

Soils and Crops Workshop 1999

A Comparison of the Expected Returns for Dryland and Irrigated Crops in Saskatchewan

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Introduction

An ongoing debate has occurred in Saskatchewan and Western Canada over the relative merits of dryland and irrigated agriculture. In Southern Alberta, where the climate is significantly drier than other areas of the prairies, it was decided early on that irrigation was necessary for a viable agriculture in that area. The Alberta Government became active in promoting irrigation projects throughout their province, so that Alberta currently has 60% of the irrigated crop land in Canada. Saskatchewan is next with 240,000 to 320,000 acres which are or can be irrigated with sufficient water supplies.

However irrigation is not viable in all areas of the prairies, as the additional returns may not compensate for the additional costs, even if water supplies are accessible. Vegetable crops in almost all areas of Canada are more profitably grown under irrigation where this is available, because vegetables are a high value crop. In the Outlook and Lake Diefenbaker area of Saskatchewan additional land could be irrigated if producers were convinced it would be profitable for them. Irrigation in the Outlook area is generally used on many crops which are also grown in nearby dryland areas, with a significant expansion into potatoes in recent years.

Explanation of Cost Data

Outlook lies in the beginning reaches of the dark brown soil zone. Areas in the black soil zone would generally be considered to have sufficient rainfall that irrigation would not be a profitable venture. This paper compares the expected returns for growing crops under irrigation in the Outlook area with the expected returns for the dark brown soil zone dryland areas, but using yields which reflect the five year averages for all of Saskatchewan. The Outlook yields are approximately 85% of the smaller plot yields obtained through the trials conducted at the Saskatchewan Irrigation Diversification Centre. These are believed to be representative of the yields that can be obtained in the Outlook area under best management practises.

There are two major groups in Saskatchewan which compile cost of production data. Saskatchewan Agriculture and Food provides estimated budgets on an annual basis for all the major field and specialty crops in the respective soil zones. The budgets for traditional dryland crops use 1999 data for the dark brown soil zone. Specialty crop data are drawn from the alternative crop budgets.

Irrigation production costs are compiled by the Irrigation Crop Diversification Centre, formerly being derived by the Saskatchewan Water Corporation. The Saskatchewan Irrigation Diversification Centre uses these cost data and yields obtained at the centre itself, and expected prices obtainable through forward contracting or indicated by futures prices, current prices, and average prices to estimate returns for irrigated crops each year, with updates through the year as prices change.

Table 1 represents the expected irrigated crop returns with a calculation of the return on investment, and the return per acre to land, management, and investment, which is more commonly used by producers to judge their crop alternatives using their own expected yields. Using the same prices, but five year average yields for all of Saskatchewan, **Table 2** represents a similar comparison for dryland crops, but not specific to the Outlook area.

Comparing Irrigated and Dryland Production

Net returns are the gross returns minus the costs per acre. These are divided by the investment costs to obtain the return on investment (using fixed costs only, not variable costs). The total costs are the fixed plus the variable costs. Net returns can also be expressed as the yield times the difference between the price of the commodity and its cost of production per tonne. In **Table 3** there is a comparison of the costs of production per tonne for irrigated and dryland production using the data from which Tables 1 and 2 are derived. These tables appear in the appendix, although investment costs have only been illustrated for irrigated crops.

From Table 3 it could be concluded that there are more crops for which the cost of production per tonne is cheaper under dryland conditions. This includes barley, hard red, prairie spring and durum wheats, canaryseed, flaxseed, Desi chickpea, lentil, field peas, oil sunflower, seed potato, and borage. While several spice crops have dryland costs of production, these have still not been finalized under irrigation to draw a comparison. The crops which appear to have some absolute advantage in cost of production **per tonne** (or due to quality considerations) under irrigation are alfalfa, soft white spring wheat, dry beans, fababeans, oats, mustard, confection sunflower, processing and table potatoes, timothy grass, and spearmint. Canola costs of production are very similar under irrigated and dryland management with a slight edge to irrigation in this calculation. Kabuli chickpeas under the assumptions used appear to also be favored for irrigated production, but have generally been grown in dryland areas. Further research on irrigated chickpeas would be needed to confirm this apparent advantage.

