



Chapter VII.

Benefits of Irrigation Development

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A. INTRODUCTION

The overall objective of the Irrigation Water Management Study was to provide reliable information on current and future water requirements and on the water management practices necessary for a sustainable agricultural industry in Alberta. A sustainable industry is one that is economically viable and socially acceptable. It preserves natural resources and the environment for the use and enjoyment of future generations. This chapter discusses the current contributions of irrigation to the economic, social and environmental well-being of Albertans, and the potential economic impacts of an expanded, sustainable irrigation industry.

Irrigation expansion is important to the health of the agricultural industry. Improving the viability of individual farming enterprises, increasing the efficiency and economic viability of irrigation districts, and contributing to the economic and social objectives of the province are the expected outcomes of irrigation expansion in southern Alberta. Intensification of irrigation, and the concomitant expansion of the irrigated area and increases in agri-food processing, will bring numerous direct and indirect benefits in the future.

The irrigation districts in southern Alberta, with their extensive networks of canals, pipelines, drains and reservoirs, have had a profound impact on the entire region – an impact that extends well beyond the farm gate. Secure supplies of good quality water have always been a concern to farmers and ranchers in southern Alberta. Urban communities face similar water concerns. Local surface water supplies are often unreliable; groundwater supplies, where adequate quantity can be found, are often of poor quality.

Although the initial development of water diversions and irrigation infrastructure in southern Alberta was predicated on increasing and stabilizing crop production, the irrigation distribution works soon became a supplemental source, and often the sole source, of good quality water for domestic, stock watering, municipal and industrial uses. Dependence on the irrigation infrastructure for non-irrigation uses of water became entrenched in the region's social fabric and has remained so.

There would be very few permanent standing water bodies in southern Alberta without irrigation reservoirs or natural water bodies supplemented by irrigation diversions. Individual municipalities and the provincial government have developed parks and recreation areas on these water bodies to provide highly popular, water-based recreational opportunities that would otherwise not be possible.

Irrigation diversions have also been used to develop habitat for wildlife. Prior to the 1970s, these projects were often operated in association with uncontrolled seepage from irrigation canals. However, as irrigation districts strive to improve irrigation efficiencies, rehabilitation of canals and replacement of canals with pipelines has essentially eliminated seepage. Most of the wildlife projects are now supported by controlled releases from the distribution system. New wildlife projects have been developed as districts make conscious efforts to address quality of life and environmental sustainability issues.





B. 1999 BENEFITS OF IRRIGATION DEVELOPMENT

1. Primary Agricultural Production

The approximately 525,000 hectares of land now under irrigation in the 13 irrigation districts comprise about 4% of the cultivated land in Alberta and is farmed by about 8.3% of Alberta's producers. Irrigation impacts farm production in four important ways.

- **Increased yields** – When irrigated, yields of conventional crops, (crops grown on both dryland and irrigated land,) are commonly increased two to three-fold or more in the drier regions of southeastern Alberta.
- **Crop diversification** – Irrigation makes possible the production of a broader range of crops, many of which are considered specialty crops, (crops that are generally not viable under dryland agriculture). These are typically higher value crops, such as corn, beans, peas, sugar beets and potatoes, that can also be processed in Alberta.
- **Stability** – Irrigated crop yields are more stable and reliable, resulting in greater income stability, reduced crop insurance costs, and greater assurance in meeting production targets and marketing contracts.
- **Diversity** – Irrigation fosters diversity in farm production. For instance, nearly 60% of all Alberta beef is fattened in southern Alberta's irrigated areas, creating employment and adding value to forage crop production.

The estimated primary production impacts for 1999, that is, the increases compared to dryland agriculture of these 525,000 irrigated hectares, are shown in Table 25. The economic activity and impact on Alberta's economy through primary production on irrigation district land is much greater than the area of irrigation would suggest. Although only about 4% of the crop land is irrigated, it generates more than 14% of the farm cash receipts, about 11% of the agricultural value-added, and 19% of direct agricultural employment.

Table 25. Primary production impacts of irrigation.

Economic Activity	Primary Benefits		Incremental Impact (Irrigation minus Dryland)
	Irrigation	Dryland	
Gross sales (\$ millions)			
crops	298	59	239
livestock	562	78	484
Total	860	137	723
Value-added ¹ (\$ millions)			
crops	163	31	132
livestock	95	16	79
Total	258	47	211
Employment ²			
crops	3,142	881	2,261
livestock	1,821	464	1,357
Total	4,963	1,345	3,618

¹ Value-added is the return to labour, land, management and capital requirements. It is approximately the same as the computations underlying the Gross Domestic Product (Anderson 2000).

