Olson, Provincial Pulse Extension Specialist |
| Project Cooperator: | Alberta Pulse Growers Commission Zone 2 |
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☐ Progress Report ☐ Interim Report ☒ Final Report

Year _____3_____ of _____3_____ year project.
**(1,2,3)** **(1st, 2nd, 3rd)**

## I. Key Results and Conclusions

In 2003, two research sites were selected – Castor and Hanna. There were (4) chickpea, (4) lentil, (4) fababean, (5) dry beans, and (4) lupin market classes sown. Seeding was carried out by Battle River Research Group (BRRG) and Chinook Applied Research Association (CARA).

Dry conditions and high levels of grasshopper infestations (despite multiple sprayings of insecticide) affected the plots at both locations. The later than ideal seeding date (for some species) may also have adversely affected the results.

The agronomic traits that were measured were plant height, standability, 1000 kwt and yield. In examining the adaptability of the majority of these pulse crops, it can be concluded that very few have a high enough yield (year in and year out) to fit in the crop rotation of the southeast central part of the province. Fababean, lupin, and dry bean, in particular, require more consistent and uniformly distributed moisture to yield high enough to make these crops viable economically. This was the final year of the project.

## II. Background

The Alberta Pulse Growers Commission Zone 2 was very interested in expanding pulse crop diversification in the region. The opportunity to diversify was based on the cyclical nature of commodity prices. AAFRD has focussed on crop diversification as an integral component of the further development of agriculture within the province.

Field pea is well suited to the region while the acreage of other pulses has been small. Numerous other pulse crops are grown in other parts of Western Canada and around the world. Zone 2 was particularly interested in researching whether it was possible to grow chickpea, fababean, lentil, dry bean, and lupin in the zone. This project would test new market classes and their relative performance to standard check varieties to provide diversification opportunities.

Regional variety testing programs (up until 2003) did not include chickpea, fababean, lentil, and lupin. Therefore, this important work would not have been conducted unless monies were provided through other funding sources such as OFD. Dry bean regional trials (irrigated and dryland) have traditionally been located in the Bow Island, Lethbridge, and Brooks area which is far from the area that encompasses Zone 2.

## III. Objectives

The following objectives were set out for this project:

1) Establish pulse diversification research trials at two locations; Castor (Rod Peterson), and Hanna (Lloyd Hutton).
2) Evaluate the performance and agronomic characteristics, and compare to well adapted, high yielding check cultivars.
3) Assess potential returns and required price for these new market classes compared to the check cultivars.
4) Evaluate marketing potential of these new cultivars and possible tonnage requirements.

The ultimate objective was to find cultivars, which were agronomically adapted to southeast central Alberta growing conditions, to further expand the marketability and diversification of the pulse industry in the Zone 2 area.

## IV. Project Plan or Method Used

**i) Treatments:** Two sites were selected: Castor and Hanna. There were (4) chickpea, (4) lentil, (4) fababean, (5) dry beans and (4) lupin market classes sown. Seeding was carried out by Battle River Research Group (BRRG) and Chinook Applied Research Association (CARA).

**ii) Replications**: The project was conducted as a four replicate randomized complete block design (RCBD) in order to statistically analyze yield results. Agronomic plant characteristics monitored were height, standability, seed size (1000 kwt) and yield.

**iii) Plot Size / # Annual Per Rep:** The plots at both locations were direct seeded using a Fabro disc drill. BRRG's sub plot size was 4 rows on 9" row spacing and a plot length of 6.7 m (22'). CARA's sub plot size was 6 rows on 7" row spacing X 6.1 m (20').