Return on Investment

It should be noted that the return on investment used in these calculations differs from the traditional calculation of this business indicator by the inclusion of the interest on fixed investment as a cost. Traditional calculations of the return on investment exclude the interest on fixed investment as a cost because this is considered part of the returns on the investment. To calculate the traditional return on investment, the discount rate of 7% can simply be added to each return calculated in the table. Agricultural producers normally do consider interest on fixed investment as part of their cost, which differs from the approach of business investors. The return on investment

is not the indicator used here to compare dryland and irrigated costs, but adopting the business approach would generally make all returns appear more positive. The calculation used for this indicator could be termed the **economic** return on investment.

The Effect of Yield and Price in Comparing Net Returns

Returning to Table 3, the calculation of the absolute costs of production per tonne could be used as a distinguishing factor to determine dryland and irrigated crops. However the calculation of net returns multiplies **yield** times the difference between price and cost per tonne.

$$\text{Net Returns} = \text{Yield} \times (\text{Price per tonne} - \text{Cost per tonne})$$

Therefore it is more accurate to compare estimates of returns to land, management, and investment which also takes into consideration the **price** factor.

The relative comparison of dryland and irrigated crop returns depends upon prices. As prices rise, irrigation will look more profitable. Advantages of dryland agriculture (at least in Saskatchewan) will appear greater when prices are lower. So 1999 is a year in which commodity prices are generally expected to be on the low side. This should tend to favor dryland production in this type of a comparison.

Using irrigation tends to give greater extremes in returns. If prices rise or are above average, irrigation returns will widen out. If they fall there will be greater losses. In 1999 prices are below average on grains, peas, fababeans, pinto beans, great northern beans, pink beans, canary seed, and spearmint. They are above long term averages on alfalfa, timothy grass, mustard, flaxseed, black beans, small red beans, chickpeas, most forage seeds, and potatoes. Canola prices were above average until their recent fall along with soybean oil. Both canola and sunflowerseed oil may turn out to have just average prices in 1999, while confection sunflower has fallen, but still appears above average.

Average Crop Returns

Table 4 gives an average of returns to land, management, and investment for all of the crops for which there are data for both dryland and irrigated production. Even though there are more irrigated crops which show a negative return, the overall average return is still higher for the irrigated crops. This is because those crops with above average prices tend to have significantly higher returns under irrigation, in particular potatoes. This is despite the fact that seed potatoes, by these data, have an absolute cost of production per tonne that is lower in dryland areas. The higher yields make a significant difference for higher value crops.

For a grower with irrigation it is even more important to distinguish between the crops which will bring a profit and those which risk losses due to lower prices. The average returns do not take into consideration the additional crop choices that a grower with irrigation has. Many crops such as dry beans, soft white spring wheat, fababeans, spearmint, confection sunflower, and processing potatoes are either too risky in dryland areas, may not be granted a contract, may not have proper quality, or simply may not be able to compete at low enough costs of production with irrigated

product. There is nothing to bind a grower to producing the crops with the lowest returns.

In fact growers with irrigation would do well to anticipate which crops dryland growers are likely to favor in a given year, anticipate that prices will fall as a result of that increased production, and then choose a crop which either has an advantage under irrigation or which dryland growers may not risk due to the lack of sufficient water. It is unlikely that irrigation growers in Saskatchewan will produce enough of an irrigated crop to sway prices, but dryland growers will. Even with over a doubling in seed potato area in 1998, prices stayed relatively firm. Unfortunately this was not the case for spearmint. In 1999 only canola (of the major crops) appears to be reacting to the downside due to a prospect of increased production.

If crop returns are averaged for all the irrigated crops and all the dryland crops appearing in Tables 1 and 2, the advantage of irrigation is even more striking. In fact potato land rented in the Lake Diefenbaker area in 1998 for prices that would have paid for the investment in irrigation, even if all the other crops in the rotation showed no increase in returns above their dryland alternative. Irrigation growers have recently benefited by diversifying into dry beans, while being able to capture their natural advantage in alfalfa, and benefit from the higher canola, flaxseed, and mustard prices as well. Durum wheat has been the usual cereal choice for rotational purposes. Timothy grass offers some promising returns, but this is just starting in Saskatchewan. Hullless oats or groats may also be an option for the weanling pig industry. In Alberta soft white spring wheat has been popular, especially with higher wheat prices, barley silage for the high priced Lethbridge feedlots, sugar beets, and now processing potatoes in both Alberta and Manitoba.

