Alberta 2005 Specialty Crop Report

Economics & Competitiveness




Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT

Acknowledgments

The Statistics and Data Development Unit of Alberta Agriculture, Food and Rural Development (AAFRD) wishes to thank all of the producers that participated in the specialty crop survey conducted in the winter of 2004/2005. Without their cooperation and assistance, this report would not have been possible.

In addition, contributions to this report from Alberta Agriculture, Food and Rural Development staff, including Chuanliang Su of Statistics and Data Development Unit, Charlie Pearson of Strategic Information Services Unit, Nabi Chaudhary of Economics Unit, and Manjula Bandara, Forrest Scharf, Judy Webber, Debbie Schuiling, K.Ampong-Nyarko, John Brown, Jill De Mulder, Zhixiong Zhang, Boris Henriquez and Chunyu Jiao of Crop Diversification Division, are very much appreciated.

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Contacts

For additional information relating to the various sections of this report, please do not hesitate to contact the subject area specialist referenced under each section.

This report is also available on the Internet at:

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sdd8416

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Alberta 2004 Specialty Crop Survey

Purpose of Survey:

By Maureen Wenger

To address some of the data and information needs of the specialty crop industry in Alberta, the Statistics and Data Development (SADD) Unit has been conducting an annual Specialty Crop Survey. Now into its twenty-second year, the survey attempts to capture data on area (seeded and harvested acres), yield and production for the various types of specialty crops grown in Alberta.

Data gathered from the survey are used primarily to generate related provincial and sub-provincial estimates. In turn, these estimates, generated by the SADD Unit, are used to validate some of the Alberta estimates generated by Statistics Canada, as well as to provide industry and other stakeholders with benchmark statistics for some of the "new" and emerging crops grown in the province.

Methodology

The Alberta Specialty Crop Survey, which is provincial in scope, collects data through a non-probability sampling procedure. In December 2004, survey questionnaires were mailed out to 3,891 specialty crop producers across Alberta. The questionnaires specifically asked survey participants to provide information on the type of specialty crop grown, area (seeded and harvested acres), yield and production for the year 2004. Survey participants were also made aware that participation in the survey was voluntary. Moreover, all individual responses would be kept confidential under the provisions of the Federal Statistics Act, as well as under the Provincial Freedom of Information and Protection of Privacy (FOIP) Act, by which the SADD Unit is governed and operates. As of March 31, 2005, a total of 913 questionnaires were returned. Of this total 821 were usable and formed part of the basis in the generation of the Alberta 2004 specialty crop estimates.

Survey responses received were reviewed for data completeness, validated and entered into an electronic database. The data was then subject to some computerized analyses, the results of which were rolled up into group summaries, to preserve data confidentiality of individual survey respondents. In turn, the group summaries, in conjunction with consultations with industry, published sources (e.g. Statistics Canada) and Alberta Agriculture, Food and Rural Development (AAFRD) subject area/provincial specialists were used to generate the provincial and sub-provincial (Census Division) estimates, where appropriate.

It cannot be over emphasized that extensive consultation is done with AAFRD's subject area/provincial specialists and industry, in the derivation of the provincial/sub-provincial estimates. Subject area/provincial specialists are acknowledged for their useful information and valuable insights on crop conditions and yields, particularly when attempting to firm up some of the sub-provincial estimates generated from the survey. Likewise, administrative data showing yield and crop area grown under private contracts also tend to add value to some of the estimates.

It should be noted that the derived estimates are subject to error. Some of the possible causes of error include data coding, entry editing and tabulation. Nonetheless, we believe that the statistics published in this report are reliable estimates for Alberta.

Survey Results

By Chuanliang Su

Area, Yield and Production in Alberta

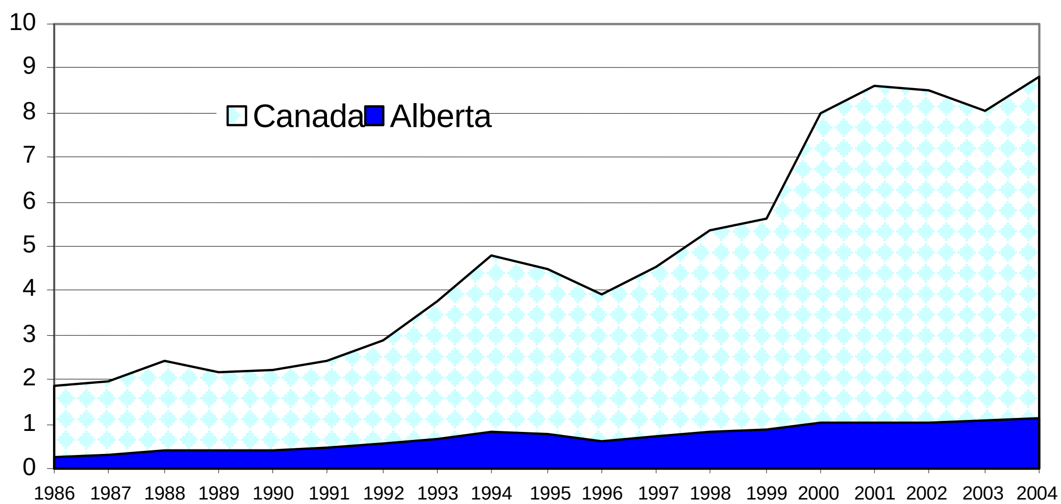
Due to needs for crop rotation and diversification, specialty crop area in Alberta continued to increase in 2004. Total seeded area of specialty crops reached a record high of 1.13 million acres in Alberta – Figure 1 (excluding potatoes and forage seeds). This represented an increase of six per cent from 1.06 million acres in 2003. Over 0.98 million acres or 87 per cent of total seeded area in 2004 were harvested for grains. Percentage distribution of 2004 specialty crop seeded acreage by crop type is presented in Figure 3.

Moisture conditions during the 2004 crop season in Alberta generally improved from a year earlier, resulting in above average yields for most specialty crops grown on dryland. However, adverse weather conditions early in the fall significantly reduced crop quality.

In 2004, dry peas produced an average yield of 39.2 bushels per acre, about 12 per cent higher than the 10-year average. The average yield of mustard seeds was estimated at 902 pounds per acre, 18 per cent above the 10-year average. However, the average yield of dry beans, estimated at 20,200 pounds per acre, was five per cent below the 10-year average. The cool, damp conditions during the later part of the 2004 crop season led to the development of some diseases in dry beans, which reduced the average yield.

On June 23, 2005, Statistics Canada is expected to release estimates of 2005 seeded area for major crops as well as some specialty crops by province.

Figure 1 - Specialty Crop Seeded Area, Alberta and Canada 1986-2004 (million acres)



Source: Statistics Canada and Alberta Agriculture, Food and Rural Development

Specialty Crops in Western Canada

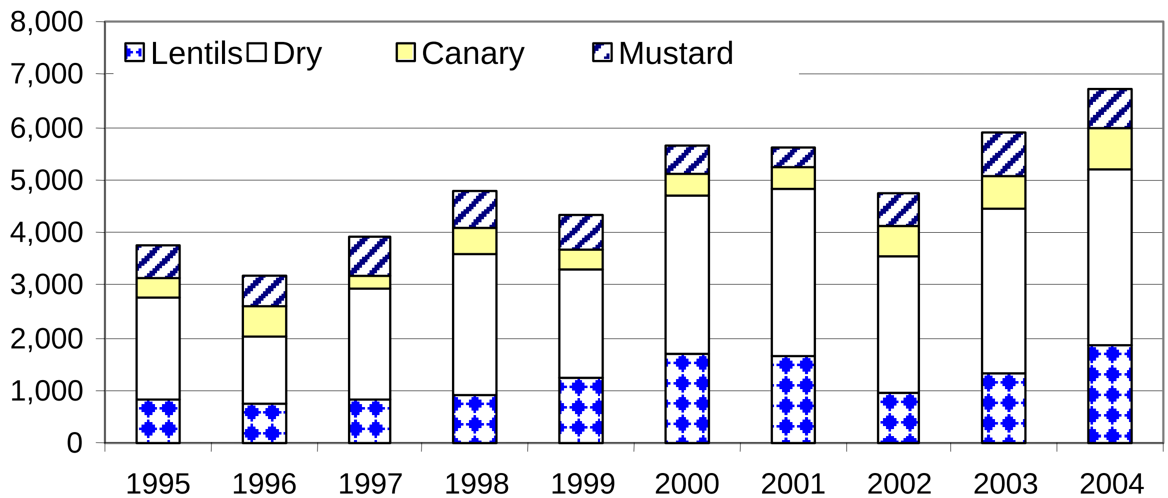
Based on Statistics Canada's November Estimate of Production of 2004 Principal Field Crops and the Alberta 2004 Specialty Crop Survey, total production of specialty crops in Western Canada in 2004 increased significantly from a year earlier. Increased acreage and improved yields both contributed to the higher production in 2004.

Producers in both Saskatchewan and Alberta planted more acres of specialty crops in 2004, which more than offset a reduction of area in Manitoba. Total seeded area of specialty crops in Western Canada in 2004 was estimated at 8.25 million acres. Of this total, 6.23 million acres or 75 per cent were in Saskatchewan. Alberta accounted for 14 per cent of the total seeded area, Manitoba ten per cent, and British Columbia one per cent. A total of 7.43 million acres of specialty crops were harvested in Western Canada in 2004, compared to 7.11 million acres in 2003.

The four major specialty crops grown in Western Canada are dry peas, lentils, canary seed and mustard seed. In 2004, dry peas remained the largest specialty crop in Western Canada, with total seeded area estimated at 3.43 million acres. Dry peas accounted for 42 per cent of the total specialty crop area in Western Canada, while lentils represented 23 per cent. Canary seed and mustard seed accounted for 11 per cent and 9 per cent, respectively.

Harvested area of major specialty crops is shown in Figure 2. Statistics on seeded area and production of selected specialty crops are presented in Table 5.

Figure 2 - Harvested Area of Specialty Crops
Western Canada ('000 acres)

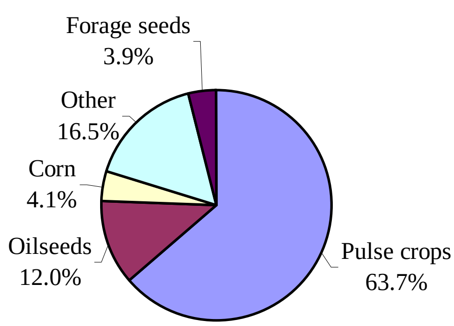


Source: Statistics Canada and Alberta Agriculture, Food and Rural Development

Table 1 Alberta 2004 Specialty Crops

		Seeded area (acres)	Harvested area (acres)	Yield (per acre)		Production (tonnes)
Pulse crops	Dry peas, green	210,000	196,000	40.5	bu	216,035
	Dry peas, yellow	480,000	450,000	38.6	bu	472,485
	Dry peas, other	10,000	9,000	39.0	bu	9,553
	Total dry peas	**700,000**	**655,000**	**39.2**	**bu**	**698,073**
	Chickpeas	15,000	15,000	1,267.0	lbs	8,621
	Dry beans	48,000	47,000	20.2	cwt	43,107
	Fababeans	5,000	5,000	2,600.0	lbs	5,897
	Lentils	18,000	18,000	1,372.0	lbs	11,202
Oilseeds	Brown mustard	12,500	12,000	850.0	lbs	4,627
	Yellow mustard	102,500	99,000	895.0	lbs	40,191
	Oriental mustard	20,000	17,000	980.0	lbs	7,557
	Total mustard	**135,000**	**128,000**	**902.0**	**lbs**	**52,375**
	Sunflowers	5,000	5,000	800.0	lbs	1,814
	Safflowers	4,000	3,200	-		-
	Borage	3,500	2,300	-		-
Corn	Grain corn	-	-	-		-
	Silage corn	50,000	35,000	18.6	ton	589,701
Other	Potatoes (1)	58,000	57,000	350.0	cwt	904,918
	Triticale	100,000	25,000	44.0	bu	27,941
	Canary seed	10,000	10,000	1,040.0	lbs	4,717
	Sugar beets (2)	35,100	35,000	21.2	tonne	740,508
Forage seeds (3)	Alfalfa seed	10,345	10,345	370.0	lbs	1,736
	Alsike clover	1,050	1,050	-		-
	Brome grass	9,476	9,476	345.0	lbs	1,483
	Red fescue	7,643	7,643	330.0	lbs	1,144
	Red clover	340	340	-		-
	Timothy	7,572	7,572	120.0	lbs	412
	Other	11,255	11,255	-		-

Figure 3 Percentage Distribution of Specialty Crop Seeded Acreage, Alberta, 2004 (Total area: 1,234,281 acres)



Source: Alberta 2004 Specialty Crop Survey, AAFRD

Except for:

(1) Statistics Canada, Canadian Potato Production by Province, 2004

(2) Alberta Sugar Beet Growers' Marketing Board

(3) Canadian Seed Growers' Association - Inspected Pedigreed Acres of Grass and Legume Seed; Yield estimates are generated from the Alberta 2004 Specialty Crop Survey, including pedigreed and common seeds

cwt - hundredweight (hundred pounds)
ton = 2,000 lbs   tonne = 1.1023 tons = 2,204.6 lbs
- Not available