**iv) Experimental Design:** The project was conducted as a four replicate randomized complete block.

a) sub plot size was 4 rows on 9" row spacing and a plot length of 6.7 m (22') at Castor
b) sub plot size was 6 rows on 7" row spacing X 6.1 m (20') at Hanna

**v) Site locations:**

Castor – NE-35-37-12-W4 (Rod Peterson)
Hanna – NW-12-31-15-W4 (Lloyd Hutton)

### vi) Soil Characteristics:

| Site | Soil Order | Soil Series & Texture | Description |
|---|---|---|---|
| Castor | Dark brown | Loam. Solonetz profile, round or flat topped B horizon. Poor to fairly good drainage. | Transported surface material has been subject to post glacial sorting; the sub soil is unsorted stones, few to many (resorted glacial) |
| Hanna | Dark brown | Clay loam (sand 27%, silt 39%, clay 34%) | N/A |

### vii) Nutrients Available and Applied:

**2003 Estimated Nutrients Available (lbs/acre) 0-6" depth**

| Site | Nitrogen | Phosphorus | Potassium | Sulfur | O.M.% 0-6" | pH 0-6" | E.C. 0-6" |
|---|---|---|---|---|---|---|---|
| Castor | 38 | >120 | >1200 | 26 | 3.9 | 6.0 | 0.18 |
| Hanna | 68 | 22 | 690 | 160 | n/a | 7.7 | 1.5 |

At Castor, 25 lbs/acre of $P_20_5$ or the equivalent 48 lbs/acre of 11-52-0 was applied with the seed. At Hanna, 20 lbs/acre of $P_20_5$ or the equivalent 39 lbs/acre of 11-52-0 was applied with the seed. LiphaTec Nitragin granular inoculant was mixed with the fertilizer and applied at 10 lbs/acre with the seed. For the Castor location only, 60 lbs of actual nitrogen or 140 lbs/acre of 46-0-0 was banded with the dry bean.

### viii) Herbicides Applied:

The objective was to ensure that weed competition did not affect yield. Due to the dry conditions and excellent field selection, no herbicides were required in 2003. The plots were hand weeded when weeds did appear.

| Site | Pre-Seeding Herbicides Applied | Post - Emergent Herbicide Applied |
|---|---|---|
| Castor | None | None |
| Hanna | None | None |

**ix) Cropping History:**

- Castor
  - previous crop was wheat, written off due to grasshoppers in 2002
  - seeded on May 28th, lupins harvested on August 27th, all other crops harvested on September 25th

- Hanna
  - previous crop was summerfallow
  - seeded on May 27th, all crops (except dry bean, harvested September 25th) were harvested on September 4th

The soil moisture at seeding was good to very good at both sites.

## V. Data Collected and Analysis

**i) Climate Information:**

**Growing Season Precipitation (mm)**

| | April | May | June | July | August | Total | 30-year (average) |
|---|---|---|---|---|---|---|---|
| **Castor** | 25.0 | 55.6 | 51.5 | 27.4 | 19.2 | 178.7 | 253 |
| **Hanna** | 63.5 | 50.8 | 38.1 | 0.0 | n/a | 152.4 | 204 |

**Growing Degree Days Above 5°C**
April 1 through August 3, 2003

| | Total | 30-year (average) |
|---|---|---|
| **Castor** | 895 | 799 |
| **Hanna** | 1093 | 1022 |

Unverified preliminary data from Environment Canada. This information does not reflect environmental conditions prior to seeding. The growing season of 2002 was very dry in Alberta and Western Canada. In 2003, soil moisture reserves were improved by moisture in late April and early May. There were numerous days above 25°C in July and August 2003.

The total growing season precipitation was 71% of the 30-year average for Castor and 75% of the 30-year average for Hanna. The growing degree days for Castor were 112% of the 30-year average. In contrast, the growing degree days at Hanna were 107% of the 30-year average.

The distribution of precipitation and amount of water in the various rainfall events paint a better picture of the 2003 growing season. In April and May, precipitation was low but adequate for germination. July and August were much hotter than usual. Pulse crops, in general, are adversely affected by temperatures above 25°C. The rain received in August was too late to have any positive effect on crop growth and final yield.

**ii) Research Results**

**Table 1.** **Lentil Trials**
**Summary of Agronomic Data**
**2003**

## Castor

| Variety | Type | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield (lbs/acre) |
|---|---|---|---|---|---|
| Crimson | Small red | 24.2 | n/a | 33 | 836 |
| Laird | Large green | 34.5 | n/a | 78 | 1074 |
| LeMay | Red | 28.8 | n/a | 32 | 736 |
| Milestone | Small green | 24.5 | n/a | 37 | 930 |
| Mean | | 28.0 | | | 894 |
| LSD | | | | | n/s |
| C.V. %* | | | | | 20.7 % |