Value Added Industries

In fact processing industries such as french fries for potatoes, sugar processing, vegetable processing, and livestock feeding not only require water, but find that irrigation lowers their input costs. This does not mean that fledging industries have not been without their growing pains as Outlook producers learned this year with their essential oil plant. New crops mean new risks until efficient and dedicated processors, and reliable markets, are established. The success of the seed potato industry has notably changed the landscape in both Outlook and Lucky Lake. In the case of seed potatoes it can be noted that the higher net returns which can be expected with irrigation and higher prices, have promoted their expansion under irrigation in Saskatchewan, even though the comparison of absolute costs of production (not considering yields and prices) might lead one to conclude they could do better in traditional dryland areas.

Future Direction

Until growers have learned best management practises, and invested in the necessary equipment for some of the crop alternatives under irrigation, the returns shown on these budgets may appear rather distant. There will not be a strong incentive to expand irrigation until crop prices rise again and stay higher for a longer period. Returns on vegetables look promising where growers can obtain sufficient storage and labour at minimal costs. Many dryland growers will lack water sources for irrigation, and those that do have a source may lack the capital to get started.

One further thing to note, however, about these budgets is that the dryland yields are based on the

past five years, when there has not been a significant drought in Saskatchewan. If irrigation has an advantage when there has been sufficient rainfall for most crops, and prices are mostly below average, the security it offers in dry years will be even more dramatic.

Market Analysis

The calculation of costs and returns can be used to help determine price levels at which to lock in prices, especially for irrigation when some crops are indicating returns about 5 to 7% above the discount rate. When prices are low, there may be no good selling price, but dryland and irrigated costs of production may help to determine when markets are bottoming out. The price which yields a zero return on irrigated investment is really only about the middle level of normal commodity price fluctuations. A specific discussion of market analysis using costs of production will, however, be left to another time.

Outlook for 1999

Table 5 has been designed for the irrigation grower to help determine which crops to grow based upon this type of comparison between dryland and irrigated crop returns based upon expected prices. Higher priced crops will appear good to growers in both categories. Table 5 makes a direct comparison with dryland production showing only the differences based on yields, costs, and deducting the cost of irrigation. Growers will try to avoid crops with negative expected returns, with below average prices, or without a significant advantage due to irrigation. With a high price which can be forward contracted, Kabuli chickpeas are among the irrigation options, but Desi chickpeas appear better for dryland areas. In 1999 mustard offers a better expected return than canola, even though both crops have comparable yields under irrigation. This is partly because most growers would prefer to produce canola. Potatoes have a clear advantage under irrigation whether considering seed, table, or processing. Pinto beans may not have above average prices, but dry beans as a group will allow a grower to maximize his irrigation advantage. Alfalfa prices are low, but still have a significant advantage under irrigation compared to other crops. Coriander prices have dropped reducing their competitive advantage for production under irrigation. Caraway, fenugreek, and fababeans may be crops that would not catch the attention of dryland growers at the moment either due to lower prices or unsatisfactory dryland yields. Vegetables and possibly herb crops clearly offer the most significant advantage to a grower with irrigation.