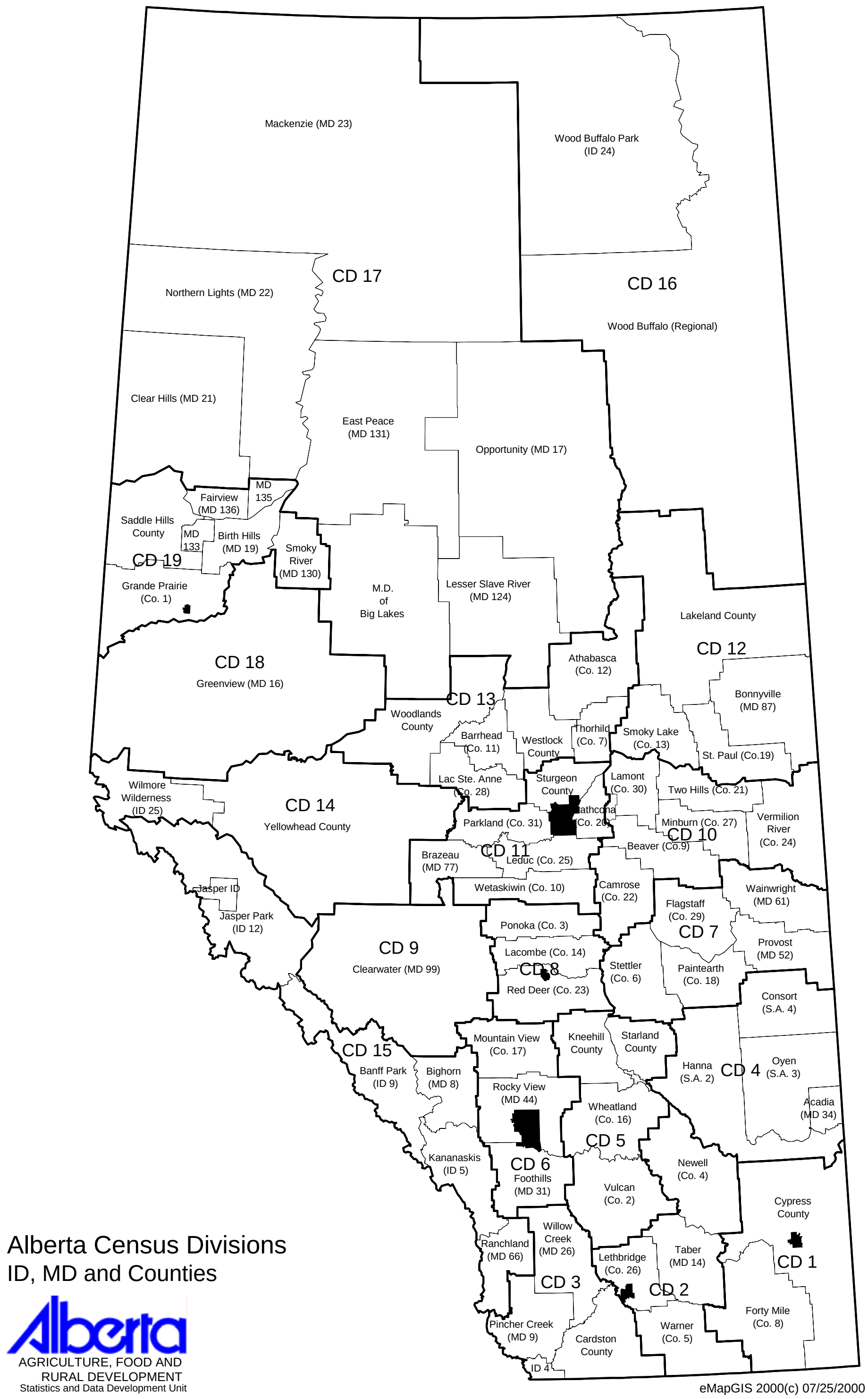

Alberta Census Divisions
ID, MD and Counties
AGRICULTURE, FOOD AND RURAL DEVELOPMENT
Statistics and Data Development Unit
eMapGIS 2000(c) 07/25/2000
Mackenzie (MD 23)
Wood Buffalo Park (ID 24)
CD 17
CD 16
Northern Lights (MD 22)
Wood Buffalo (Regional)
Clear Hills (MD 21)
East Peace (MD 131)
Opportunity (MD 17)
Fairview (MD 136)
MD 135
Saddle Hills County
MD 133
Birth Hills (MD 19)
Smoky River (MD 130)
CD 19
Grande Prairie (Co. 1)
M.D. of Big Lakes
Lesser Slave River (MD 124)
Lakeland County
CD 12
Athabasca (Co. 12)
CD 18
Greenview (MD 16)
Bonnyville (MD 87)
CD 13
Woodlands County
Barrhead (Co. 11)
Westlock County
Thorhild (Co. 7)
Smoky Lake (Co. 13)
St. Paul (Co.19)
Lac Ste. Anne (Co. 28)
Sturgeon County
Lamont (Co. 30)
Two Hills (Co. 21)
Wilmore Wilderness (ID 25)
CD 14
Yellowhead County
Parkland (Co. 31)
Strathcona (Co. 20)
Minburn (Co. 27)
Vermilion River (Co. 24)
CD 10
Beaver (Co.9)
CD 11
Brazeau (MD 77)
Leduc (Co. 25)
Camrose (Co. 22)
Wainwright (MD 61)
Jasper ID
Wetaskiwin (Co. 10)
Jasper Park (ID 12)
Flagstaff (Co. 29)
CD 7
Ponoka (Co. 3)
Provost (MD 52)
CD 9
Clearwater (MD 99)
Lacombe (Co. 14)
CD 8
Stettler (Co. 6)
Paintearth (Co. 18)
Red Deer (Co. 23)
Consort (S.A. 4)
Mountain View (Co. 17)
Kneehill County
Starland County
CD 15
Banff Park (ID 9)
Bighorn (MD 8)
Hanna (S.A. 2)
CD 4
Oyen (S.A. 3)
Rocky View (MD 44)
Acadia (MD 34)
Wheatland (Co. 16)
CD 5
Kananaskis (ID 5)
CD 6
Foothills (MD 31)
Newell (Co. 4)
Vulcan (Co. 2)
Cypress County
Willow Creek (MD 26)
Ranchland (MD 66)
Lethbridge (Co. 26)
Taber (MD 14)
CD 1
CD 3
CD 2
Forty Mile (Co. 8)
Pincher Creek (MD 9)
Cardston County
Warner (Co. 5)
ID 4

Figure 4

Table 2 Alberta 2004 Specialty Crops by Census Division

C.D.	Dry Peas	Mustard	Lentils	Dry Beans	Chickpeas
			Harvested Area (acres)		
1	74,719	16,427	4,480	26,082	6,943
2	73,145	32,586	7,208	20,318	2,893
3	43,643	9,656	-	-	-
4	28,665	32,296	4,661	-	1,355
5	117,510	23,437	1,652	600	3,810
6	25,463	3,501	-	-	-
7	81,104	9,498	-	-	-
8	14,700	-	-	-	-
9	-	-	-	-	-
10	102,588	600	-	-	-
11	22,289	-	-	-	-
12	9,629	-	-	-	-
13	17,453	-	-	-	-
17	22,534	-	-	-	-
18	-	-	-	-	-
19	21,558	-	-	-	-
Alberta	**655,000**	**128,000**	**18,000**	**47,000**	**15,000**
			Yield Per Acre		
	(bushels)	**(pounds)**	**(pounds)**	**(cwt)**	**(pounds)**
1	28.2	876.1	-	23.4	-
2	45.4	904.5	1,394.4	18.1	1,373.0
3	41.4	833.5	-	-	-
4	30.8	759.0	-	-	-
5	45.0	1,034.4	-	-	-
6	40.4	-	-	-	-
7	39.0	-	-	-	-
8	41.5	-	-	-	-
9	-	-	-	-	-
10	38.9	-	-	-	-
11	46.3	-	-	-	-
12	48.0	-	-	-	-
13	42.4	-	-	-	-
17	24.2	-	-	-	-
18	-	-	-	-	-
19	31.1	-	-	-	-
Alberta	**39.2**	**902.0**	**1,372.0**	**20.2**	**1,267.0**
			Production (tonnes)		
1	57,370	6,528	-	27,660	-
2	90,470	13,370	4,559	16,651	1,802
3	49,158	3,651	-	-	-
4	24,050	11,119	-	-	-
5	143,884	10,996	-	-	-
6	28,010	-	-	-	-
7	85,989	-	-	-	-
8	16,614	-	-	-	-
9	-	-	-	-	-
10	108,585	-	-	-	-
11	28,099	-	-	-	-
12	12,588	-	-	-	-
13	20,150	-	-	-	-
17	14,869	-	-	-	-
18	-	-	-	-	-
19	18,240	-	-	-	-
Alberta	**698,073**	**52,375**	**11,202**	**43,107**	**8,621**

Note: Totals may not add up due to rounding or insufficient data for generating estimates for some census divisions.
cwt - hundredweight (hundred pounds)   - Not available
Source: Statistics Canada; and Alberta Agriculture, Food and Rural Development (AAFRD)

Table 3 Alberta 2003 Specialty Crops by Census Division

C.D.	Dry Peas	Mustard	Lentils	Dry Beans	Chickpeas
			Harvested Area (acres)		
1	46,553	12,137	5,701	27,449	15,391
2	47,119	57,032	6,016	22,818	6,382
3	18,645	7,638	-	-	-
4	39,816	27,901	889	-	395
5	79,251	26,976	2,394	588	2,832
6	34,048	1,138	-	642	-
7	75,317	1,608	-	-	-
8	17,114	-	-	-	-
9	-	-	-	-	-
10	106,897	569	-	-	-
11	26,957	-	-	-	-
12	12,673	-	-	-	-
13	14,063	-	-	503	-
17	45,421	-	-	-	-
18	2,717	-	-	-	-
19	38,412	-	-	-	-
Alberta	**605,000**	**135,000**	**15,000**	**52,000**	**25,000**
			Yield Per Acre		
	(bushels)	**(pounds)**	**(pounds)**	**(cwt)**	**(pounds)**
1	25.7	810.5	-	25.5	1,092.4
2	29.5	743.4	1,147.1	25.8	1,322.1
3	35.5	583.7	-	-	-
4	17.1	287.0	-	-	-
5	27.0	718.2	-	-	-
6	35.7	-	-	-	-
7	27.6	-	-	-	-
8	33.8	-	-	-	-
9	-	-	-	-	-
10	34.6	-	-	-	-
11	44.7	-	-	-	-
12	36.4	-	-	-	-
13	40.7	-	-	-	-
17	35.6	-	-	-	-
18	34.7	-	-	-	-
19	27.4	-	-	-	-
Alberta	**30.8**	**634.0**	**1,013.0**	**25.6**	**1,160.0**
			Production (tonnes)		
1	32,584	4,462	-	31,692	7,627
2	37,775	19,231	3,130	26,667	3,827
3	18,002	2,022	-	-	-
4	18,480	3,632	-	-	-
5	58,224	8,788	-	-	-
6	33,042	-	-	-	-
7	56,642	-	-	-	-
8	15,759	-	-	-	-
9	-	-	-	-	-
10	100,557	-	-	-	-
11	32,785	-	-	-	-
12	12,550	-	-	-	-
13	15,567	-	-	-	-
17	43,967	-	-	-	-
18	2,569	-	-	-	-
19	28,602	-	-	-	-
Alberta	**507,865**	**38,825**	**6,891**	**60,300**	**13,155**

Note: Totals may not add up due to rounding or insufficient data for generating estimates for some census divisions.
cwt - hundredweight (hundred pounds) - Not available
Source: Statistics Canada; and Alberta Agriculture, Food and Rural Development (AAFRD)

Specialty Crops by Census Division in Alberta

The following section presents estimates of area, yield and production at the census division level for dry peas, mustard seed, lentils, dry beans and chickpeas. Please note that census division estimates were generated from a small sample, therefore, caution is advised when using this data. Also attached for your reference is the Alberta census division and municipality map – Figure 4.

Dry Peas

In 2004, total seeded area of dry peas reached a record high of 700,000 acres in Alberta, of which 655,000 acres were harvested (see Table 1). Due to improved crop growing conditions in 2004, the average yield of dry peas was estimated at 39.2 bushels per acre, 12 per cent higher than the 10-year average of 35.1 bushels per acre. Total production of dry peas reached a record high 698,073 tonnes in 2004. An increase in harvested area and higher yields both contributed to the record high production in 2004.

Although dry peas are grown primarily on dryland across the province, higher acreage of dry peas is concentrated in central and northeastern Alberta, particularly in census divisions 5 (Drumheller area), 7 (Provost area) and 10 (Vermilion area) (see Tables 2 and 3). These three census divisions (5, 7 and 10) accounted for 46 per cent of the provincial total harvested area in 2004 (see Table 2). Yields of dry peas varied significantly across Alberta, ranging from 24.2 bushels per acre in census division 17, to 48.0 bushels per acre in census division 12.

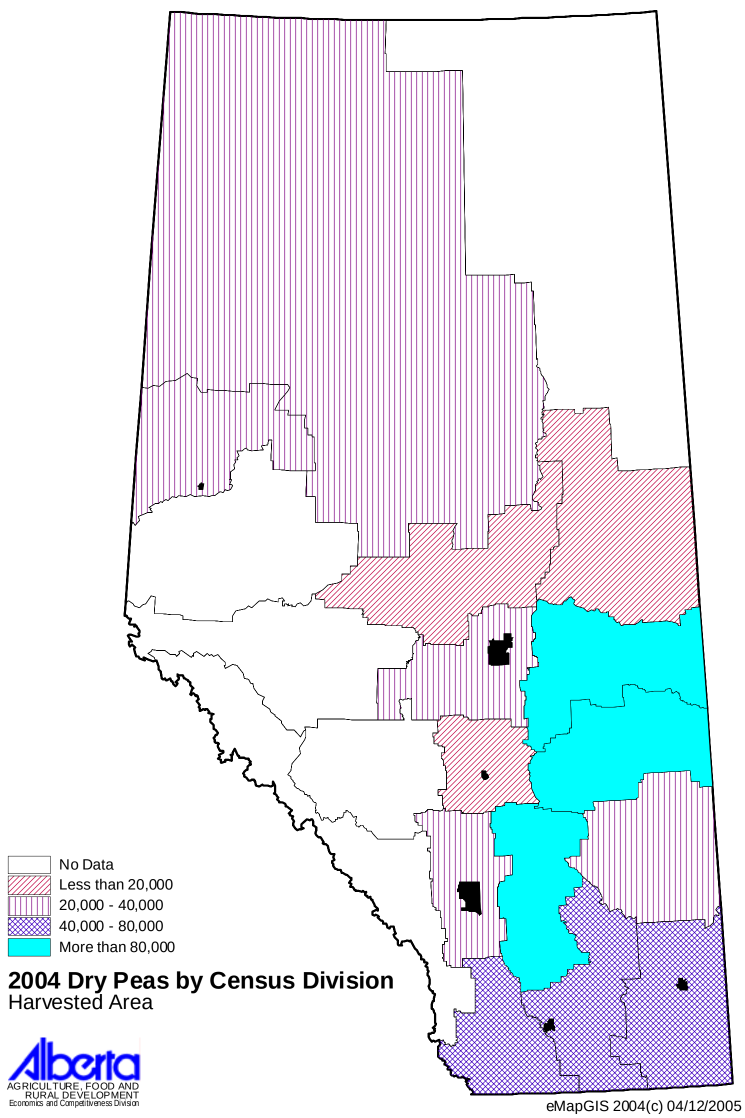


Figure 5

Mustard Seed

In 2004, total area seeded to mustard seed was estimated at 135,000 acres in Alberta, of which 128,000 acres were harvested (see Table 1). The average yield of mustard seed was estimated at 902 pounds per acre, up 18 per cent from the 10-year average of 766 pounds per acre. Mustard seed is grown primarily on dryland in southern Alberta, where moisture conditions improved significantly in 2004.

Total production of mustard seed in 2004 reached a record high of 52,375 tonnes, about 49 per cent higher than the ten-year average. An increase in harvested area and higher yields were behind the record high production in 2004.

Of the three types of mustard seeds produced in Alberta, yellow mustard continued to dominate in 2004, accounting for 77 per cent of the provincial total harvested acreage, while brown and oriental mustard represented ten per cent and 13 per cent, respectively.

In 2004, about 82 per cent of the provincial total harvested area was in census divisions 1, 2, 4 and 5 (see Table 2). Yields varied significantly across the province. Census division 4 had the lowest yield of 759 pounds per acre in the province, while the highest average yield, 1,034 pounds per acre, was reported in census division 5.

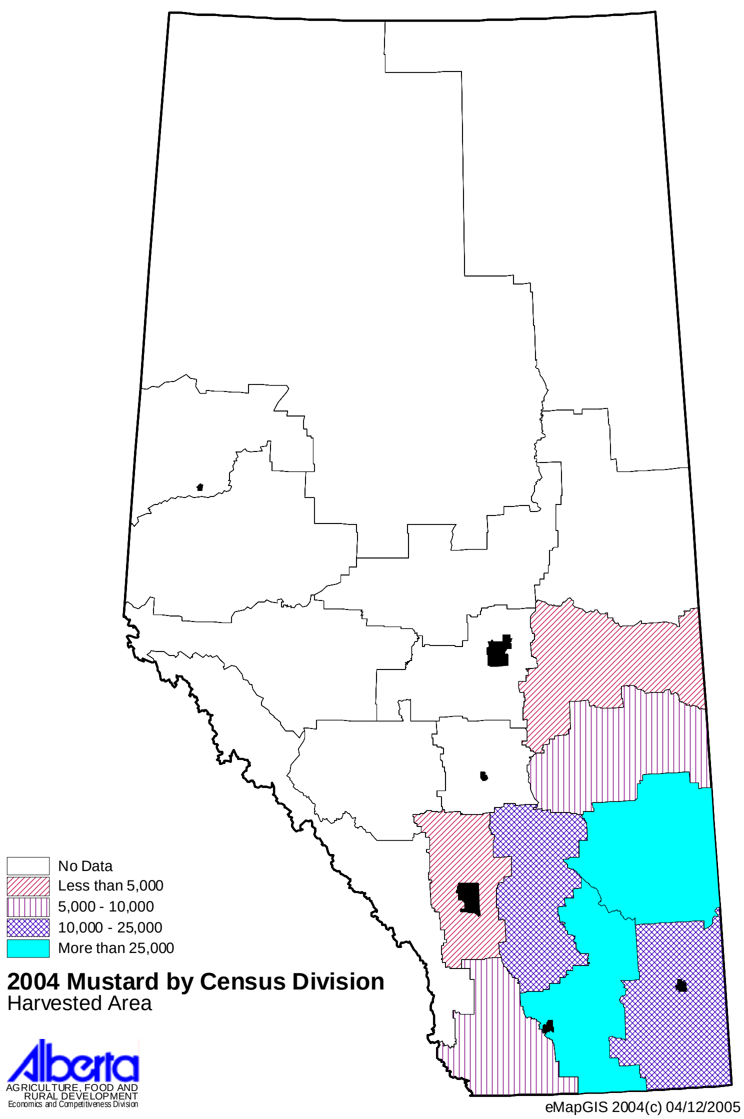


Figure 6

Lentils

Alberta producers seeded and harvested a total of 18,000 acres of lentils in 2004 (see Table 1). The average yield of lentils was estimated at 1,372 pounds per acre, 38 per cent higher than the 10-year average of 994 pounds per acre.