## Hanna

| Variety | Type | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield (lbs/acre) |
|---|---|---|---|---|---|
| Crimson | Small red | 23 | 3 | 31 | 811 |
| Laird | Large green | 32 | 1 | 67 | 686 |
| LeMay | Red | 24 | 2 | 35 | 369 |
| Milestone | Small green | 24 | 2 | 28 | 670 |
| Mean | | 26 | 2 | | 634 |
| LSD | | | | | 139 |
| C.V. %* | | | | | 13.0 % |

*A high coefficient of variances (>15%) indicates the difference between varieties may be due to some other variable (ie. soil, landscape, moisture gradients) other than genetic potential. Yield data with C.V.(15% )should be interpreted with caution.

**a,b…yields followed by the same letter are not statistically different.

***Standability scale: 1=perfectly upright, 9=flat. Standability measurements are not normally taken for lentil but have been included for information purpose only.

Note: The lentils were harvested at Castor on September 25th and at Hanna on September 4th. There was some shattering on the early maturing red split lentil which may be under estimating the yield potential of this type.

**Table 2.**

# Chickpea Trials
# Summary of Agronomic Data
# 2003

## Castor

| Variety | Type | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|---|
| Amit | Kabuli | 36 | n/a | 308 | 1551 a |
| Myles | Desi | 33 | n/a | 212 | 1132 b |
| Sanford | Kabuli | 40 | n/a | 485 | 1301 b |
| Xena | Kabuli | 34 | n/a | 502 | 1282 b |
| Mean | | | | | 1316 |
| LSD | | | | | 193 |
| C.V. %* | | | | | 13.2 % |

## Hanna

| Variety | Type | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|---|
| Amit | Kabuli | 31 | 1 | 251 | 1282 |
| Myles | Desi | 29 | 1 | 190 | 1409 |
| Sanford | Kabuli | 37 | 2 | 412 | 366 |
| Xena | Kabuli | 30 | 1 | 447 | 624 |
| Mean | | | | | 920 |
| LSD | | | | | 312 |
| C.V. %* | | | | | 21.0 % |

* A high coefficient of variances (>15%) indicates the difference between varieties may be due to some other variable (ie. soil, landscape, moisture gradients) other than genetic potential. Yield data with C.V.(15% ) should be interpreted with caution.

**a,b…yields followed by the same letter are not statistically different.

***Standability scale: 1=perfectly upright, 9=flat. Standability measurements are not normally taken for chickpea but have been included for information purpose only.

Note: The chickpeas were harvested at Castor on September 25th and at Hanna on September 4th.

**Table 3.**

# Dry Bean Trials
# Summary of Agronomic Data
# 2003

## Castor

| Market class | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| Red Mexican | 36 | n/a | 280 | 871 a |
| Pinto | 28 | n/a | 232 | 873 a |
| Pink | 24 | n/a | 271 | 902 a |
| Great Northern | 33 | n/a | 284 | 897 a |
| Black | 28 | n/a | 172 | 620 b |
| Mean | | | | 833 |
| LSD | | | | 186 |
| C.V. %* | | | | 14.5 % |

## Hanna

| Variety | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| Red Mexican | 21 | 1 | n/a | 522 a |
| Pinto | 21 | 1 | n/a | 477 a |
| Pink | 17 | 1 | n/a | 473 a |
| Great Northern | 25 | 1 | n/a | 441 a |
| Black | 21 | 1 | n/a | 404 a |
| Mean | 21 | 1 | | 463 a |
| LSD | | | | 133 |
| C.V. %* | | | | 21.0 % |

* A high coefficient of variances (>15%) indicates the difference between varieties may be due to some other variable (ie. soil, landscape, moisture gradients) other than genetic potential. Yield data with C.V.(15% ) should be interpreted with caution.

**a,b…yields followed by the same letter are not statistically different.

***Standability scale: 1=perfectly upright, 9=flat. Standability measurements are not normally taken for bean but have been included for information purpose only.

Note: The dry beans at both Castor and Hanna harvested on September 25th.