Table 1. Expected Irrigated Crop Returns - 1999 -- Saskatchewan

Crop					February 11, 1999			Returns	
	Expected Yield kg/ha	Expected t/acre	Expected Price \$/t	Expected Returns \$/acre	Investment \$/acre	Total Costs \$/acre	Land and Manage- ment \$/acre	(4) Economic Return on Investment (%)	Per Acre to Land, Mgmt, and Investment \$/acre
Alfalfa	9637	3.900	75	293	1211	261	41	3%	73
Timothy Grass (3)	10410	4.213	130	548	1183	369	28	15%	207
Barley	5671	2.295	110	252	1206	313	53	-5%	-8
Oats (milling)	4726	1.913	110	210	1206	312	53	-8%	-49
Triticale	5348	2.164	120	260	1206	327	53	-6%	-14
CPS Wheat	4653	1.883	145	273	1206	329	53	-5%	-3
SWS Wheat	5132	2.077	145	301	1206	327	53	-2%	27
CWRS Wheat	4124	1.669	160	267	1206	325	53	-5%	-5
Durum Wheat (2CW)	4235	1.714	170	291	1206	329	53	-3%	15
Green Peas	3294	1.333	160	213	1206	304	53	-8%	-38
Yellow Peas	3294	1.333	160	213	1206	304	53	-8%	-38
Fababean	3659	1.481	209	309	1206	301	53	1%	61
Flaxseed	2430	0.983	312	307	1206	320	53	-1%	40
Oriental Mustard	2407	0.974	419	408	1206	316	53	8%	145
Yellow Mustard	2216	0.897	397	356	1206	310	53	4%	99
Canary Seed	2242	0.907	287	260	1206	303	53	-4%	10
Canola	2407	0.974	350	341	1206	325	53	1%	69
Confection Sunflower	2242	0.907	484	439	1206	344	53	8%	148
Eston Lentil	2000	0.809	485	392	1206	310	53	7%	135
Pinto Beans	2000	0.809	507	410	1263	406	53	0%	57
Pink Beans	1902	0.770	576	443	1263	408	53	3%	88
Small Red Beans	1878	0.760	639	486	1263	413	53	6%	126
Great Northern Beans	1990	0.805	595	479	1263	409	53	6%	123
Black Beans	1857	0.752	711	534	1263	395	53	11%	192
Kabuli Chickpea (2)	2291	0.927	485	449	1206	321	53	11%	181
Seed Potatoes	33358	13.500	264	3564	6269	2367	281	19%	1478
Table Potatoes (Red)	29652	12.000	242	2904	5310	1936	281	18%	1249
Processing Potatoes (1)	33358	13.500	154	2079	5289	1536	140	10%	683
Average									181

(1) Manitoba

(2) Adapted from SIDC yields, SAF 1998 Crop Planning Guide, and ICDC irrigation data for lentil.

(3) Updated with information from Sommer-Green Forage Inc., Outlook, SK

(4) Covers interest on fixed investment. Add 7% discount rate to obtain business return on investment.

Cost Data Source: Irrigation Crop Diversification Corporation, "Irrigation Economics and Agronomics for Saskatchewan (1998)"

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, February 11, 1999

Table 2. Expected Returns for Dryland Crops - 1999 - Saskatchewan

Crop	Expected Yield		Expected Price \$/t	Expected Returns \$/acre	Investment \$/acre	Total Costs \$/acre	February 11, 1999		
	kg/ha	t/acre					Land and Management \$/acre	(1) Economic Return on Investment (%)	Returns Per Acre to Land, Management & Investment \$/acre
Alfalfa	2965	1.200	75	90	500	105	32	-3%	17
Barley	2716	1.099	110	121	543	140	43	-4%	24
Oats	2200	0.945	110	104	735	163	52	-8%	-7
CPS Wheat	2466	0.998	145	145	543	144	43	0%	44
CWRS Wheat	2000	0.815	160	130	543	144	43	-3%	29
Durum Wheat	2100	0.829	170	141	543	146	47	-1%	42
Buckwheat	1067	0.432	287	124	657	190	42	-10%	-24
Green Peas	1910	0.773	160	124	622	175	48	-8%	-3
Yellow Peas	2017	0.816	160	131	622	175	48	-7%	4
Safflower	751	0.304	309	94	610	160	33	-11%	-33
Canaryseed	1109	0.449	287	129	543	140	43	-2%	32
Sunflower (Oil)	1216	0.492	309	152	650	182	42	-5%	12
Flaxseed	1265	0.512	312	160	620	158	43	0%	45
Canola	1226	0.496	350	174	620	167	43	1%	50
Oriental Mustard	932	0.377	419	158	562	132	33	5%	59
Yellow Mustard	817	0.331	397	131	562	132	33	0%	32
Desi Chickpea	1345	0.544	287	156	539	146	33	2%	43
Kabuli Chickpea	1233	0.499	485	242	539	207	33	6%	68
Laird Lentil	1407	0.569	375	213	587	178	43	6%	78
Eston Lentil	1407	0.569	485	276	587	168	42	18%	150
Dill	897	0.363	551	200	803	191	47	1%	56
Pinto Beans	1121	0.454	507	230	764	231	42	0%	41
Fenugreek	897	0.363	551	200	734	168	42	4%	74
Coriander	785	0.318	485	154	738	195	42	-6%	1
Caraway	729	0.295	727	215	991	266	83	-5%	32
Quinoa	505	0.204	815	167	762	160	42	1%	49
Borage	140	0.057	4959	281	778	226	42	7%	97
Seed Potatoes	24710	10.0	264	2640	4068	1728	128	22%	1040
Average									73

(1) Covers interest on fixed investment. Add 7% discount rate to obtain business return on investment.