Total production of lentils was estimated at 11,202 tonnes in 2004, up 17 per cent from the 10-year average. The higher production in 2004 was attributed to a much higher average yield, which more than offset the impact of a smaller harvested area.

Lentils are grown in southern Alberta. In 2004, about 91 per cent of the provincial total harvested area was in census divisions 1, 2 and 4 (see Table 2).

There is limited lentil acreage under irrigation in the province, based on information from the Irrigation Branch of Alberta Agriculture, Food and Rural Development.

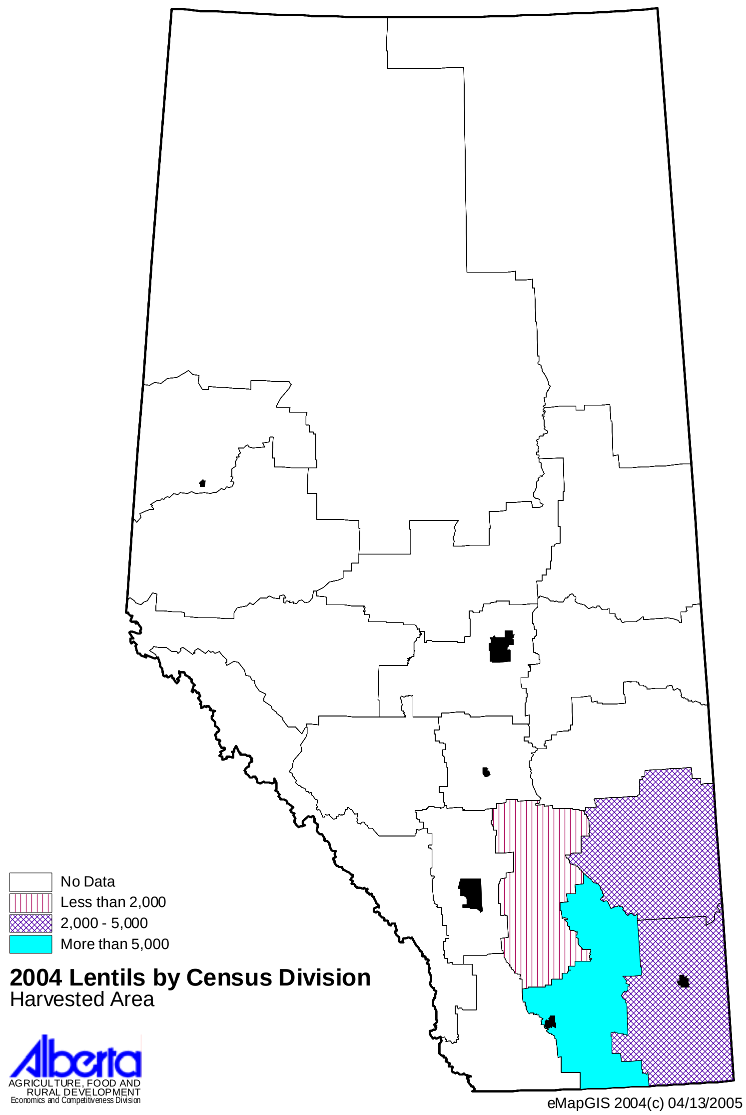


Figure 7

Dry Beans

In 2004, total seeded area of dry beans was estimated at 48,000 acres, of which 47,000 acres were harvested (see Table 1). The average yield of dry beans was estimated at 20,200 pounds per acre, about five per cent below the 10-year average.

Total production of dry beans in Alberta in 2004 was estimated at 43,107 tonnes, up four per cent from the 10-year average. The higher production in 2004 was attributed to an increase of 11 per cent in harvested area, which more than offset the impact of a lower average yield.

Dry beans are grown mostly under irrigation in southern Alberta. In 2004, census divisions 1 and 2 jointly accounted for 99 per cent of the provincial total harvested area (see Table 2).

For most years, over 80 per cent of total dry bean area in Alberta is irrigated, according to information from the Irrigation Branch of Alberta Agriculture, Food and Rural Development.

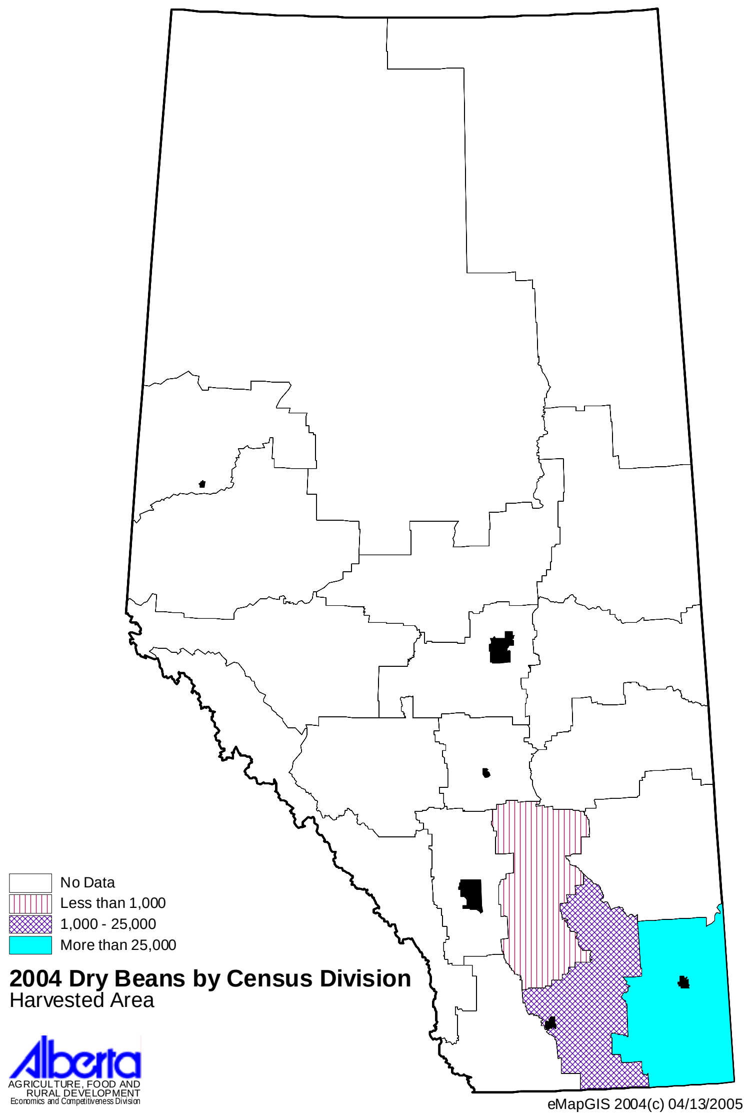


Figure 8

Please note, dry beans are grown under contract in Alberta.

Chickpeas

Alberta producers seeded and harvested a total of 15,000 acres of chickpeas in 2004 (see Table 1). This is significantly below the seeded and harvested area of 25,000 acres in 2003. The average yield of chickpeas was estimated at 1,267 pounds per acre, nine per cent higher than in 2003. The higher average yield in 2004 was a result of improved moisture conditions during the 2004 crop season.

Total production of chickpeas was estimated at 8,621 tonnes, compared to 13,155 tonnes in 2003. The lower production in 2004 was due to a reduction in acreage.

Chickpeas are grown in the southeastern parts of Alberta. In 2004, census divisions 1, 2 and 5 accounted for 91 per cent of the provincial total harvested area (see Table 2).

Chickpeas is a relatively new crop in the Prairies. Producers in Alberta started growing chickpeas in the late 1990's. The crop has contributed to the diversification of crop production in the province. It is also valuable in crop rotation, as the crop helps improve soil texture and fertility.

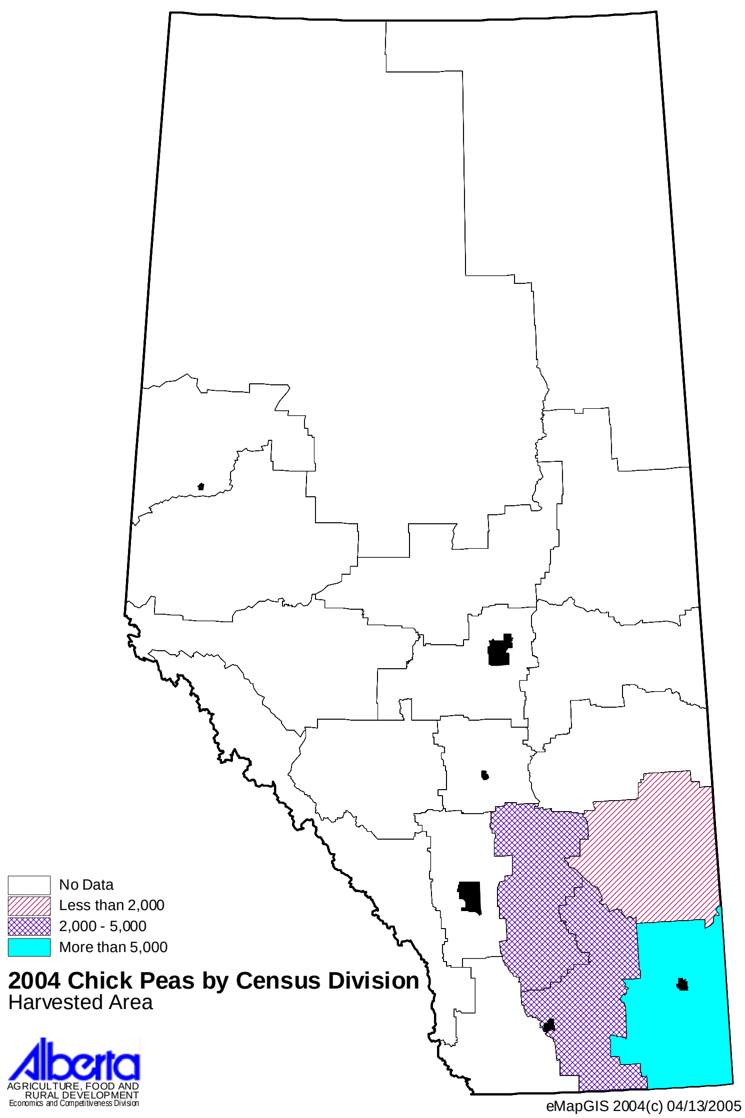


Figure 9

Only a small amount of chickpeas in Alberta are grown under irrigation.

Table 4 Alberta Specialty Crops Historical Series

		1995	1996	1997	1998	1999	2000	2001	2002*	2003*	2004*
Alfalfa Seed (1)											
Inspected area	(acres)	12,851	10,355	10,376	12,069	16,461	17,117	15,381	12,709	11,292	10,345
Yield	(lbs/acre)	265	265	300	425	200	525	385	265	550	370
Production	(tonnes)	1,545	1,245	1,412	2,327	1,493	4,076	2,686	1,528	2,817	1,736
Buckwheat											
Harvested area	(acres)	850	850	400	400	400	-	-	-	-	-
Yield	(bu/acre)	-	-	-	-	-	-	-	-	-	-
Production	(tonnes)	-	-	-	-	-	-	-	-	-	-
Canary Seed											
Harvested area	(acres)	10,000	25,000	10,000	20,000	10,000	10,000	4,000	7,000	10,000	10,000
Yield	(lbs/acre)	990	960	810	950	1,400	1,100	775	520	900	1,040
Production	(tonnes)	4,500	10,900	3,700	8,600	6,400	5,000	1,400	1,651	4,082	4,717
Corn for Grain											
Harvested area	(acres)	5,000	2,600	4,000	5,000	10,000	10,000	3,000	-	-	-
Yield	(bu/acre)	100.0	96.2	100.0	90.0	80.0	110.0	86.7	-	-	-
Production	(tonnes)	12,700	6,400	10,200	11,400	20,300	27,900	6,600	-	-	-
Corn Silage											
Harvested area	(acres)	10,000	10,000	15,000	15,000	15,000	30,000	30,000	30,000	30,000	35,000
Yield	(tons/acre)	16.0	19.5	12.0	20.0	13.3	17.0	16.0	16.0	16.7	18.6
Production	(tonnes)	145,100	176,900	163,300	272,200	181,400	462,700	435,400	435,453	453,606	589,701
Fababeans											
Harvested area	(acres)	-	200	1,000	2,000	-	-	3,000	2,500	2,000	5,000
Yield	(lbs/acre)	-	1,300	2,000	2,500	-	-	1,700	1,450	-	2,600
Production	(tonnes)	-	120	900	2,300	-	-	2,300	1,644	-	5,897
Dry Beans											
Harvested area	(acres)	30,000	25,000	35,000	45,000	47,000	45,000	59,000	40,000	52,000	47,000
Yield	(cwt/acre)	20.0	18.0	22.9	22.2	20.0	21.3	22.3	20.5	25.6	20.2
Production	(tonnes)	27,200	20,400	36,300	45,400	42,700	43,500	59,700	37,195	60,300	43,107
Dry Peas											
Harvested area	(acres)	445,000	280,000	385,000	500,000	455,000	640,000	570,000	440,000	605,000	655,000
Yield	(bu/acre)	34.0	40.4	40.3	35.9	42.9	35.6	32.6	19.6	30.8	39.2
Production	(tonnes)	412,300	307,500	421,800	488,000	530,800	620,500	506,200	234,324	507,865	698,073
Lentils											
Harvested area	(acres)	38,000	20,000	25,000	15,000	22,000	32,000	15,000	12,000	15,000	18,000
Yield	(lbs/acre)	1,250	845	732	1,180	1,245	684	722	900	1,013	1,372
Production	(tonnes)	21,500	7,700	8,300	8,000	12,400	9,900	5,000	4,899	6,891	11,202
Mustard Seed											
Harvested area	(acres)	100,000	85,000	145,000	110,000	90,000	50,000	50,000	80,000	135,000	128,000
Yield	(lbs/acre)	1,125	753	769	795	1,100	606	373	603	634	902
Production	(tonnes)	51,100	29,000	50,600	39,700	44,800	13,800	8,500	21,888	38,825	52,375
Safflower											
Harvested area	(acres)	2,000	800	-	12,000	5,000	3,000	1,000	-	2,500	3,200
Yield	(lbs/acre)	870	760	-	1,020	900	625	750	-	1,215	-
Production	(tonnes)	2,000	700	-	1,400	2,000	900	300	-	1,378	-

Source: Statistics Canada; and Alberta Agriculture, Food and Rural Development (AAFRD) - Not available

(1) Inspected pedigreed acres are from Canadian Seed Growers' Association; yield and production data are from the Alberta Specialty Crop Survey

Note: * Data shown in 2002, 2003 and 2004 are from Alberta Specialty Crop Survey, AAFRD.