**Table 4.**

# Fababean Trials
# Summary of Agronomic Data
# 2003

## Castor

| Variety | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| CDC Blitz | 50 | n/a | 327 | 438 |
| Fatima | 46 | n/a | 337 | 533 |
| Snowbird | 44 | n/a | 328 | 454 |
| Earlibird | 42 | n/a | 261 | 435 |
| Mean | 45 | n/a | 320 | 465 |
| LSD | | | | n/s |
| C.V. %* | | | | |

"Fababean did poorly under the conditions at Castor in 2003. As they are late maturing, fababean had green leaves later than other crops. These were consumed by grasshoppers. There was some shattering of the crop before harvest. Yield results were variable with yields from 223 to 665 lbs/acre. The height of the crop ranged from 41 to 50 cm." (Alvin Eyolfson, Manager, Battle River Research Group, BRRG Annual Report, p27).

## Hanna

| Variety | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| CDC Blitz | 49 | 1 | 281 | 1027 |
| Fatima | 46 | 1 | 347 | 1015 |
| Snowbird | 42 | 1 | 277 | 787 |
| Earlibird | 36 | 1 | 333 | 525 |
| Mean | 43 | 1 | | 839 |
| LSD | | | | 258 |
| C.V. %* | | | | 19.0 % |

*A high coefficient of variances (>15%) indicates the difference between varieties may be due to some other variable (ie. soil, landscape, moisture gradients) other than genetic potential. Yield data with C.V.(15% ) should be interpreted with caution.

**a,b…yields followed by the same letter are not statistically different.

***Standability scale: 1=perfectly upright, 9=flat. Standability measurements are not normally taken for fababean but have been included for information purpose only.

**Table 5.** **Lupin Trials**
**Summary of Agronomic Data**
**2003**

## Castor

| Variety | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| F6-RF | 36 | n/a | 147 | 787 |
| P12-1 | 37 | n/a | 130 | 603 |
| Prima | 33 | n/a | 153 | 582 |
| G24(Syren) | 33 | n/a | 154 | 590 |
| Mean | | | | 640 |
| LSD | | | | n/s |
| C.V. %* | | | | |

"Lupin also did poorly at this location in 2003. The crop stand was short and averaged 34 cm. The lupin was damaged by grasshoppers in August. This may have hastened maturity. Much of the yield was lost to shattering by the harvest date of August 27. Salvaged mean yields were 590 to 787 lbs/acre, actual yield would have been significantly higher." (Alvin Eyolfson, Manager, Battle River Research Group, BRRG Annual Report, p27). The variety F6-RF had very little shattering compared to the rest (range was 0-17%). The range in yield was 167 to 1314 lbs/acre.

## Hanna

| Variety | Plant height (cm) | Standability*** | 1000 kwt (g) | Yield** (lbs/acre) |
|---|---|---|---|---|
| F6-RF | 28 | 1 | 140 | 407 |
| P12-1 | 26 | 1 | 141 | 216 |
| Prima | 27 | 2 | 136 | 132 |
| G24(Syren) | 27 | 1 | 123 | 121 |
| Mean | 27 | 1 | | 219 |
| LSD | | | | 86 |
| C.V. %* | | | | 24.0 % |

*A high coefficient of variances (>15%) indicates the difference between varieties may be due to some other variable (ie. soil, landscape, moisture gradients) other than genetic potential. Yield data with C.V.(15% ) should be interpreted with caution.
**a,b…yields followed by the same letter are not statistically different.
***Standability scale: 1=perfectly upright, 9=flat. Standability measurements are not normally taken for fababean but have been included for information purpose only.

### iii) Maturity Information:

Maturity is part of the agronomic equation for farmers evaluating new crops for diversification potential. Chickpea, lentil, dry bean, fababean and lupin all have long season growing requirements in comparison to many traditionally grown crops. Due to the difficult nature of taking maturity notes, maturity data was not taken for these experiments.

The provincial database indicates a range in days to maturity for each of the crops as follows; kabuli chickpea (120 days), desi chickpea (110 days), Chilean lentil (111days), Persian lentil

(104 days), dry beans; black beans (109 days), great northern (109 days), pink (117 days), pinto (105 days), small red (120 days), navy (110 days), fababean (115-120 days), and lupin (N/A).