² Full time equivalents.

2. Farm Supply Implications

Compared to dryland agriculture, irrigation requires increased inputs and expenditures – fertilizers, pesticides, irrigation equipment and special crop harvesting equipment – to realize the primary benefits. These *backward linkages* generate economic activities that ripple through the economy to generate additional employment and income.

Multipliers of primary benefits (*scaling factors*) have been used to estimate the economic and employment impacts of irrigation backward linkages in 1999, as shown in Table 26.

3. Agri-processing Implications

Irrigation also stimulates post-primary economic activities or *forward linkages*, such as storage, transportation, and processing. A 1996 profile of Alberta's rapidly growing agri-processing industry shows a \$6.8 billion business with nearly 18,000 employees, a large meat and poultry component (33%), a beverages component (11%), dairy products and vegetables (each 9%), and flour products (8%).

As these statistics show, in-province value-added processing of agricultural produce allows Albertans to capture additional income and employment from primary production, rather than exporting raw produce, as has been the predominant historical pattern. Agri-processing is largely concentrated in the irrigation-dependent southern part of the province. The ratio between the value of agri-processing shipments and farm receipts from primary production is 2.66 in the irrigated south, compared with 1.05 for other parts of Alberta. The socio-economic factors that make Alberta in general, and particularly the irrigated southern part of Alberta, attractive for agri-processing activities include:

- Adequate quantity and quality of water for the processing activity;
- Reliable supply of high quality raw material at a relatively low cost;
- Technologically advanced, skilled and motivated workers;
- Strong institutions focused on the environment and long-term sustainability;
- Proximity to markets;
- Excellent physical infrastructure (roads, power, water, natural gas);
- Excellent social infrastructure (schools, hospitals, recreational facilities, religious and cultural facilities); and
- Business-friendly tax structure and political and social environment.

The estimated post-primary production impacts of 525,000 hectares of irrigated agriculture in 1999 are shown in Table 27.

Table 26. Multipliers of primary benefits.

Economic Activity	Backward Linkages		Incremental Impact Irrigation minus Dryland
	Irrigation	Dryland	
Gross sales (\$ millions)	860	137	723
Value-added (\$ millions)	215	34	181
Employment (Full time equivalents)	2,150	343	1,807



Table 27. Post primary production impacts of irrigation.

Economic Activity	Forward Linkages		Incremental Impact Irrigation minus Dryland
	Irrigation	Dryland	
Gross sales (\$ millions)	2,266	144	2,122
Value-added (\$ millions)	574	38	536
Employment (full time equivalents)	5,971	308	5,663

4. Total Agricultural Impacts

The total agricultural impacts of irrigation in 1999, both direct and indirect, are shown in Table 28.

Note that the value-added estimate of \$927 million approximates the incremental contribution of irrigation to the agri-food gross domestic product (GDP), considering primary production and both backward and forward linkages (AAFRD 2001/b). The 1999 agri-food GDP for all Alberta has been determined by AAFRD to be \$4.52 billion, considering only primary production and forward linkages. In 1999, the incremental irrigation-based component represented about 16.5% of the agri-food GDP for all Alberta.

5. Non-agricultural Benefits of Irrigation Infrastructure

In addition to direct and indirect agricultural benefits, irrigation provides significant benefits related to municipal and industrial water supplies, recreation and tourism, and wildlife.

Irrigation development benefits municipalities and industries by ensuring municipal water supplies, and by providing a means of disposing of waste water. About 42,000 people in 47 southern Alberta communities rely on irrigation districts for their domestic water supplies – and the list is growing. Twelve major industrial users, in addition to those within the communities, use water directly from irrigation infrastructure. A number of communities and industries rely on effluent irrigation for disposal of their wastewater.

Eighty-nine irrigation supported water bodies provide recreational activities in southern Alberta. Recreational pursuits include water-based activities such as boating, fishing, swimming and water skiing, as well as camping, hunting, and wildlife watching and photography. There are seven provincial parks, 26 municipal parks and 13 day-use recreational areas on or near-by irrigation reservoirs or canals. User-days would total in the order of 400,000 per year.