Table 4 Alberta Specialty Crops Historical Series (Cont'd)

		1995	1996	1997	1998	1999	2000	2001	2002*	2003*	2004*
Sugar Beets (2)											
Harvested area	(acres)	33,656	33,463	33,124	41,132	44,522	42,017	28,457	27,754	27,389	35,000
Yield	(tonnes/acre)	20.46	20.22	19.64	23.32	18.86	21.90	18.38	15.22	22.90	21.20
Production	(tonnes)	688,498	676,611	650,423	959,310	839,773	920,252	523,110	422,389	628,081	740,508
Sunflowers											
Harvested area	(acres)	5,000	2,000	5,000	5,000	5,000	5,000	5,000	2,000	3,000	5,000
Yield	(lbs/acre)	1,900	1,675	1,400	1,900	1,600	2,240	1,250	1,500	-	800
Production	(tonnes)	4,300	1,500	3,200	4,300	3,600	5,100	2,800	1,361	-	1,814
Triticale											
Harvested area	(acres)	10,000	15,000	15,000	50,000	60,000	50,000	20,000	35,000	40,000	25,000
Yield	(bu/acre)	50.0	33.3	36.7	38.0	53.3	41.0	37.0	50.0	33.8	44.0
Production	(tonnes)	12,700	12,700	14,000	48,300	81,300	52,100	18,800	44,452	34,343	27,941
Potatoes											
Harvested area	(acres)	29,500	31,000	30,500	32,200	42,300	47,700	57,300	55,800	61,000	57,000
Yield	(cwt/acre)	297.7	268.0	290.0	295.0	290.0	310.0	315.0	280.0	330.0	350.0
Production	(tonnes)	398,400	376,900	401,200	430,900	556,400	670,700	818,700	708,700	913,200	904,918

Source: Statistics Canada; and Alberta Agriculture, Food and Rural Development (AAFRD)   - Not available

(2) Alberta Sugar Beet Growers, Annual Report

Note: * Data shown in 2002, 2003 and 2004 are from Alberta Specialty Crop Survey, AAFRD.

Table 5 Western Canada Specialty Crops Area and Production

	1994	1995	1996	1997	1998	1999	2000	2001	2002*	2003*	2004*
Mustard Seed					**Seeded Area ('000 acres)**						
Alberta	90.0	100.0	90.0	145.0	110.0	100.0	50.0	60.0	95.0	140.0	135.0
Saskatchewan	700.0	550.0	490.0	560.0	580.0	585.0	465.0	330.0	600.0	675.0	640.0
Manitoba	10.0	10.0	11.0	17.0	10.0	7.0	10.0	20.0	30.0	25.0	8.0
Western Canada	800.0	660.0	591.0	722.0	700.0	692.0	525.0	410.0	725.0	840.0	783.0
					Production ('000 tonnes)						
Alberta	36.3	51.1	29.0	50.6	39.7	44.8	13.8	8.5	21.9	38.8	52.4
Saskatchewan	278.9	190.6	196.9	186.5	195.5	259.7	185.1	91.2	125.2	176.9	250.4
Manitoba	4.1	2.6	4.9	6.3	3.4	1.9	3.3	5.1	10.0	10.4	2.7
Western Canada	319.3	244.3	230.8	243.4	238.6	306.4	202.2	104.8	157.1	226.1	305.5
Sunflowers					**Seeded Area ('000 acres)**						
Alberta	5.0	5.0	2.0	5.0	5.0	5.0	5.0	5.0	3.5	3.0	5.0
Saskatchewan	60.0	40.0	25.0	35.0	40.0	65.0	25.0	20.0	30.0	70.0	40.0
Manitoba	140.0	75.0	63.0	85.0	125.0	140.0	155.0	155.0	210.0	220.0	170.0
Western Canada	205.0	120.0	90.0	125.0	170.0	210.0	185.0	180.0	243.5	293.0	215.0
					Production ('000 tonnes)						
Alberta	4.5	4.3	1.5	3.2	4.3	3.6	5.1	2.8	1.4	-	1.8
Saskatchewan	25.9	18.4	15.7	14.3	21.3	35.4	12.4	8.1	17.2	23.6	8.6
Manitoba	86.6	43.5	37.7	47.6	86.2	82.9	101.8	92.9	136.1	124.7	44.0
Western Canada	117.0	66.2	54.9	65.1	111.8	121.9	119.3	103.8	154.7	148.3	54.4
Lentils					**Seeded Area ('000 acres)**						
Alberta	40.0	40.0	20.0	25.0	20.0	25.0	32.0	20.0	15.0	15.0	18.0
Saskatchewan	830.0	735.0	690.0	780.0	900.0	1,210.0	1,660.0	1,720.0	1,470.0	1,350.0	1,900.0
Manitoba	115.0	50.0	40.0	8.0	15.0	16.0	35.0	10.0	0.0	4.0	7.0
Western Canada	985.0	825.0	750.0	813.0	935.0	1,251.0	1,727.0	1,750.0	1,485.0	1,369.0	1,925.0
					Production ('000 tonnes)						
Alberta	19.5	21.5	7.7	8.3	8.0	12.4	9.9	5.0	4.9	6.9	11.2
Saskatchewan	381.0	381.9	373.8	365.2	465.9	702.6	888.1	557.9	351.9	510.3	948.9
Manitoba	49.9	28.5	21.0	5.3	5.9	8.8	16.1	3.4	0.0	2.7	0.8
Western Canada	450.4	431.9	402.5	378.8	479.8	723.8	914.1	566.3	356.8	519.9	960.9
Dry Peas					**Seeded Area ('000 acres)**						
Alberta	400.0	465.0	290.0	385.0	510.0	470.0	660.0	610.0	650.0	635.0	700.0
Saskatchewan	1,110.0	1,350.0	900.0	1,500.0	1,900.0	1,520.0	2,240.0	2,550.0	2,350.0	2,440.0	2,575.0
Manitoba	210.0	180.0	145.0	205.0	260.0	105.0	155.0	150.0	200.0	135.0	150.0
Western Canada	1,720.0	2,025.0	1,345.0	2,097.0	2,680.0	2,104.0	3,065.0	3,320.0	3,205.0	3,220.0	3,430.0
					Production ('000 tonnes)						
Alberta	374.2	412.3	307.5	421.8	488.0	530.8	620.5	506.2	234.3	507.9	698.1
Saskatchewan	898.1	868.2	729.4	1,158.1	1,613.8	1,623.4	2,072.4	1,366.2	963.5	1,469.6	2,476.7
Manitoba	168.7	147.0	132.0	178.3	225.9	92.0	160.5	146.1	176.9	137.4	160.0
Western Canada	1,441.0	1,454.7	1,173.0	1,762.3	2,336.8	2,251.9	2,864.3	2,023.0	1,378.2	2,124.4	3,338.2
Canary Seed					**Seeded Area ('000 acres)**						
Alberta	-	10.0	25.0	10.0	20.0	15.0	10.0	5.0	10.0	10.0	10.0
Saskatchewan	480.0	330.0	520.0	250.0	450.0	340.0	360.0	360.0	600.0	550.0	840.0
Manitoba	25.0	25.0	70.0	20.0	50.0	15.0	40.0	55.0	100.0	60.0	30.0
Western Canada	505.0	365.0	615.0	280.0	520.0	370.0	410.0	420.0	680.0	620.0	880.0
					Production ('000 tonnes)						
Alberta	-	4.5	10.9	3.7	8.6	6.4	5.0	1.4	1.7	4.1	4.7
Saskatchewan	226.8	137.9	240.0	102.1	201.8	152.0	148.6	101.2	140.6	183.7	284.4
Manitoba	13.6	12.2	33.7	9.2	24.9	7.6	17.2	11.3	32.7	31.8	11.4
Western Canada	240.4	154.6	284.6	115.0	235.3	166.0	170.8	113.9	175.0	219.6	300.5

Source: Statistics Canada; Saskatchewan Agriculture and Food; and Alberta Agriculture, Food and Rural Development (AAFRD)

* Data shown in 2002, 2003 and 2004 for Alberta are from Alberta Specialty Crop Survey, AAFRD - Not available

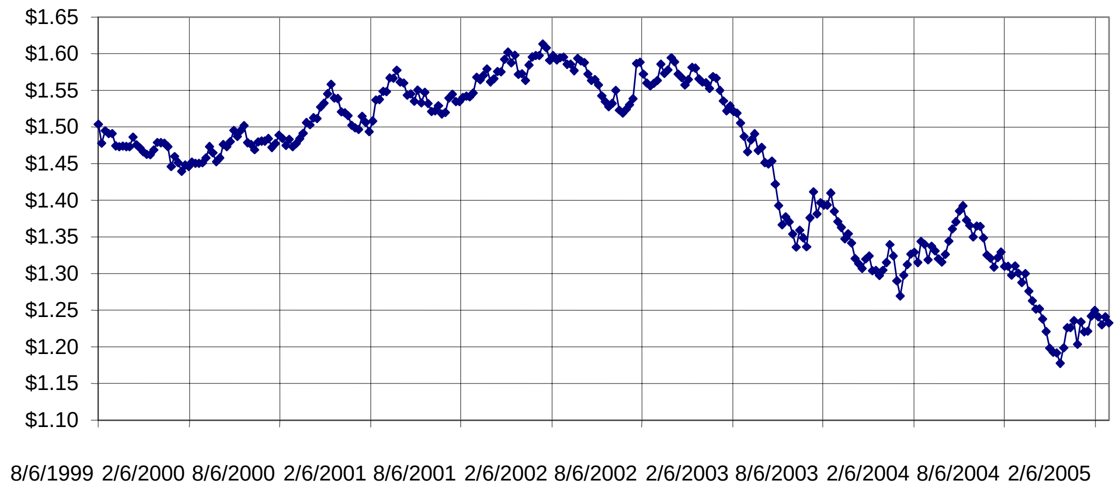
Market Outlook for Selected Specialty Crops

By Charlie Pearson

Overall Factors Influencing Canadian Crop Markets

The higher valued Canadian dollar relative to our US counterpart has resulted in lower prices for Alberta crops. The chart below highlights the change in the currency values over the past five years. A commodity valued at US $100 has changed in value from about $160 during the winter of 2002 to current levels of somewhere closer to $125. Over the same period, ocean freight rates have exploded higher. The net result is that many commodities (including pulse and special crops) are actually more expensive to our buyers when converted to their local currency, while at the same time being historically low priced in Western Canada.

Figure 10 - US Versus Canadian Dollar



Field Peas

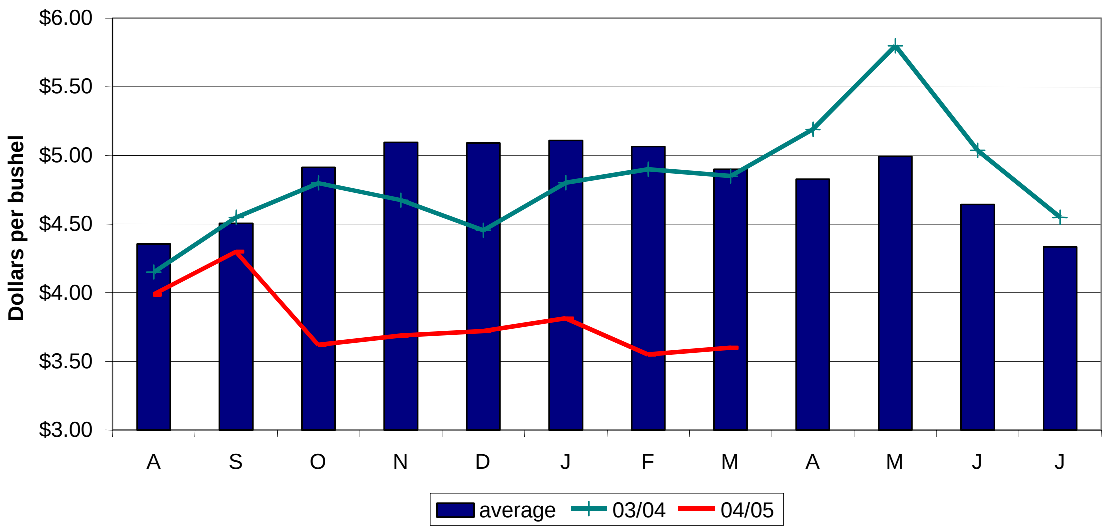
Human consumption pea prices (both greens and yellows) have held in the $3.50 to $4.50/bushel range over the past winter. A combination of better pulse crops in south east Asia, a higher valued Canadian dollar relative to the US dollar and expensive ocean freight rates have kept pressure on edible pea prices.

World pea production has increased substantially from the previous year, with Canada being the major contributor. Canadian pea production is estimated by Statistics Canada to be 3.3 million tonnes, up over 60 % from 2003 and over double the level produced in 2002. Better crops in South East Asia (particularly India) have reduced import opportunities.

On the feed pea side, cheaper soybean meal prices (large world soybean crop) and feed grain prices have impacted feed peas. Feed peas in the $3.00 to $3.25/bushel range are very competitively priced in domestic livestock feed rations based on its nutrient value.

The Canadian field pea outlook for 2005/06 is uncertain at best. The best current estimate is that Canadian pea acreage will remain relatively unchanged from the last couple of years (3.2 to 3.4 million-acre range). New crop pea price are forecast to remain similar to current values.

Figure 11 - Yellow Edible Pea Prices

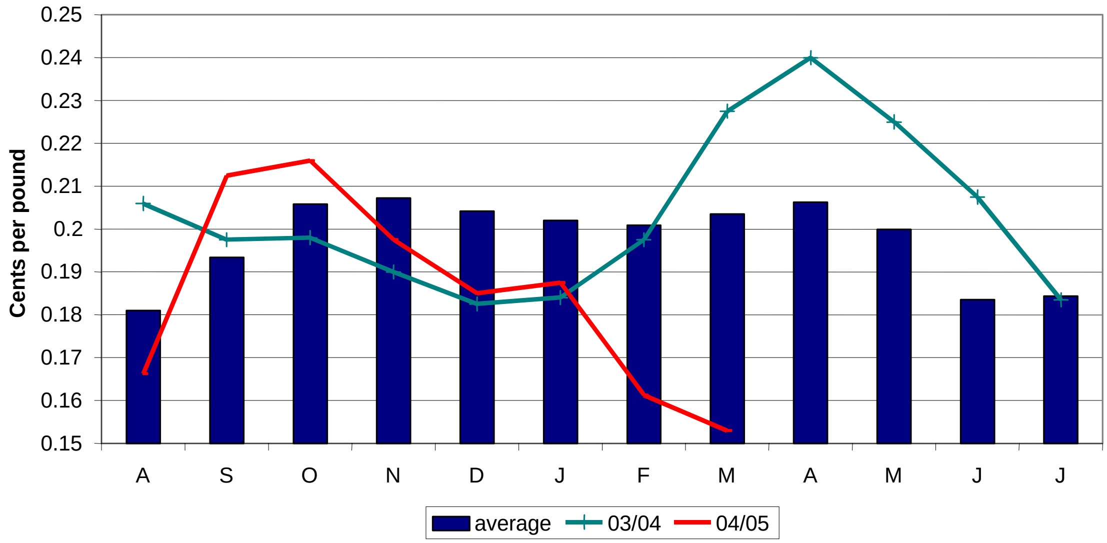


Lentils

The major factor in the lentil market has been the large Canadian and world lentil crops. High production has pushed 2004/05 prices lower relative to 2003/04 with a range of 14 to 18 cents/lb for top quality large seeded lentils. The quality of the western Canadian lentil crop is mixed this year with a good blend of class/grades for customers. The impact of the larger crop will be a significant carryover at the end of the 2004/05 crop year.

Western Canadian lentil acres are likely to be down again this summer. If prices hold current historic crop values, lentils are likely to be among the most profitable crops in the brown and dark brown soil zones of the prairies for many farmers even at current price levels.

Figure 12 - Large Seeded (Laird) Lentil Prices



Chickpeas

World chickpea production has been stable in the 6.6 to 6.7 MMT range over the last several years. The Indian sub continent makes up the vast majority of this crop with 85 to 90 percent of production occurring in the Indian sub continent.

Canadian chickpea production in 2004 is estimated to be 51,000 tonnes, 25 percent less than that 2003 and less than 15 percent of the record 455,000 tonnes produced in 2001.

Kabuli chickpeas have maintained a good premium above the five-year average for the large high quality seeded varieties. Kabuli chickpeas have ranged from 34 to 36 cents/lb for 9 mm size. There is good demand for this product within the North American market. Desi chickpeas have stayed in the 9 to 10 cent/lb area.