Source: Saskatchewan Agriculture and Food, Crop Planning guides, 1998

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, February 11, 1999

Table 3. Comparison of Irrigated and Dryland Costs of Production - Saskatchewan

Crop	Irrigated Expected Yield (t/acre)	Irrigated Total Annual Costs/Acre	Irrigated Costs Per Tonne (\$/tonne)	Dryland Expected Yield (t/acre)	Dryland Total Annual Costs/Acre	Dryland Costs Per Tonne
Alfalfa	3.911	261	66.7	1.200	105	87.5
Timothy Grass	4.213	369	87.6			
Barley	2.295	313	136.4	1.099	140	127.4
Oats	1.913	312	163.1	0.945	163	172.5
Triticale	2.164	327	151.1			
CPS Wheat	1.883	329	174.7	0.998	144	144.3
SWS Wheat	2.077	327	157.4			
CWRS Wheat	1.669	325	194.7	0.815	144	176.7
Durum Wheat	1.714	329	191.9	0.829	146	176.1
Buckwheat (1)				0.432	190	439.8
Canaryseed	0.907	303	334.1	0.449	140	311.8
Field Peas	1.333	304	228.1	0.816	175	214.5
Canola	0.974	325	333.7	0.496	167	336.7
Flaxseed	0.983	320	325.5	0.512	158	308.6
Sunflower (Oil)				0.492	182	369.9
Confection Sunflower	0.907	344	379.3			
Safflower				0.304	160	526.3
Brown Mustard	0.974	316	324.4	0.377	132	350.1
Yellow Mustard	0.897	310	345.6	0.331	132	398.8
Desi Chickpea				0.544	146	268.2
Kabuli Chickpea	0.927	320	345.2	0.499	207	414.8
Laird Lentil				0.569	178	312.8
Eston Lentil	0.809	310	383.2	0.569	168	295.3
Pinto Beans	0.809	406	501.9	0.454	245	540.0
Pink Beans	0.770	408	529.9			
Small Red Beans	0.760	413	543.4			
Great Northern Beans	0.805	409	508.1			
Black Beans	0.752	395	525.3			
Seed Potatoes	13.500	2367	175.3	10.000	1728	172.8
Table Potatoes	12.000	1936	161.3			
Processing Potatoes (1)	13.500	1536	113.8			
Spearmint (2)	0.025	853	15.5			
Dill Seed (3)				0.363	191	0.24
Fenugreek (3)				0.363	168	0.21
Coriander (3)				0.318	195	0.28
Caraway (3)				0.295	266	0.41
Borage (3)				0.057	226	1.80
Quinoa (3)				0.204	160	0.36

(1) Manitoba

(2) Not including risk of winterkill, costs in \$/lb

(3) Costs in \$/lb

Table 4

Average Expected Returns for Comparable
Irrigated and Dryland Crops in Saskatchewan
1999

Crop	Returns Per Acre to Land, Management and Investment	
	Irrigated	Dryland
Alfalfa	73	17
Barley	-8	24
CPS Wheat	-3	44
CWRS Wheat	-5	29
Durum Wheat	15	42
Peas	-38	4
Canaryseed	10	32
Sunflower	148	12
Canola	69	50
Oriental Mustard	124	51
Eston Lentil	135	150
Pinto Beans	57	41
Kabuli Chickpea	181	68
Seed Potatoes	1484	1045
Average	160	115

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, February 15, 1999

Table 5. Should You Be Irrigating?