## VI. Discussion of Results:

In 2003, dry conditions after seeding and high levels of grasshopper infestations (despite multiple sprayings of insecticide) affected the plots at both locations. At Hanna, Eco bait (bran with carbaryl) and repeated applications of Sevin XRL (carbaryl) were used to control the extremely high grasshopper populations.

The agronomic traits measured in the project were plant height, standability, 1000 kwt and yield. Following is a brief description of the crop species tested in 2001-2003.

### i) Description of Crop Species Tested:

#### Chickpea

Chickpea originated in southeast Turkey about 8000 years ago. The kabuli type is thought to have evolved from a desi type, probably through mutation. From its origin in Turkey, chickpea was spread overland by traders, both westward to Europe and North Africa and eastward to India, where it arrived in 2000 BC. In the 1930's chickpea was introduced in California. Chickpea is a short herbaceous annual, 20 to 70 cm tall. Chickpea has an extensive root system; the taproot often penetrates well below one metre. The main stem gives rise to a variable number of (up to seven) primary branches near ground level. Foliage is similar to vetches with small, subdivided leaves from 4 to 7 cm long, with 10 to 15 leaflets. Chickpea flowering is indeterminant, extending to 60 days or more; single, small purple flowers or white flowers are produced in the axillary racemes and are self pollinated. Chickpea seed weighs from 200 to 500 gms per 1000 seeds; kabuli (garbanzo) seeds are much larger than desi (Park et al. 1999. p142).

#### Lentil

The primary market classes of lentil are the Chilean (large seed size, 60-70 grams or higher per 1000 seeds) and the Persian (small seed size, 30-40 grams per 1000 seeds). Other niche markets include red split lentil, zero tannin lentil, Spanish green, and small black (Indian Head) used primarily for green manure plowdown. Seed coat colors range from clear to green, brown, grey, blotched purple or black. Lentil is self-pollinating. Early maturing varieties flower at the $11^{th}$ or $12^{th}$ node and later maturing varieties at the $13^{th}$ or $14^{th}$. Flowers appear in clusters of two or three at the base of the upper leaves, and flowering will be delayed in high moisture and high fertility conditions. The lentil plant usually has two or more secondary branches rising from the main stem. The majority of the crop yield comes from branches from the uppermost nodes of the main stem, below the first flower node. Seed pods are less than an inch in length and contain one to two seeds. Seeds are lens-shaped with a range of cotyledon colors – yellow, red or green (Park et al. 1999. pp 105-106).

#### Fababean

Fababean is a traditional crop in Europe, Africa, the Middle East and Asia. Recent trends have been towards a large seeded fababean. Varieties with seed sizes in the range of 500-700 grams

per 1000 seeds are preferred types for the human edible market. For livestock feed, fababean is used as a protein supplement as the seed has a crude protein content of approximately 28 per cent. The recent development of zero tannin varieties shows promise in the feeding of monogastric species such as swine. In addition to be low in tannins (tannins have anti-nutritional properties for monogastrics), the zero tannin varieties have 15 per cent more useable energy. Fababean is a cool season crop, which prefers cool moist growing conditions. It is best adapted to the irrigated area of southern Alberta and portions of the black soil zone with longer frost-free periods. Fababean is an annual plant with coarse, upright unbranched stems, 1 to 2 metres tall with one or more hollow stems coming from the base. Fababean is the highest nitrogen fixer of all the legumes (Park et al. 1999. pp 123-124).

### Dry bean

Alberta dry bean is sold in dry packaged form for human consumption. Bean is an excellent source of protein (22-23 per cent), is low in fat and is a good source of thiamine and niacin. Several types of dry bean are grown in Alberta, but production is greatly influenced by adaptability to a particular region and market demand. The majority of commercial production falls into five types: Pinto, Pink, Red Mexican, Great Northern, Navy, and Black. Dry bean cultivated types are herbaceous annuals, determinate or indeterminate in growth habit, which bear flowers in axillary and terminal racemes. Daytime temperature between 20 and 32 degrees C are ideal for dry bean production. Temperatures below 10 degrees C will limit plant growth and development; below 8 degrees C at flowering will cause substantial flower abortion. Bean plants are not frost tolerant, so seeding should not begin until the likelihood of frost has passed (in southern Alberta, this normally results in a seeding date between May 20 and May 25)(Park et al. 1999. pp 89, 90, 96).