An optimistic picture can be developed for larger kabuli chickpeas given the development of higher valued specialty markets for this crop. The decision to grow should be based the probability of harvesting top quality/large sized seeds within the growing season window on your farm and the disease pressure you have seen on this crop in the past.

Desi chickpeas have a less optimistic outlook given competition from the Australian crop and the domestically produced crop in South East Asia. These chick peas have a poor fit in the domestic feed market because of high tannin levels. Alberta farmers in most regions are better to grow yellow peas in the coming year than desi chickpeas.

Figure 13 - Kabuli Chickpea Prices

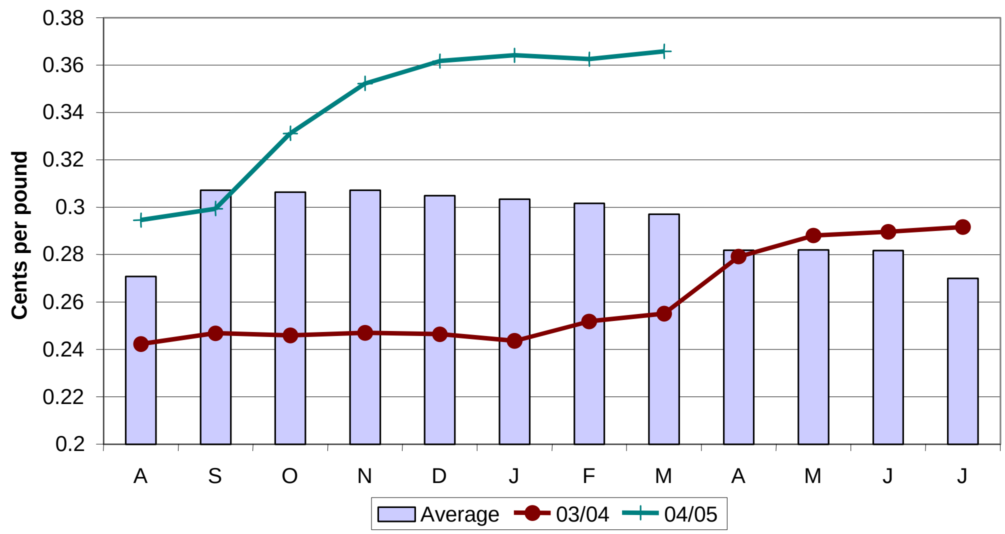
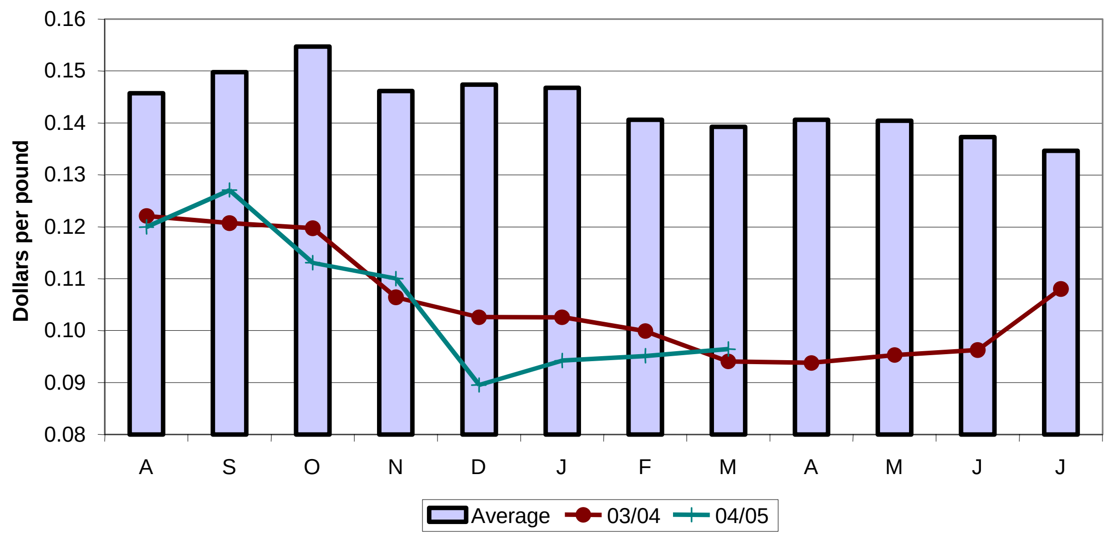


Figure 14 - Desi Chickpea Prices

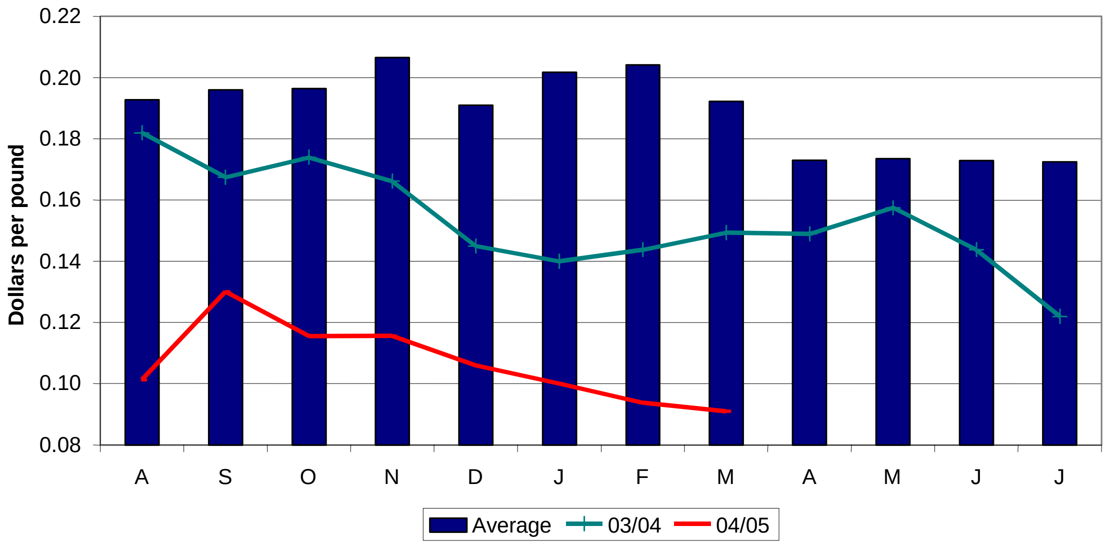


Canary Seed

Canary seed prices dropped over the past winter into the 9 to 11 cent/lb range. Canadian canary seed production is estimated to be 300,500 tonnes in 2004, up 33 per cent from 2003. Carryovers on July 31, 2005 will be large.

Canary seed acres are likely to drop in 2005 as farmers switch to more profitable crops. Large carryovers from the 2004 crop will prevent a major increase in canary seed prices unless a major weather problem occurs in Western Canada this summer.

Figure 15 - Canary Seed Prices



Mustard

Mustard prices are holding in the 13 to 14 cent/lb range for all mustard classes (yellow, oriental and brown mustard), well below the five year average for all three types. Canadian mustard production estimated to be 306,000 tonnes, up over 35 percent from 2003.

Low mustard prices are expected to continue into 2005/06 even with a slight decline in Canadian acres. Unless weather impacts western Canadian yields, western Canadian supplies are forecast to be large again in 2005/06.

Figure 16 - Brown Mustard Prices

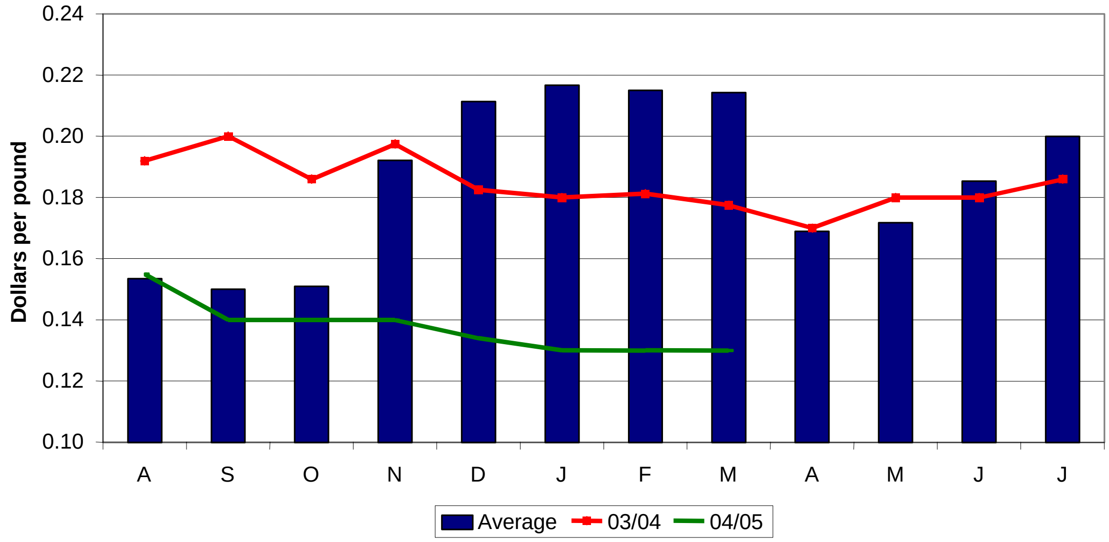
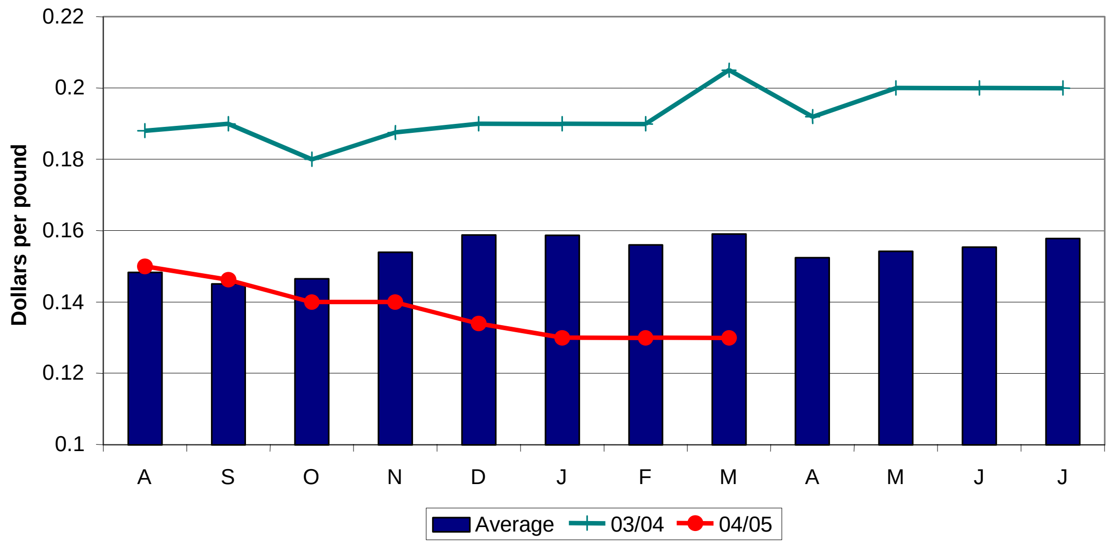


Figure 17 - Oriental Mustard Prices



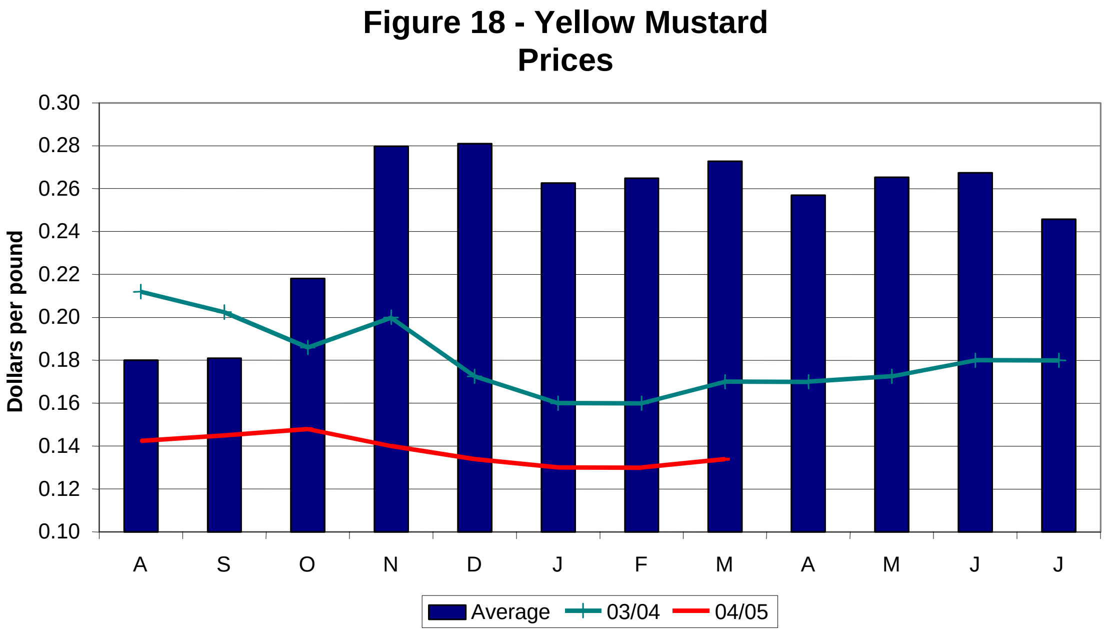


Figure 18 - Yellow Mustard
Prices
Dollars per pound
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
A
S
O
N
D
J
F
M
A
M
J
J
Average
03/04
04/05

Economics of Specialty Crop Production

By Nabi Chaudhary

Costs and returns for crops, livestock, and several other enterprises have been monitored in the province in an extensive way since the 1960's. These studies have been viewed as an important tool for assisting producers in their cropping decisions and the federal and provincial governments in developing policies and programs for different farm enterprises. Where information gaps existed in other provinces, results from these studies have served as the basis to fill those gaps.

The Economics Unit (formerly known as Production Economics Branch) in the Economics and Competitiveness Division of Alberta Agriculture, Food and Rural Development has been conducting economic studies on various farm enterprises for the last several decades. Since the early nineties, much greater emphasis has been placed on developing costs and returns data on specialty and/or alternative crops for farm diversification purposes.

Continued depressed prices and volatile markets for traditional cereals and oilseeds have forced producers to seriously look into diversifying their operations into new and emerging specialty crops. As mentioned above, results from these studies have been very helpful to primary producers when making cropping decisions. Furthermore, individual producers have also used the results from these studies to compare costs and returns and profitability margins of their farms with the group averages from their respective areas in order to develop better management practices. Agri-businesses and other stakeholders have used the results of the economic studies for feasibility purposes.

During the last ten to thirteen years, area under special crops has increased significantly. Dry pea acreage has almost quadrupled since 1991. It reached its highest level at 650,000 acres in 2001. In 2002, seeded area for dry peas remained at the same level as in 2001. However, in 2003 seeded area declined marginally by over two per cent from the previous year to 635,000 acres. Because of the droughts in 2001 and 2002, there was a considerable decrease in the area harvested for dry peas. Harvested area in 2002 was 440,000 acres (67 per cent of the seeded area) compared with 570,000 acres (88 Percent of seeded area) in 2001. In 2003, harvested area for dry peas was 605,000 acres (95 per cent of the seeded area). In 2004, seeded area for dry peas was estimated at 700,000 acres, an increase of about 15 percent over 2003. Harvested area for peas was at 655,000 acres (94 percent of seeded area). Yield per acre for peas was about 13 percent higher when compared with the last 10 years average and 17 percent higher over in 2003.