Crop	(Saskatchewan)	(Outlook)	Additional	1999	Additional	Minus \$130
	Expected Yield In Your Area t/acre	Irrigated Yield t/acre	Yield With Irrigation t/acre	Expected Crop Price \$/t	Value From Irrigation \$/acre	Cost of Irrigation \$/acre
Alfalfa	1.200	3.900	2.700	75	203	73
Barley	1.099	2.295	1.196	110	132	2
Oats	0.945	2.082	1.137	110	125	-5
CPS Wheat	0.998	1.883	0.885	145	128	-2
CWRS Wheat	0.815	1.669	0.854	160	137	7
Durum Wheat	0.829	1.714	0.885	170	150	20
Green Peas	0.773	1.333	0.560	160	90	-40
Yellow Peas	0.816	1.333	0.517	160	83	-47
Canaryseed	0.449	0.907	0.458	287	131	1
Flaxseed	0.512	0.983	0.471	312	147	17
Canola	0.496	0.974	0.478	350	167	37
Oriental Mustard	0.377	0.974	0.597	397	237	107
Yellow Mustard	0.331	0.897	0.566	375	212	82
Sunflower (Oil)	0.492	0.907	0.415	309	128	-2
Eston Lentil	0.569	0.809	0.240	485	116	-14
Pinto Beans	0.454	0.809	0.355	507	180	50
Seed Potatoes	10.000	13.500	3.500	264	924	794
Processing Potatoes	10.000	13.500	3.500	154	539	409
Coriander	0.318	0.635	0.318	485	154	24
Caraway	0.295	0.599	0.304	727	221	91
Fenugreek	0.363	0.862	0.499	551	275	145
Kabuli	0.499	0.880	0.381	485	185	55
Chickpea						
Desi Chickpea	0.544	0.779	0.235	287	67	-63
Fababeans	0.662	1.481	0.819	209	171	41
Carrots *	14.000	20.000	6.000	441	2645	2515
Ginseng *	0.635	0.907	0.272	33060	9000	8870

* Dryland yield estimated as 70% of irrigated yield.

Prepared by : Harvey Clark, Saskatchewan Irrigation Development Centre, February 15, 1999

Appendix Table 1. Costs and Returns for Irrigated Wheat and Triticale

January 26, 1999

Fixed Costs	CWRS Wheat		Durum Wheat		SWS Wheat		CPS Wheat		Triticale	
	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual
Interest @ 7%										
Land @ 5%	350	18	350	18	350	18	350	18	350	18
Bldg's/Equip (25 yrs)	60	7	60	7	60	7	60	7	60	7
Truck/Equip (15 yrs)	64	9	64	9	64	9	64	9	64	9
Machinery (10 yrs)	193	33	193	33	193	33	193	33	193	33
Irrigation (20 yrs)	489	67	489	67	489	67	489	67	489	67
Taxes/Water	14	14	14	14	14	14	14	14	14	14
Management	35	35	35	35	35	35	35	35	35	35
Total Fixed Costs	1206	182	1206	182	1206	182	1206	182	1206	182
Variable Costs										
Seed/Land Prep'n		14		18		20		18		16
Fertilizer		44		44		40		44		44
Weed Control		20		20		20		20		20
Disease Control		0		0		0		0		0
Insect Control		0		0		0		0		0
Fuel		35		35		35		35		35
Repairs		17		17		17		17		17
Utilities/Other		6		6		6		6		6
Labour		0		0		0		0		0
Custom Work		0		0		0		0		0
Operating Interest		7		7		7		7		6
Total Variable Costs		143		147		145		147		144
Total Cost	1206	325	1206	329	1206	327	1206	329	1206	326
Yield (t/acre)		1.669		1.714		2.077		1.883		2.164
Producer Price (\$/t)		160		170		145		145		120
Returns (\$/acre)		267		291		301		273		260
Cost (\$/tonne)		194.55		191.90		157.35		174.68		150.62
Return on Investment		-5%		-3%		-2%		-5%		-5%

Source of Cost Data: Irrigation Crop Diversification Corporation, "Irrigation Economics and Agronomics for Saskatchewan (1998)"

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Appendix Table 2. Costs and Returns for Irrigated Cereals and Feeds - Saskatchewan