### Lupins

Lupin has been used in agriculture for thousands of years. Prior to the 1920's usefulness of these types were limited by the high alkaloid content of the grain. Between 1928 and 1943, German plant breeding efforts produced low alkaloid lines. To date, the main use for lupin is in livestock rations. The lupin grain contains approximately 28 per cent crude protein. Lupin is an erect, self-supporting, herbaceous to woody annual ranging in height from 20 to 150 cm tall when mature. Lupin leaves are compound, comprising between five and eleven leaflets. Lupin typically develops a robust taproot, from which numerous (relatively thick) lateral roots arise. Pods vary in length from 35 to 150 mm, depending on the species. Lupin is a long day plant, and many genotypes are responsive to cold-induced dormancy. Lupin has a growing season requirement between 120 and 150 days, which severely limits production in traditional cool season pulse production areas of the province (Park et al. 1999. pp 147, 148). In 2002, lupin types were brought in from Denmark and preliminary evaluation of these types look promising.

## VII. Conclusions

Based on the 2001-2003 research trials evaluating new pulse crops in the southeast central part of Alberta, lentil and chickpea appear to have the most promise. The earlier maturing small red split lentil market classes, should seriously be considered as an alternate pulse crop for the rotation by southeast central Alberta growers. The early maturity of these varieties, often catch

technical staff off guard and as result there was some shattering in the trials. For this reason, yields of these lentil types are most likely even higher than indicated in the data. However, grower contracts with splitting companies should be investigated fully before growing these types.

In regards to chickpea, there is a large range in the maturity for chickpea cultivars. Green, small immature seeds in the grain sample indicate frost damage due to too late maturity. Since the premium market is the high quality kabuli type (human consumption), a green chickpea is virtually unmarketable. However, based on observations on a number of occasions, there was no difference in maturity between some of the kabuli and desi types. Some the latest maturing desi types were equal to maturity to the earliest maturing kabuli type. The result is growers must be careful not to make the assumption that all kabuli chickpea are late and all desi types are early.

Fababean are a cool season, moisture-loving crop and are more suited to area (west, Highway 2 corridor) where the moisture is usually higher and more uniformly distributed. Additionally, grasshoppers and blister beetles preferentially feed on fababean.

As for lupin, the Australian lines tested in the past had very late maturities. The "new" blue narrow leafed lupin lines from Europe are very determinant in nature, with maturities equivalent to a medium to late maturing field pea. However, poor yields under the lower moisture conditions of east central Alberta make lupin unlikely fit for this part of the province. Again, blister beetles concentrated their feeding on this crop.

Last, there were a number of dry bean market types tested. Due to the extreme sensitivity to frost of dry beans, seeding in southern Alberta is usually purposely delayed. The sites were seeded on May 28 (Castor) and May 27 (Hanna), which fits in the seeding window to when dry bean are normally seeded. Pinto is the earliest maturing and has the greatest chance of being grown outside of the traditional bean growing areas. However, the low yield of dry bean in the region, compared to the southern Alberta traditional bean growing areas, make the fit for dry bean a long shot at best. Additionally, dry bean would have to be further processed at one of the bean plants in southern Alberta. The additional trucking cost, coupled with lower yields, make dry bean under dryland conditions economically not viable.

## VIII. Extension Activities

√ Hanna – CARA's annual field day on July 16, (30) farmers.

√ Three Hills – Alberta Pulse Growers (Zone 2) on July 28, (30) farmers.

√ Castor – BRRG on August 6, (12) farmers.

The OFD projects including this project "Evaluation of Pulse Crop Diversification Potential in South Central Alberta" were discussed at the APGC Zone 2 annual meeting held at Three Hills on December 3, 2003.

## IX. Recommendations/Acknowledgments

Alberta Pulse Growers Commission Zone 2 and Mark Olson (AAFRD) would like to acknowledge the staff of BRRG (Alvin Eyolfson) and CARA (Audrey Bamber) for all their hard work and cooperation on the pulse crop diversification projects over the last three years.

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Last, a special thanks to our farmer-cooperators: Rod Peterson and Lloyd Hutton. Their assistance and provision of land for research purposes is greatly appreciated.

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