Dry bean and lentil production in Alberta has fluctuated considerably over the last decade or so. Dry bean area in Alberta peaked to 60,000 acres in 2002. For the 2002 dry bean crop, area harvested was just about two-thirds of the seeded area. In 2003, seeded area for dry beans decreased by about 13 per cent from the previous year. Dry bean seeded area further decreased by about eight (8) percent from the previous year to 48,000 acres in 2004. Please note, most of the dry beans are grown under contract on irrigated land in southern Alberta.

Area under lentils has also fluctuated from a high of 40,000 acres in 1994 to a low of 15,000 acres in 2002. In 2003, area under lentils was at 15,000 acres; the lowest area in the last 10 years. In 2004, lentil area in the province increased by over 18 percent over the previous year to about 18,000 acres.

In the late nineties there was a considerable interest in chickpeas (known as the new Cinderella crop on the Prairies – desi and kabuli) production. Chickpeas were a huge crop in Saskatchewan from 1999 to 2001, occupying almost one million acres. In Alberta, acreage under chickpeas was about 100,000 acres in 2001, almost double from the previous year. However, in 2002, area under chickpeas decreased drastically to the 2000 level of 50,000 acres, primarily due to drought and disease problems. In 2003, area under this crop further declined by half to 25,000 acres. Decline in production area under chickpeas continued into 2004 where seeded area dropped to a record low level of just about 15,000 acres. As mentioned above, these dramatic declines in acreage of chickpeas can be attributed to drought, diseases, world demand and improved production prospects of major importing countries.

Producer interest in other specialty crops such as caraway, buckwheat, coriander, borage, herbs and spices, and other emerging specialty crops continues to grow.

Tables (6, 7 and 8) provide estimates of production costs and returns for dry peas, dry beans and chickpeas (desi and kabuli), respectively:

Table 6 Production Costs and Returns for Dry Peas
Dark Brown Soil Zone, 2004

	$ per acre	$ per bushel
Revenue per Acre		
Yield per Acre (bushels)	39.2	
Expected Market Price/Acre ($)	3.95	
(a) Gross Revenue per Acre	**154.84**	**3.95**
Costs per Acre ($)		
Seed and Seed Cleaning	26.29	0.67
Fertilizer Rates: 2N 16P 1K 3S	7.08	0.18
Chemicals	28.03	0.72
Hail/Crop Insurance Premiums	7.55	0.19
Trucking and Marketing	1.61	0.04
Fuel	9.01	0.23
Repairs – Machinery & Buildings	7.93	0.20
Utilities & Miscellaneous Expenses	11.54	0.29
Custom Work & Labour	7.16	0.18
Operating Interest Paid	2.85	0.07
Unpaid Labour	3.90	0.10
(b) Variable Costs	**112.95**	**2.88**
Taxes, License & Insurance	10.20	0.29
Equipment & Building – Depreciation	18.55	0.53
Paid Capital Interest	5.45	0.16
© Capital Costs	**34.20**	**0.87**
(d) Total Production Costs (b+c)	**147.15**	**3.75**
Gross Margin	**31.69**	**0.81**
Return to Investment (a-d+capital interest)	**13.14**	**0.34**
Return to Equity (a-d)	**7.69**	**0.20**

Note: Returns per acre would vary with yield and price.

Source: Economics Unit, Alberta Agriculture, Food and Rural Development
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Table 7 Production Costs and Returns for Dry Beans
Dark Brown Soil Zone, 2004

	$ per acre	$ per pound
Revenue per Acre		
Yield per Acre (lbs)	2020	
Expected Market Price/Acre ($)	0.24	
(a) Gross Revenue per Acre	**484.40**	**0.24**
Costs per Acre ($)		
Seed and Seed Cleaning	27.65	0.01
Fertilizer Rates: 2N 16P 1K 3S	72.70	0.04
Chemicals	88.05	0.04
Hail/Crop Insurance Premiums	10.25	0.00
Trucking and Marketing	7.74	0.00
Fuel	37.35	0.02
Repairs – Machinery & Buildings	50.06	0.02
Utilities & Miscellaneous Expenses	12.90	0.01
Custom Work & Labour	10.55	0.01
Operating Interest Paid	2.96	0.00
Unpaid Labour	91.80	0.05
(b) Variable Costs	**412.01**	**0.20**
Cash/Crop Share Rent	0.00	0.00
Taxes, License & Insurance	30.10	0.01
Equipment & Building – Depreciation	66.80	0.03
Paid Capital Interest	9.85	0.00
© Capital Costs	**106.75**	**0.05**
(d) Total Production Costs (b+c)	**518.76**	**0.26**
Gross Margin	**42.69**	**0.02**
Return to Investment (a-d+capital interest)	**-24.11**	**-0.01**
Return to Equity (a-d)	**-33.96**	**-0.02**

Note: Returns per acre would vary with yield and price.

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Table 8 Production Costs and Returns

Desi and Kabuli Chickpeas, 2004

	Desi Chickpeas	Kabuli Chickpeas
Revenue Per Acre		
Estimated Yield per Acre (lbs)	925	1175
Price per Pound ($)	0.12	0.22
(a) Gross Revenue per Acre ($)	**111.00**	**258.50**
Costs per Acre ($)		
Variable Costs per Acre		
Seed	21.75	50.30
Fertilizer	12.79	13.90
Chemicals	15.33	19.45
Machinery Expenses (Fuel & Repair)	17.04	17.04
Custom Work & Hired Labour	6.50	6.50
Utilities & Miscellaneous	8.35	8.95
Interest on Variable Expenses	2.10	2.80
(b) Total Variable Costs	**83.86**	**118.94**
Other Costs per Acre		
Building Repair	1.95	1.95
Property Expenses, Insurance & License	5.60	5.60
Machinery & Building Depreciation	17.65	17.65
Machinery & Building Investment	12.45	12.45
Labour & Management	15.60	15.60
(c) Total Other Costs	**53.25**	**53.25**
(d)TOTAL PRODUCTION COSTS (b+c)	**137.11**	**172.19**
RETURNS PER ACRE ($)		
Return Over Variable Expenses (a-b)	27.14	139.56
Return Over Total Production Costs (a-d)	-26.11	86.31

Note: Returns per acre would vary with yield and price.

Source: Economics Unit, Alberta Agriculture, Food and Rural Development
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New Crop Development
Special Crops Program (Crop Diversification Centre North-Edmonton, AB.)

By K. Ampong-Nyarko, John Brown, Jill De Mulder, Zhixiong Zhang and Boris Henriquez

Project 1: Alternative Non-Wood Sources of Raw Material Suitable for Pulp, Paper and Building Industries

Alberta's agri-industrial processing sector is in its early stages of commercialization and expansion. However, there is an increasing interest in biomass crops as a renewable carbon dioxide-neutral source for fuel, chemicals and fiber. Growing dedicated biomass crops confer several advantages including predictable supply, uniform quality, high yield per unit of area and vast potential supply. Opportunities for improvement exist throughout the supply chain, from crop genetics to cultivation and transport technology, and finally, to end use utilization. Advances in research will lead to large gains in efficiency and reductions in costs as progress is made to commercial production.

The overall purpose of the project is to deveop improved agronomic practices that will maximize biomass yield, reduce cost of biomass feedstock production and delivery, ensure sustainable crop production and present a profit for the grower. The project will optimize biomass yield with better methods of crop growth management. It will also evaluate the effect of the environment on quality and biomass properties, establish the economic profitability of biomass production and analyze the risk of growing dedicated biomass crops in Alberta. The project will develop methods for reducing biomass size, drying and other material handling at harvest in collaboration with Alberta Pacific Forest Industries. Finally we will create GIS map of potential biomass production regions in Alberta based on yields and production costs by land class using representative species. As part of the overall project, our partners: the University of Alberta and the Alberta Research Council, will determine the suitability of biomass for the pulping process. We will also create a database of Alberta biomass and their papermaking, biochemical and energy and fiber potential with Iogen Corporation, Alberta Research Council and the University of Alberta using the crops grown by Alberta Agriculture Food and Rural Development.

Hemp

We evaluated five hemp cultivars at two densities at two locations (Edmonton, Alpac near Boyle). Hemp plants are grown at a wide range of plant densities depending on the goal of the production and the expected yield level. For fiber production, densities between 50 and 750 plants have been recommended. Plant height among the hemp varieties ranged from 150 cm to 246 cm for Finola to USO 31 at Edmonton. In Alpac, the hemp varieties height ranged from 92 cm to 175 cm for Finola and USO 31. Stem diameter of the hemp varieties ranged between 7.1 cm to 10.2 cm at Edmonton for Fasamo and USO 31. In Alpac, the hemp stem diameter ranged from 4.6 cm to 6.2 cm for Fasamo and USO 31. At Alpac however, the differences between varieties were not significant. Higher seeding rates significantly reduced stem diameter. The Edmonton site had much higher productivity than Alpac. The stem biomass ranged between 1613-5482 kg/ha for Finola and USO 31 respectively for the second harvest. At Alpac, stem biomass yield ranged between 1400- 4565 kg/ha for USO 31 and Finola respectively for the second harvest. At both locations there were highly significant differences between varieties. The seed yields at Edmonton ranged between 557 -1006 kg/ha and 355-755 at Alpac. The significant difference in biomass yield between cultivars indicated that further screening might identify specific cultivars that are well suited to Alberta conditions. At Edmonton, CRAG with stem yield of 7050 kg/ha and seed yield of 1006 kg was the cultivar that approached dual-purpose cultivar status.

Hemp time of harvesting appeared critical. At Edmonton, stem biomass yield was higher when the plants were harvested on August 13th than when harvested 6 weeks later on September 21st. Actually, yields were reduced by 28 per cent by late harvesting. At Alpac, because of slow early hemp growth, late harvesting increased stem biomass yield by 22%. Time to harvest should be site specific but must be related to crop ontogeny. The trade-off between delaying stem harvest to mature hemp seeds for dual-purpose crops needs to be investigated further.

Flax

At Edmonton, the stem biomass yield for flax ranged between 2695 –2341 kg/ha. The differences between varieties were not significant. Seed yield ranged between 607- 697 kg/ha and the differences were also not significant. Seed yield was very low at Alpac and ranged between 84-142 kg/ha. Seed yield at Westlock ranged between 397- 489 kg/ha. Flax seed yield was the parameter most affected by location.

Cereal straw

At Edmonton, barley was the highest yielder, followed by oats, wheat and triticale. At Westlock, the order from highest to lowest was triticale, wheat and barley. The highest total straw biomass yields were obtained with triticale at the Westlock and Stony Plain locations (5773 and 6375 kg ha^{-1}). The mean proportion of stem in total straw of combined straw biomass was 49 per cent.

Dedicated Biomass Crops

The species varied in their ease of seeding establishment. Dahurian wild rye, reed canary grass, tall fescue and orchard grass were the easiest to establish at all locations among the perennial grasses. The annuals were all easy to establish. Basin wild rye (*Elymus cinereus Scribn. and Merr*), big bluestem (*Andropogon gerardii*), bluejoint reedgrass, (*Calamagrostis canadensis*), switchgrass (*Panicum virgatum*), stinging nettle (*Urtica dioica*), giant wild rye, smooth wild rye were the most difficult to establish. At Edmonton, the dry biomass yields in the fall during the year of establishment was highest for the annuals: corn with a yield 22,740 kg ha^{-}1, sorghum Sudan-grass 20,044 kg ha^{-}1, German millet 5110 kg ha^{-1} and sunflower 17,973 kg ha^{-1}. Among the perennial grasses, the high biomass yields were obtained with Canada wildrye (4114 kg ha^{-1}), dahurian wildrye (4490 kg ha^{-1}), reed canary grass (4445 kg ha^{-1}), tall fescue (5183 kg ha^{-1}) and orchard grass (4629 kg ha^{-1}). At Cremona, triticale was the highest yielder with yields of 13,634 kg ha^{-1}. Among the perennial grasses, the highest biomass yields were obtained with dahurian wildrye (6792 kg ha^{-1}), orchard grass (5054 kg ha^{-1}), reed canary grass (5963 kg ha^{-1}) and tall fescue (4049 kg ha^{-1}). Corn yield was low at 6216 kg ha^{-1} . At Evansburg, triticale was the highest yielder with yields of 10, 137 kg ha^{-1}. Among the perennial grasses, the high biomass yields were obtained with dahurian wildrye (2073 kg ha^{-1}), orchard grass (5054 kg ha^{-1}) and reed canary grass (2937 kg ha^{-1}). Corn yield was low at 5490 kg ha^{-1}

Natural Health Products

The relatively high growth rate of various segments of the nutritional and natural health products market is attracting pharmaceutical and chemical and food processing companies which increasingly, are requiring good sources of raw materials and ingredients. Global companies are interested in sourcing innovative products. Developing and supplying such products represents a significant opportunity for Alberta farmers and companies.

Rhodiola Potential Commercialization in Alberta

Interest in *Rhodiola rosea* L (Crassulaceae), also known as golden root, is increasing because of its adaptogenic characteristics. It is a popular plant in traditional medical systems in Eastern Europe and Asia, with a reputation for stimulating the nervous system, acting as an antidepressant, enhancing work performance, improving sleep, and eliminating fatigue. Rhodiola is a plant with excellent adaptation potential to Alberta. Supply of rhodiola on the world market is limited and restricted to wild crafting. The growing market demand calls for reliable cultivated commercial sources. The project seeks to build the foundation for the cultivation, processing and commercialization of rhodiola in Alberta within five years. The project targets are:

1. Identify market opportunities and potential buyers.

2. Collect and examine germplasm from across the world to decide which plants might be the best for commercial development
3. Develop basic agronomic techniques for rhodiola cultivation in Alberta (e.g. seed germination biology, vegetative propagation, age of seedling at transplanting, plant density, transplanting method, plant age at harvesting, fertilization, weed control, pest and disease)
4. Develop capacity for determining the authenticity and quality of the rhizome as well as methods for quantitative analysis of some of the biologically active compounds
5. Establish rhodiola production test plots at the Crop Diversification Centre North to serve as training, source of planting material and provide root for processing for test marketing
6. Develop a draft production manual for rhodiola based on the literature and experience gained from project
7. Compile health claim dossier for rhodiola

We undertook several field agronomic studies in 2004.

To establish the optimum plant density and spacing for growing rhodiola, we tested the following plant densities: 20,080 ha (60x83 cm), 39,682 (60x42 cm), 61,728 (60x27 cm), 83,333 (60x20 cm), 98,039 (60x17 cm) and (60x 13 cm). The plants were transplanted on May 31, 2004 at CDC North and will be harvested in the third or fourth year.

Weed Control

The objective was to establish non-chemical weed control options for growing economically rhodiola. Treatments consisted of plastic mulch, straw mulch, bark mulch, 1 hand weeding per year, 2 hand weeding per year, weed free, corn gluten bio-weed, organic pre-emergent herbicide, and red clover live mulch. Plant density was (60 x 20cm) and transplanting was done on June 1, 2004 and will be harvested in the third or fourth year.

Rhodiola Fertilizer Effect on Root Yield and Salidroside, Rosavin, Rosarin Content

The objective was to assess the response of rhodiola to inorganic N, P, K and organic fertilizers to yield and salidroside, rosavin and rosarin content. The treatments consisted of factorial combinations of three levels of nitrogen (0, 50, 200 kg/ha), two levels of phosphorous (0, 50 kg/ha) and three levels of potassium (0, 100, 200 kg/ha). In addition, there were these additional treatments: bone meal, 50 kg/ha P_2O_5 , rock phosphate 50 kg/ha P_2O_5, cow manure (50 ton/ha), hog manure (50 ton ha), red clover living mulch "Green Garden Organic Fertilizer" (NPK 100-50-63 kg/ha). The trial was transplanted on June 3, 2004 and will be due for harvesting in third or fourth year

Rhodiola Time to Economic Maturity

The objective was to establish time to economic root maturity. The treatments consisted of eight times of harvesting (6, 12, 18, 24, 30, 36, 42, 48 months) after transplanting. This trial was planted at CDC North, Fairview and Cremona.