Table 28. Direct and indirect agricultural impacts of irrigation.

Economic Activity	Total Agricultural Benefits		Incremental Impact Irrigation minus Dryland
	Irrigation	Dryland	
Gross sales (\$ millions)	3,986	418	3,568
Value-added (\$ millions)	1,047	120	927
Employment (full time equivalents)	13,084	1,996	11,088

Municipal water use refers to water diverted through the works of a municipality for households, gardens and lawns, industry, commerce, institutional, recreational and fire protection uses.

Domestic water use refers to private, individual diversions for household use, gardens and domestic animal and poultry watering. Rural co-op projects also divert water for domestic use.

More than 20 irrigation reservoirs provide an estimated 250,000 angler-days of recreational fishing for species such as whitefish, northern pike and walleye. In addition, commercial fishing typically yields about 300 tonnes annually, valued at about \$500,000. More than 35,000 hectares of wetland habitat has been created or enhanced by irrigation development. The wetlands provide habitat for a variety of waterfowl, shore birds, amphibians and reptiles, including several species of special concern due to declining populations. Improved upland habitat adjacent to the wetlands enhances conditions for foxes, weasels, badgers, sharp-tailed grouse, hawks, owls, deer, antelope and other wildlife. At least 60% of the province's pheasant population exists within the irrigation districts. Trail systems, such as the Kinbrook Marsh Nature Trail in the EID, are very popular for recreational and educational purposes.

Recreational facilities in the irrigation areas also attract out-of-province visitors. It is estimated these tourists spend about \$2 million a year on water-based recreation in southern Alberta. The monetary impact of recreational activities on the regional economy has been estimated to be in the order of \$29 million a year.

Other non-irrigation uses include water supplies for beef feedlots, stock watering and domestic uses, market gardens, golf courses, tree farms and sod farms. Irrigation works provide the source of domestic and stock water for at least 15 rural co-operative water supply projects.

C. OPPORTUNITIES FOR THE FUTURE

In 1995, AAFRD challenged Alberta's agri-food sector to strive for \$10 billion in primary production and \$20 billion in value-added manufacturing by 2005. The Ministry retained Toma and Bouma Management Consultants to identify and explore various scenarios for meeting the challenge. The consultants concluded the primary production target could probably be achieved through a crop/livestock diversification strategy (Toma and Bouma Management Consultants 1997). Achieving the value-added processing target will be challenging and will require new ideas, new products and new businesses.

The Alberta government, particularly AAFRD, has identified economic and job creation goals that generally focus on the need to add value to all raw material produced within the province (Alberta Treasury 1999; AAFRD 1999). An intensified and expanded irrigation industry is central to the successful execution of both a crop/livestock diversification strategy and an expanded value-added processing sector. Following is a brief overview of what is likely to evolve in the irrigation industry during the next 10 years, with and without expansion of the irrigated area from the current 525,000 hectares in the irrigation districts (Anderson 2000).

1. Livestock

Additional beef production, beef finishing and slaughter operations in Alberta, and particularly southeastern Alberta, are expected to serve western Canada and, increasingly, the United States Pacific Northwest. A 50% increase in the meat processing industry in the irrigation-dependent south is expected by 2010. Feedlot capacity would also have to expand and become more dispersed.

Forage production will continue to increase. Irrigated barley and corn silage are key feed ingredients for feedlots in southern Alberta. By 2010, it is expected the area of forage production will comprise almost one half of the irrigated land. This will result in a continual shift away from cereal grain crops.





2. Agri-processing

Based on recent trends and discussions with practitioners in irrigation and agri-processing industries, projections for the future of value-added processing are as follows.

- The agri-processing sector in Alberta is expected to grow at about 4% a year. The growth rate in the irrigation areas is expected to be slightly higher.
- The irrigation sector currently accounts for about 30% of agri-processing shipments. This share is expected to climb to about 32% by 2010. The value-added component is expected to increase from a current 26% to 29%. Employment is expected to remain flat at about 30%.
- Vegetable processing in Alberta, which is tied to irrigation farm production, is expected to become more concentrated in the irrigated areas.
- Crop requirements for the agri-processing industry will increasingly impact on primary production patterns and marketing structure in irrigated areas.
- Producer/industry commodity contracts will become more common.