January 25, 1999

Fixed Costs	Barley		Canary Seed		Oats		Alfalfa		Timothy Grass	
	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual
Interest @ 7%										
Land @ 5%	350	18	350	18	350	18	350	18	350	18
Bldg's/Equip (25 yrs)	60	7	60	7	60	7	100	11	320	29
Truck/Equip (15 yrs)	64	9	64	9	64	9	53	7	0	0
Machinery (10 yrs)	193	33	193	33	193	33	182	31	0	0
Irrigation (20 yrs)	489	59	489	59	489	59	489	59	489	59
Taxes/Water	14	14	14	14	14	14	14	14	14	14
Management	35	35	35	35	35	35	23	23	10	10
Total Fixed Costs	1206	173	1206	173	1206	173	1211	162	1183	129
Variable Costs										
Seed/Land Prep'n		13		11		12		5		1
Fertilizer		42		40		42		18		4
Weed Control		20		14		20		2		6
Disease Control		0		0		0		0		0
Insect Control		0		0		0		0		0
Fuel		35		35		35		40		35
Repairs		17		17		17		17		7
Utilities/Other		6		6		6		6		6
Labour		0		0		0		7		0
Custom Work		0		0		0		0		169
Operating Interest		6		6		6		3		11
Total Variable Costs		139		129		138		98		239
Total Cost	1206	313	1206	303	1206	312	1211	261	1183	368
Yield (t/acre)		2.295		0.907		1.913		3.911		4.213
Producer Price (\$/t)		110		287		110		75		130
Returns (\$/acre)		252		260		210		293		548
Cost (\$/tonne)		136.22		333.94		162.88		66.65		87.25
Return on Investment		-5%		-4%		-8%		3%		15%

Source of Cost Data: Irrigation Crop Diversification Corporation, "Irrigation Economics and Agronomics for Saskatchewan (1998)"

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, January 25, 1999.

Appendix Table 3. Costs and Returns for Irrigated Oilseed Crops - Saskatchewan

January 26, 1999

Fixed Costs	Canola		Oriental Mustard		Yellow Mustard		Flaxseed		Confection Sunflower	
	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual
Interest @ 7%										
Land @ 5%	350	18	350	18	350	18	350	18	350	18
Bldg's/Equip (25 yrs)	60	7	60	7	60	7	60	7	60	7
Truck/Equip (15 yrs)	64	9	64	9	64	9	64	9	64	9
Machinery (10 yrs)	193	33	193	33	193	33	193	33	193	33
Irrigation (20 yrs)	489	67	489	67	489	67	489	67	489	67
Taxes/Water	14	14	14	14	14	14	14	14	14	14
Management	35	35	35	35	35	35	35	35	35	35
Total Fixed Costs	1206	182	1206	182	1206	182	1206	182	1206	182
Variable Costs										
Seed/Land Prep'n		8		4		7		8		32
Fertilizer		47		47		42		42		47
Weed Control		13		13		13		28		13
Disease Control		0		0		0		0		0
Insect Control		6		6		6		0		0
Fuel		39		35		31		31		39
Repairs		17		17		17		17		17
Utilities/Other		6		6		6		6		6
Labour		0		0		0		0		0
Custom Work		0		0		0		0		0
Operating Interest		7		6		6		7		7
Total Variable Costs		143		134		128		139		161
Total Cost	1206	325	1206	316	1206	309	1206	320	1206	343
Yield (t/acre)		0.974		0.974		0.897		0.983		0.907
Producer Price (\$/t)		350		397		375		312		484
Returns (\$/acre)		341		387		336		307		439
Cost (\$/tonne)		333.38		323.96		344.77		326.04		377.90
Return on Investment		1%		6%		2%		-1%		8%

Source of Cost Data: Irrigation Crop Diversification Corporation, "Irrigation Economics and Agronomics for Saskatchewan (1998)"

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, January 26, 1999.