Experimental Analysis of Characteristic Marker Compounds in Rhodiola rosea L. Grown in Alberta

Phenylpropanoids rosarin, rosavin, and rosin found in *R. rosea* are now the accepted markers of genetically pure *R. rosea*. The objective of this study was to evaluate the compounds in Alberta cultivated *Rhodiola rosea* to confirm its botanical purity and environmental suitability before commercialization.

A chromatographic separation has been developed for extracts of *Rhodiola rosea*. Six characteristic chemicals provide very strong mass spectral signals. Extraction with 85% methanol was more efficient than extraction with 60% methanol. UV absorbance signals provided questionable data for rosiridin and for some of the rosavins due to the presence of numerous other compounds including flavonoids that interfered with the absorbance signals. The rhizome sample contains proportionately more salidroside than the crown. The crown contains proportionately more rosarin, rosavin, rosin, rosiridin. The leaf material contains relatively little of the characteristic chemicals. There are substantial differences in the chemical profiles that can be attributed to either age or location. The characteristic compounds and the levels found in the Alberta cultivated *Rhodiola rosea* has confirmed it to be genetically pure. This work was done in collaboration with NovoKin Biotech Inc Edmonton.

Project 3: Fine-Tuning Agronomic Recommendations for Echinacea in Alberta

In Canada, Echinacea is one of the top 5 selling herbs with 35% of the market. Research information on the medicinal characteristics of echinacea is readily available. However, specific information about production costs and yields under both traditional and organic production is virtually non-existent. There are on-going field studies on plant density, spacing, time of establishment, organic and inorganic fertilization, mulching and yield to provide these vital pieces of information to growers to enable them to increase their yields and profits.

We tested six plant densities: 10, 20, 40, 80, 160 and 320 plants/m^2. We used Echinacea angustifolia and replicated the experiment 4 times. This study is in its third year and will be harvested in October 2005.

Echinacea Time of Planting and Winter Survival Trial

Echinacea bare roots seedlings were field transplanted at CDC North on June 6, June 26, July 17, August 7, August 28, September 18 and October 9, 2002 to study effects of time of planting on establishment and winter survival. This study is in its third year and will be harvested in October 2005. Winter survival in the third year ranged between 20-45%.

Echinacea Fertilizer Effect on Root Yield and Chemical Content

The objective was to assess the response of echinacea to inorganic N, P, K and organic fertilizers to yield and alkylamides content. The treatments consisted of factorial combinations of three levels of nitrogen (0, 50, 200 kg/ha), two levels of phosphorous (0, 50 kg/ha) and three levels of potassium (0, 100, 200 kg/ha). In addition, there were these additional treatments: bone meal, 50 kg/ha P_2O_5 , rock phosphate 50 kg/ha P_2O_5, cow manure (50 ton/ha), hog manure (50 ton ha), red clover living mulch "Green Garden Organic Fertilizer" (NPK 100-50-63 kg/ha). The trial was transplanted on June 3, 2004 and will be due for harvesting in the third year.

Preliminary Agronomic Evaluation of Special Crops

We continued with our observation on the adaptation of several special crops (cereals, pseudocereals, grain legumes, forages, oilseeds, aromatic, spice, medicinal). This also served as a demonstration plot at CDC North. In 2004, we grew yarrow (*Achillea millefolium),* arnica (*Arnica chamissonis),* mustard (*Brassica hirta (Sinapis alba),* safflower (*Carthamus tinctorius),* caraway (*Carum carvi),* quinoa (*Chenopodium quinoa),* teff (*Erogrostis tef),* buckwheat (*Fagopyrum esculentum),* Jerusalem artichoke (*Helianthus tuberosus),* woad (*Isatis tinctoria*), angelica (*Angelica archangelica)*, borage (*Borago officinalis)*, burdock (*Arctium lappa),* catnip *(Nepeta cataria),* chicory (*Cichorium intybus)*, Chinese milkvetch (*Asrtagalus membranaceus*), elecampane (*Inula helenium)*, feverfew (*Tanacetum parthenium*), goldenseal (*Hydrastis canadensis)*, marshmallow (*Althaea officinalis)*, milk thistle (*Silybum marianum)*, stinging nettle (*Urtica dioica),* St. Johnswort (H*ypericum perforatum) and* valerian (*Valeriana officinalis).*

The special crops program will like to acknowledge the contribution of Chunyu Jiao.

New Crop Development
Special Crops Program (Crop Diversification Centre South-Brooks, AB.)

By Manjula Bandara, Forrest Scharf, Judy Webber and Debbie Schuiling

The special crops program at the Crop Diversification Centre South (CDCS) at Brooks is primarily responsible for the evaluation, introduction and development of new crops for southern Alberta through applied and adaptive research projects. Some study projects are conducted in collaboration with other research programs at CDCS, other divisions of Alberta Agriculture, Food and Rural Development (AAFRD), University of Alberta, University of Saskatchewan, Agriculture and Agri-Food Canada, Applied Research Associations and industry partners. Different funding sources such as Agriculture Funding Consortium, regional variety testing programs and also several industry partners provide the financial support for the program.

Research Study Projects

Chickpea and Lentil Crop Improvement Project

In 2001, a five-year crop improvement project for chickpeas and lentils was initiated at the Crop Diversification Centre South, Brooks in collaboration with the Crop Development Centre, University of Saskatchewan, Saskatoon, Saskatchewan, where F_1 and F_2 generations of both crop species are raised. The main objective of this project is to develop new chickpea and lentil cultivars for southern Alberta under dryland conditions with specific selection criteria of high seed yield, early flowering, early and uniform maturity, resistance to common foliar and root diseases and desired market traits.

Seed of lentils and chickpeas $F_{2:3}$ generation from the Crop Development Centre, University of Saskatchewan and seed of $F_{2:4}$, $F_{2:5}$ and $F_{2:6}$ generations of chickpeas and lentils selected under field conditions in southern Alberta in previous years, were planted between May 10 and May 28, 2004, for further evaluation and selection.

Four hundred and seventy six $F_{2:3}$ lines and 12 cultivars of desi and kabuli chickpea micro-plots were planted at CDCS. A total of 88 micro-plots were selected and harvested based on desirable growth habits and crop maturity. Using seed quality and days to maturity as selection criteria, 45 $F_{2:4}$ lines were selected for further evaluation in 2005. Twenty-eight chickpea $F_{2:4}$ and 3 cultivars of desi and kabuli chickpeas were grown in standard small plots (6, 3-m long rows spaced 18-cm apart) at CDCS and Bow Island with two replicates at each location. Using plant growth traits, yield components and plant maturity, 14 lines were selected for further evaluation in 2005. Eight $F_{2:5}$ (4 desi and 4 kabuli) and 4 cultivars (Myles, Sanford, Amit and CDC Frontier) were grown in standard small plots at CDCS and Bow Island with 2 replicates at each location. Using plant growth traits, yield components and plant maturity, 5 lines (2 desi and 3 Kabuli) chickpeas were selected for further evaluation in 2005. Eleven $F_{2:6}$ (6 desi and 4 kabuli) and 4 cultivars (Myles, Sanford, Amit and CDC Frontier) were grown plots at 4 locations in Alberta (CDCS, Brooks; Bow Island Sub Station, Bow Island grower's site and Chinook Applied Research Association, Oyen) and 2 sites in Saskatchewan (Goodale Research Farm and SPG Research Farm, near Saskatoon), with 2 replicates at each location. The chickpea trials at Saskatchewan site were not harvested due to frost damage prior to crop maturity. However, Alberta trials were harvested as planned and data were collected. On average, the crop maturity ranged from 97 days (desi line 381-4 and 381-18) to 105 days (kabuli cultivar Sanford) and seed yields ranged from 2222 kg/ha (Sanford) to 3902 kg/ha (CDC Frontier). None of the $F_{2:6}$ kabuli lines produced significantly heavier seed than that of Sanford or CDC Frontier. However, based on crop growth and development, crop maturity, seed quality and size, and seed yield, six $F_{2:6}$ lines (three desi and three kabuli) were selected for further evaluation and selection in 2005.

Three separate studies were conducted using seed of $F_{2:5}$ generation at 2 test sites (CDCS, Brooks and Bow Island Sub Station) with 2 replicates at each site.

Study 1: This study included 10 lines (8 red and 2 green) and 4 cultivars (CDC Redberry, CDC Robin, Sovereign and Laird). Days to crop maturity, 1000-seed weight and seed yield were determined. On average, crop maturity varied from 79 days (1900-4, 1881-7 and CDC Robin) to 88 days (Laird) and seed yield varied from 1286 kg/ha (CDC Robin) to 2252 kg/ha (CDC Redberry). Based on these overall evaluations, 2 lines from each red and green lentil group were selected for further evaluation in 2005.

Study 2: 17 red lentil lines and 2 cultivars (CDC Redberry and CDC Robin) were evaluated at two test sites (CDCS, Brooks and Bow Island Sub station) with 2 replicates at each site. On average, crop maturity varied from 79 days (2120 S-3) to 87 days (CDC Redberry) and seed yield varied from 1391 kg/ha (2120 S-3) to 2378 kg/ha (1967 S-5).
Based on overall evaluation, 8 red lentil lines were selected for further evaluation in 2005.

Study 3: The same test sites were used as in Study 1, using 17 small green lentil lines and 2 cultivars (Milestone and Eston). Crop maturity varied from 77 days (1986 S-4 and 1987 S- 16) to 81 days (1986 S-3) and seed yield varied from 1057 kg/ha (1984S-1) to 1821 kg/ha (1887T-4). Based on overall evaluations, 5 small green lentil lines were selected for further evaluation in 2005.

Six $F_{2:6}$ lentil lines and 2 cultivars (CDC Redberry and CDC Robin) were grown at 4 locations in Alberta (Brooks; Bow Island Sub Station, Bow Island grower's site and Oyen) and two sites in Saskatchewan (Goodale and SPG Research Farms, near Saskatoon), with two replicates at each location. The trials at all test sites were harvested. On average, crop maturity varied from 80 days (P4-2) to 84 days (CDC Redberry) and seed yield varied from

1414 (CDC Robin) to 1737 kg/ha (P5-2). Based on evaluations, 3 lines selected for further evaluations in 2005.

Fall Versus Spring Seeding of Desi Chickpeas

Fall seeding, or dormant seeding, refers to the planting of spring crop species in the fall, prior to freeze up the ground. A field study was conducted in 2003/2004 cropping season at CDCS, using the desi chickpea cultivars Myles and small-seeded kabuli cultivar CDC Chico. Treatments included one seeding date in late fall (October 28, 2003) and two seeding dates in early spring (April 27 and May 20, 2003). Seeding of fall-seeded treatment was carried out using 1 and 1.5 times the recommended seeding rates for uncoated seed and the recommended seeding rate for plastic polymer-coated (Grow Tec Inc. Edmonton, Alberta, Canada) seed treatment. The recommended seeding rate was used for the spring-seeded treatments. Treatments were arranged in a randomized complete block design (RCBD) with 4 replications. Each plot was 6.0 m long and consisted of 6 rows, spaced 17.5 cm apart. The crop was grown under rain-fed conditions. Data collection included stand count at 5 weeks after spring seeding, date of first flowering, date of maturity, plant height at harvest, 1000-seed weight, number of seeds per plant at harvest, harvest index and plot seed yield after eliminating borders.

On average, CDC Chico plants were significantly taller than Myles plants. Moreover, fall-seeded crops were significantly taller than the spring-seeded crops. On average, CDC Chico produced a significantly heavier seed than Myles. Late spring-seeded crop produced significantly heavier seed than early spring-seeded crop. Irrespective of seed coat treatment or seeding rate, fall-seeded crop produced seed with comparable weights. Increasing seeding rate of fall-seeded treatments from 1x recommended rate to 1.5 x recommended rate did not increase plant density or seed yield. On average, plant population density of the fall-seeded, uncoated seed at recommended seeding rate was comparable with that of the fall-seeded plastic polymer seed coat treatment, which was about 42% of the plant population of the early spring-seeded crop. This indicates that the plastic polymer seed coat treatment had no beneficial effect on seedling establishment of the fall-seeded chickpea crop. Despite that, among fall-seeded treatments, seed coat treatment produced a significantly higher seed yield compared to the uncoated treatment with 1 x recommended seeding rate.

On average, Myles produced a significantly higher seed yield than CDC Chico. The earlier spring-seeded crop produced about 40 % higher seed yield than the later spring-seeded crop. On average, plants from the fall-seeded treatments of both cultivars flowered and attained maturity 15 days and 28 days, respectively earlier than the early spring–seeded crop. Lower plant density and seed yield of CDC Chico, compare to Myles mainly due to poor over wintering ability of the CDC Chico crop. Thus, further studies are required to elucidate the factors affecting over wintering ability of chickpeas.

Impact of Seed Size Planted on Crop Phenology and Seed Yield

The size of the seeds planted has been shown to have a significant impact on seedling establishment, seedling vigor and crop growth of several small-seeded field crops such as canola, mustard, coriander and carrot. Conversely, other studies have revealed that the seed size had no significant impact on plant growth, development and seed yield of large-seeded crops such as chickpeas. Two studies were conducted at Crop Diversification Centre South to examine the effect of size of seeds planted, on seedling growth, seed yield and seed size profile of the resulting crop of 4 kabuli chickpea and 4 pinto bean cultivars at CDCS, Brooks.

Kabuli Chickpeas

Three large-seeded kabuli chickpea cultivars, Sanford, Evans and CDC Xena, and one small-seeded kabuli cultivar, CDC Chico were used for this study. Seed of each chickpea cultivar were screened into two size categories, for large-seeded cultivars, <8.7 mm and >8.7mm, and small-seeded cultivar, < 8.1, and > 8.1 mm. These treatments (cultivar x seed size) were seeded at the recommended seeding rate (55 seeds m^{-2}). In addition, another treatment using smaller seed category of all chickpea cultivars at 1.4 x recommended seeding rate was included. The treatments were arranged in a RCBD with 4 replications. Each plot was 6.0 m long and consisted of 6 rows, spaced 17.5 cm apart. The crop was grown under rain-fed conditions using recommended cultural practices. Data collection included stand establishment at 5 weeks after seeding, date of first flowering, plant height at first flowering, date of maturity, number of seeds per plant at harvest, 1000-seed weight, harvest index, plot seed yield after eliminating borders.

The chickpea cultivars differed in plant height, seed yield components and seed size distribution, but the size of seed planted had no significant impact on most of these parameters. The large-seeded chickpea cultivars, Sanford and Evans were taller than the large-seeded cultivar CDC Xena and the small-seeded cultivar CDC Chico. All three large-seeded cultivars flowered simultaneously, but 6 days later than CDC Chico. On average, CDC Chico matured at least 4 days earlier than the large-seeded chickpeas. All three large-seeded chickpea cultivars produced fewer seeds per plant, compared to CDC Chico. Despite these phenological differences, the lack of a significant impact of seed size planted, on plant growth, seed yield components and seed yield suggests that smaller seed of kabuli chickpea can be used for planting without affecting seed yield or the seed size profile of the resulting crop. Moreover, the use of smaller seed category at higher seeding rate (1.4 x recommended seeding rate) had no significant effect on seed yield. This assumes the reduction in seed size not due to disease infected seed or immature seed. If a smaller seed category is used for planting purposes, the grower could reduce their seed cost due to reduced seeding rate and transportation costs. At the same time, the larger seed portion of the crop can be sold at a premium for human consumption.

Pinto Bean

The seeds of the four cultivars (Othello, Fargo, CDC Pintium and CDC Pinnacle) were screened into four size categories (<7.1 mm, 7.1-7.9 mm, 7.9-8.7 mm and > 8.7 mm in diameter). These seed categories of the 4 bean cultivars were seeded at the recommended seeding rate (55 seeds m^{-2}). In addition, a treatment using the 7.1 –7.9 mm seed category at 1.3 x recommended seeding rate was also included. The crop was seeded at a spacing of 0.18 m between rows in late May, 2003 and was grown under irrigation using recommended cultural practices. Treatments were arranged in a 4 (cultivar) x 5 (4 seed size + 1 smaller seed category at higher seeding rate) factorial structure in a Randomized Complete Block Design (RCBD) with 4 replications. Plant population density at five weeks after seeding, plant height at harvest, 1000-seed weight, test weight, plot seed yield and seed size distribution of the resulting crop were determined. Data were subjected to ANOVA and treatment means were compared using an LSD test.