Appendix Table 4. Costs and Returns for Irrigated Pulse Crops - Saskatchewan

January 26, 1999

Fixed Costs	Green Pea		Fababean		Eston Lentil		Pinto Bean		Kabuli Chickpea (1)	
	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual	Investment	Annual
Interest @ 7%										
Land @ 5%	350	18	350	18	350	18	350	18	350	18
Bldg's/Equip (25 yrs)	60	7	60	7	60	7	60	7	60	7
Truck/Equip (15 yrs)	64	9	64	9	64	9	64	9	64	9
Machinery (10 yrs)	193	33	193	33	193	33	251	43	193	33
Irrigation (20 yrs)	489	67	489	67	489	67	489	67	489	67
Taxes/Water	14	14	14	14	14	14	14	14	14	14
Management	35	35	35	35	35	35	35	35	35	35
Total Fixed Costs	1206	182	1206	182	1206	182	1263	191	1206	182
Variable Costs										
Seed/Land Prep'n		31		18		21		43		52
Fertilizer		14		14		14		29		7
Weed Control		13		13		17		33		17
Disease Control		0		0		21		45		7
Insect Control		0		6		0		0		0
Fuel		35		39		26		31		26
Repairs		17		17		17		17		17
Utilities/Other		6		6		6		6		6
Labour		0		0		0		0		0
Custom Work		0		0		0		0		0
Operating Interest		6		6		6		11		7
Total Variable Costs		122		119		128		215		139
Total Cost	1206	304	1206	301	1206	310	1263	406	1206	320
Yield (t/acre)		1.333		1.481		0.809		0.809		0.927
Producer Price (\$/t)		160		209		485		507		485
Returns (\$/acre)		213		310		392		410		450
Cost (\$/tonne)		227.80		202.90		383.16		501.96		345.74
Return on Investment		-7%		1%		7%		0%		11%

(1) Kabuli Chickpea data adapted from SIDC yields, SAF 1998 Crop Planning Guide for Alternative Crops, and ICDC irrigation data for lentils.

Seeding rate of 130 lb per acre @ cost of \$.46 per pound. 1999 contracting price of \$.23 per pound.

Source of Cost Data: Irrigation Crop Diversification Corporation, "Irrigation Economics and Agronomics for Saskatchewan (1998)"

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, January 26, 1999.

Appendix Table 5. Costs and Returns for Dryland Crops in Saskatchewan (2)

February 17, 1999

	HRS Wheat	Durum Wheat	CPS Wheat	Barley	Canary Seed	Eston Lentil	Feed Peas	Flax	Canola
Fixed Costs									
Interest @ 7%									
Land	16	16	16	16	16	16	16	16	16
Buildings	3	3	3	3	3	5	6	5	5
Machinery	21	21	21	21	21	25	27	30	30
Taxes	4	4	4	4	4	4	4	4	4
Insurance/Licenses (1)	2	2	2	2	2	2	2	2	2
Management	27	27	27	27	27	27	27	27	27
Total Fixed Costs	73	73	73	73	73	79	82	84	84
Variable Costs									
Seed/Land Prep	6	8	7	5	6	19	18	7	9
Fertilizer	20	20	20	20	20	9	9	20	24
Weed Control	15	15	15	15	12	36	22	20	19
Disease/Insect Control	3	3	3	2	2	4	4	1	4
Fuel	6	6	6	6	6	7	7	7	7
Repairs (3)	8	8	8	8	8	12	12	10	8
Utilities/Other	3	3	3	3	3	3	3	3	3
Custom Work/Hired Labour	5	5	5	4	5	3	3	4	4
Interest @ 7%	4	4	4	3	3	5	4	4	4
Total Variable Costs	71	72	71	67	67	98	81	75	83
Total Cost	143	145	144	140	139	177	163	159	167
Yield (tonnes/acre)	0.815	0.829	0.998	1.099	0.449	0.569	0.816	0.512	0.496
(bu/acre)	30.8	29.2	34.8	51.4			30.0	19.6	21.9
(lb/acre)					989	1255	1799		
Producer Price (\$/t)	160	170	145	110	287	485	160	312	350
(\$/bu)	4.35	4.63	3.95	2.39			4.35	7.93	7.94
(cents/lb)					13	22			
Returns (\$/acre)	130	141	145	121	129	276	131	160	174
Cost (\$/tonne)	175.98	175.19	144.35	126.94	310.40	310.68	199.74	310.09	336.51
(cents/lb)					14.1	14.1			
Profit Margin	-9%	-3%	0%	-13%	-8%	56%	-20%	1%	4%

(1) Other than crop insurance.

(2) Dark brown soil zone, conventional seeded stubble.

(3) Building and machinery.

(4) No hired labour, operator's labour costs are included under management.

Sources: Saskatchewan Agriculture and Food, 1999 Crop Planning Guide, Dark Brown soil zone;

Statistics Canada, 5 year average provincial yields for 1994 to 1998.

Prepared by: Harvey Clark, Saskatchewan Irrigation Diversification Centre, February 17, 1999.