Pinto bean cultivars differed in plant height, mean seed weight, seed density, and seed yield. On average, CDC Pinnacle and Fargo produced the tallest plants whereas Othello produced the shortest plants. Regardless of cultivar or size of seed planted, all the bean cultivars flowered on July 23, 2004. There was a difference in crop maturity among cultivars, but size of seed planted had no impact on crop maturity. Among bean cultivars, CDC Pintium matured earliest (102 days after seeding) whereas CDC Pinnacle matured latest (119 days after seeding). Both Othello and Fargo matured 116 days after seeding. On average, CDC Pinnacle produced the heaviest seed and Othello produced the lightest seed. On average, the size of seed planted had no significant impact on seed yield, final plant height, test weight or plant population density. These results indicate that smaller seed categories can be used for seed purpose without having any adverse impact on seed yield, while larger seed categories can be used for human consumption purpose. Moreover, use of the 7.1 –7.9 mm seed category at 1.3 x recommended seeding rate had no benefit to seed yield of the resulting crop.

Evaluation of Rosemary as a Potential Medicinal Plant for Alberta

Rosemary (Rosmarinus officinalis L.), a member of the Labiateae or mint family, is a slow growing, cold sensitive, woody perennial cultivated for its aromatic foliage. The crop is used primarily as a culinary herb with meats, vegetables and in soups. In traditional medicine, the plant is used as an astringent and diuretic, and to increase menstrual flow. Interest has been increased in using rosemary extracts as a source of phenolic compounds, which possess antioxidant properties that can be used in commercial food preparations. Norac Technologies, a division of Newlywed Foods in Edmonton, AB is currently extracting antioxidants from leaves of imported rosemary, using a supercritical fluid extraction method. Preliminary studies conducted at the Crop Diversification Centre indicated that rosemary plants produced under field conditions are superior in antioxidant content than imported rosemary. Norac Technologies is interested in using this high quality locally grown rosemary for their processing. This will require a detailed economic, risk, and logistic analysis of the cost and methods of production, screening of potential cultivars for foliage yield and antioxidant content. Several field studies were conducted :

- To assess the possibilities of growing rosemary as an annual crop under field conditions in southern Alberta
    - To evaluate the impact of freezing temperatures exposed in the field, and killing frost on plant growth and antioxidant content in rosemary
    - To evaluate effect of age of the rooted stem cutting planted in field, on growth and productivity of rosemary
    - To evaluate the effect of planting density and soil nitrogen content on plant growth, productivity and product quality of rosemary

Field Study 1: Rosemary cultivar evaluation for plant growth, foliage production and phenolic compound content.

This study was conducted using 8-week-old rooted stem cuttings of eleven promising rosemary cultivars namely: Arp, Barbeque, Majorca, Pink Majorca, Rex, Santa Barbara, Severn Seas, Standard, Blue Lagoon, Primely Blue and unnamed cultivar. Prior to the final land preparation, the test site was fertilized with 12:51:0 (N:P:K) fertilizer mixture at a rate of 42 kg ha^{-1}. Stem cuttings were transplanted into the field on June 1, 2004, at a plant population density of 16.7 plants m^{-2}. Each experimental plot (cultivar) consisted of 4 rows spaced 30 cm apart and each row contained 12 plants spaced 20 cm apart. Treatments (cultivars) were arranged in a randomized complete block design (RCBD) with 4 replicates. The crop was grown under irrigation and several rounds of hand weeding were carried out to keep the crop free of weeds. Data was collected: 1) before the 1st frost, 2) after the 1st frost, 3) Before "killing frost", and 4) after "killing frost". Data included: plant height, plant diameter, above ground dry weight, leaf and stem dry weights, and total phenolic activity (TPA = total phenolic content = Carnosic acid+ Carnosol+12-Methoxy Carnosic acid content, expressed as a percentage of leaf dry weight), using plants from middle rows of each plot. The phenolic compound extractions and quantification are being performed at Norac Technologies, Edmonton, AB, Canada.

Rosemary cultivars differed in plant growth. Cultivars Arp, Barbeque, Rex and unnamed cultivar were produced taller plants with larger diameters. After being exposed to the freezing temperatures in the field, the plant growth of all the rosemary cultivars appeared to be arrested. However, impact of freezing temperature and killing frost on total phenolic content is still being investigated. The analysis of those compounds is in progress. In rosemary, foliage portion is the most important plant part since it contains over 85% the total antioxidant content (TA = total activity). The leafiness (dry weight ratio between foliage portion and the total above ground portion) is more important than the total aboveground biomass production. Among the tested cultivars, Rex produced the highest (28.9 g DW/plant) and unnamed cultivars produced the second highest (25.1 g DW/plant) foliage biomass. Cultivars Barbeque, Standard and Primely Blue produced comparable foliage yields, but all were significantly lower than that of Rex. However, promising cultivars will be selected based on the productivity of phenolic compounds (phenolic compound % x foliage dry matter yield), once the phenolic compound analyses are complete.

Study 2: Effect of nursery age of rooted stem cutting on plant growth and foliage production in rosemary

This study was conducted to evaluate the impact of age of rooted stem cutting on plant growth, productivity and total phenolic content of rosemary cultivar Majorca using 4-, 6- and 8-week-old rooted stem cuttings. The stem cuttings were transplanted at a spacing of 30 cm x 20 cm (16.7 plants m^{-2}) in 4 rows. Cultural practices were similar to that of the rosemary cultivar study. Data collection included plant height, plant diameter, total above ground biomass, and leaf and stem dry weights. Data was collected in mid September (just prior to a mild frost). Results indicated that age of rooted stem cutting had no significant impact on plant height and diameter, but an increasing trend in both total biomass and leaf production was observed as the length of rooting period increases from 4 weeks to 8 weeks. However, the trend was not statistically significant. Thus, these results suggest that 4-week-old rooted stem cuttings can be used as a planting material for field production of rosemary. However, further studies are required to examine effective means for accelerated root growth of rosemary stem cuttings during the nursery period.

Study 3: Effect of plant population density and soil nitrogen content on plant growth and total phenolic compound content of rosemary.

This study was conducted to evaluate the effect of plant population density and soil nitrogen content on crop growth and total phenolic compound content of rosemary cultivars Majorca and Rex. The cultural practices were similar to the cultivar evaluation study. Basal fertilizer mixture (N: P: K = 12:51:0 at a rate of 42 kg ha^{-1}) was applied prior to the final land preparation. Treatments included three plant population densities (40 cm x 20 cm = 12.5 plants m^{-2}, 30 cm x 20 cm = 16.7 plants m^{-2}, and 20cm x 20cm=25 plants m^{-2}), and four nitrogen rates (0, 50, 100, and 200 N kg ha^{-1}) arranged as factorial combinations. Each plot consisted of four rows and each row contained 12 plants. The treatments were arranged in a split-split design with 3 replications and data were collected from the middle row plants. Data collection included plant height and diameter, total biomass production, leaf and stem dry weights and TPA and total phenolic compound. Data was obtained just prior to the first frost in mid September.

The two rosemary cultivars used in this study were significantly different from each other in terms of biomass production (total and foliar), but not in plant height or lateral growth measured through plant diameter. Planting space (population density) had a significant impact on biomass production and plant diameter, but not on plant height.

The highest leaf production and antioxidant yield were observed from the plants grown at a spacing 30 cm x 20 cm at 50 N kg ha^{-1} and increasing N rates from 50 to 100 N kg ha^{-1} had no beneficial effect on either leaf production or antioxidant production.

Evaluation of Chicory Cultivars and Timing of Harvest for the Production of Inulin in Southern Alberta

Chicory (Cichorium intybus) is a perennial plant belonging to the Asteraceae (sunflower) family. Chicory roots contain relatively high levels of inulin and fructo-oligosaccharides, which have been shown to have prebiotic effects such as enhancing the growth of lactobacillus in the human intestine which can improve the balance of the beneficial bacteria in the bowel. Rogers Sugar Ltd. of Taber, is interested in diversifying, by adding chicory-based sugar into the production line. Chicory is a relatively new commercial crop to North America, thus information on cultivars with high quality inulin content, and cultural practices for root production on the Canadian prairies is lacking. A study was conducted at three locations, Brooks, Bow Island, and Taber, using six chicory cultivars; Arancha, Beryl, Mauraine, Orchies, Magdeburg and Turquoise, to examine the adaptability and productivity of the chicory cultivars, as well as the impact of date of harvest and storage period on root inulin content and quality. At the Taber site, all the cultivars but Magdeburg were included. The crop was grown with supplementary irrigation and moderate soil fertility conditions (200 kg N/ha and 60 kg P_2O_5/ha). The crop was harvested on two separate dates, mid September and mid October. Root samples from each harvest were stored at 4 –5 °C for 5 weeks to examine the impact of date of harvest and storage period on the inulin content of the roots.

At all three locations, date of harvest and cultivar produced a significant impact on root and total fructan yields of chicory crop. In addition, storage period significantly influenced the moisture and fructan content of chicory roots. The total biomass (foliage and root fresh weight) yields of chicory cultivars were determined at Brooks and Bow Island. At Taber, only the root yields were determined. At Brooks, the total biomass fresh weight the mid September-harvested crop was 71.5 t/ha whereas the mid October-harvested crop had 80.0 t FW/ha. Increase in root yield was the main reason for this biomass increase. At Bow Island, the root yield of the mid October-harvested chicory crop was significantly higher than that of the mid September-harvested crop. In contrast, foliage biomass of the late harvested crop was significantly lower than the early harvested crop. Overall, however, the total biomass yield of the mid September-harvested crop was significantly higher than that of the mid October-harvested crop. In Taber, average root yield on the mid October-harvested crop was significantly higher than the mid September-harvested crop. Furthermore, late-harvest Mauraine produced the highest root yield (9.4 DW t/ha), among the cultivars tested.

On average, late-harvested crops produced heavier roots with larger diameters, compared to early-harvested crops at all three test sites. Among the chicory cultivars, Mauraine produced the heaviest roots with the largest diameter. On average, depending upon test site, mid October-harvested crops produced 1.4 to 1.7 times higher fructan yield (root yield x root fructan content) than the mid September-harvested crops. At all three test sites, on both dates of harvest, Mauraine produced the highest fructan yields, but in most cases, the fructan yield of Mauraine was comparable with that of Arancha and Orchies. At Taber, the late harvested Mauraine root produced the highest fructan yields among the cultivars. The root moisture and fructan contents were significantly reduced as a result of storage. However, mid October-harvested chicory roots are more suitable for storage with minimal loss of moisture and fructan content, compared to that of mid September-harvested roots.

In summary, Mauraine and Orchies are the best chicory cultivars for higher fructan production in southern Alberta, and for the maximum fructan yield, the root should be harvested in mid October. Late-harvested roots (more mature roots) are much more suitable for storage than early harvested roots. The quality analysis of inulin (degree of polymerization) is in progress at the Olds College School of Innovation, (Olds, Alberta) and results will be available in late March.

Crop Selection and Improvement

The seed of Echinacea angustifolia, E. pallida, E purpurea and borage and the stolons of peppermint, spearmint and Alaskan mint were treated with mutagenic compound, Ethyl Methanesulphonate (EMS) in 2000. Treated seeds and stolons were planted in plugs or pots and placed in a greenhouse. In early spring, both Echinacea and mint species were transplanted in the field. Echinacea species are being visually evaluated for aster yellows disease resistance and medicinal quality. The mint species are being evaluated for over wintering ability and essential oil contents. Foliage of individual mint plants raised from the treated stolons was used to extract essential oil and crop selection based on essential oil content, oil composition and over-wintering ability is in progress.

The seed harvested from borage plants from EMS-treated seed were planted in spring 2004 in the field for selection and seed multiplication. Based on maturity, borage plants were categorized into several groups and further selection is in progress based on seed shattering, and seed oil content.

Regional Cultivar Evaluations

Newly recommended cultivars and promising lines of chickpeas, dry beans, field peas, lentils and fababean received from various pulse breeding programs are evaluated under growing conditions in southern Alberta, to select the most promising cultivars for the region.

The emphasis of the dry bean cultivar testing is on yield performance, early maturity and architecture of a dry bean plant that allows for narrow row configurations, direct combining and consequently an expansion of dry bean production to areas in Alberta.

Majority of bean cultivars/lines for this evaluation receives from the dry bean crop improvement programs at Agriculture and Agri-food Canada Lethbridge Research Centre and the Crop Development Centre at the University of Saskatchewan.

Five field studies were established using various dry bean lines/varieties in late May, 2004, at the Bow Island sub station (1 coop, 1 narrow row and 1 wide row under irrigation) and at CDCS (1 narrow row and 1 wide row under irrigation). Performance of most bean cultivars/lines was site-specific. Among the cultivars evaluated , Othello, AC Polaris, AC Redbond, Viva, CDC Minto and AC Black Diamond produced the highest seed yields with a range of 2429 kg/ha to 3631 kg/ha.

Two field pea cultivar evaluation studies were conducted at CDCS and Bow Island sub station, to evaluate varieties/lines for regional adaptation. At both test sites, under rain-fed conditions, 7 green pea cultivars/lines produced comparable seed yields ranging from 1750 to 2013 kg/ha in Brooks and 1066 to 1281 kg/ha at Bow Island. Among the 17 yellow field pea cultivar/lines evaluated, DS Admiral (1848 kg/ha) and Eclipse (1830 kg/ha) produced the highest seed yield at Brooks, and Eclipse (3887 kg/ha) and CDC Mozart (3666 kg/ha) produced the highest seed yield at Bow Island.

Different lines and registered varieties of other pulse crops, such as chickpeas, lentils, soybeans and faba beans were evaluated for regional adaptation. Two chickpea tests were established at CDCS and the Bow Island. Among the 13 cultivars evaluated, CDC Desiray and Sanford produced the highest seed yields at Bow Island and CDC Frontier and Amit produced the highest seed yields at Brooks. Among the 7 large seeded lentil lines evaluated, CDC Vantage and Laird produced the highest seed yield at Brooks and CDC Plato and CDC Vantage produced highest seed yield at Bow Island. Among the red lentils, CDC Redberry and line 1145-3-6 produced the highest seed yields at Brooks, and CDC Viceroy and Redberry produced the highest seed yields at Bow Island. Two soybean tests were established at Brooks (rain-fed) and Bow Island (irrigated), using 9 cultivars received from the oilseed breeding program at Agriculture Canada Research Station in Ottawa. Soybean cultivars Gentleman, AC Orford and OAC Prudence produced highest yield among the cultivars tested. Seven faba bean cultivars were evaluated under irrigated conditions at Bow Island sub station. Among the cultivars tested, Earlibird, Scirocco and Ben produced the highest seed yields.

Several cultivars/lines of silage and grain corn were established for regional adaptation. Both silage and grain corn performed very well under both Bow Island and Brooks growing conditions.

Evaluation of New Pulse Crop Species

Seed of unnamed and named lines of mung bean (Vigna radiata L. Wilczek), black gram (Vigna mungo L. Hepper.), moth bean (Vigna aconitifolia) and pigeon pea (Cajanus cajan L. Millisp) were planted in the research field at CDCS in mid May, 2004. Crop maturity was challenged by cool and wet growing season so that only moth bean and black gram were able to harvest in 2004. Further evaluation and selection will be conducted in 2005.

Extension and Industry Development Activities

Program staff continued to answer numerous inquiries on the production of special crops, particularly on herb, spice and essential oil crops. Several field days and workshops were organized and research information was contributed on special crops to producer newsletters and the news media. Test plots of various special crops including pulse crops and medicinal herbs at CDCS and Bow Island were visited by a large number of interested individuals and groups. Extension staff and other interested parties were provided with planting materials for demonstration and field testing to assist herb, essential oil and spice producers evaluate new crops and to develop agronomic practices.