Ten-year projections of cropping implications for irrigated agriculture due to agri-processing initiatives include the following:

- The irrigated potato-growing area is expected to expand from the current 10,000 hectares to about 17,000 hectares;
- The sugar beet growing area is expected to expand to about 23,000 hectares from the current 17,000 hectares;
- Irrigated vegetable production will expand rapidly from 2,000 hectares to 8,000 hectares in response to demands by Lucerne, Bassano Growers and several other small processors;
- The area of pulse crop and forage seed production will likely increase significantly;
- Oilseed production, particularly canola, is expected to increase from the current 53,000 hectares to about 81,000 hectares; and
- Production of cereal crops will decrease, gradually shifting to grains that can be processed locally, for example, feed barley for the livestock industry and wheat for the flour milling industry (Ellison Milling Company).

Virtually all the anticipated production shifts will reflect a trend to capture more value-added processing within Alberta. Land use intensity and input requirements will increase.

3. Impacts of Intensification and Expansion of Irrigation

The impacts of intensification and two levels of potential expansion, 10% and 20%, are summarized in Tables 29 and 30.

The 2005 and 2010 intensification scenarios (Table 29) track the economic impacts of a change in cropping patterns – particularly a shift from cereals to forage to support the livestock industry, and to specialty crops to support the agri-processing industry. By 2010, the total provincial value-added impact (direct and indirect) will be about \$248 million, an increase of 27% from the current value-added contribution of irrigated agriculture. Employment would increase by almost 2,400 jobs, a gain of 21% over current irrigation-related employment.

Irrigation expansion by 10% or 20% (Table 30) would have additional stimulative impacts on the Alberta economy. A 20% expansion by 2010 would approximately double the impact of the demand-driven crop production shifts, increasing the impact from 27% to 52% from current levels. The incremental

Table 29. Projected impacts of irrigation intensification.

Economic Impacts	Base Case 1999 - 525,000 ha.			Intensification Only - No Expansion					
				2005 - 525,000 ha.			2010 - 525,000 ha.		
	Gross Sales \$M	Value-Added \$M	Employ. FTE	Gross Sales \$M	Value-Added \$M	Employ. FTE	Gross Sales \$M	Value-Added \$M	Employ. FTE
Direct (crops and livestock)	723	211	3,617	811	230	3,853	881	244	4,067
Backward links (suppliers)	723	181	1,807	811	203	2,026	881	220	2,203
Forward links (processors)	2,122	536	5,663	2,534	644	6,528	2,787	711	7,191
Total (direct and indirect)	3,568	927	11,088	4,155	1,078	12,407	4,550	1,175	13,461
Increase from 1999 Base Case				587	150	1319	982	248	2,374
Percent increase				16%	16%	12%	28%	27%	21%

Table 30. Projected impacts of irrigation intensification and expansion.

	Base Case 1999 - 525,000 ha.			Intensification plus 10% Expansion 2005 - 579,000 ha			Intensification plus 20% Expansion 2010 - 632,000 ha		
	Gross Sales \$M	Value-Added \$M	Employ. FTE	Gross Sales \$M	Value-Added \$M	Employ. FTE	Gross Sales \$M	Value-Added \$M	Employ. FTE
Direct (crops and livestock)	723	211	3,617	892	253	4,239	1,058	293	4,881
Backward links (suppliers)	723	181	1,807	892	223	2,229	1,058	264	2,644
Forward links (processors)	2,122	536	5,663	2,788	709	7,181	3,345	853	8,629
Total (direct and indirect)	3,568	927	11,088	4,571	1,185	13,649	5,460	1,411	16,154
Increase from 1999 Base Case									
Intensification plus 10% expansion				1,003	258	2,562			
Percent increase				28%	28%	23%			
Intensification plus 20% expansion							1,892	483	5,067
Percent increase							53%	52%	46%
Increase due to expansion only									
10% expansion only				416	108	1,243			
Percent increase				12%	12%	11%			
20% expansion only							910	235	2,693
Percent increase							26%	25%	24%

Notes (Tables 29 and 30):

- All figures represent incremental values from dryland agriculture on the same areas.
- Value-added estimate (direct and indirect) is approximately equal to the contribution to the agri-food GDP.
- \$M = millions of dollars.
- Employment based on 1 person-year per \$100,000 in direct sales and assumes 1 Full Time Equivalency.
- FTE = 1880 person-hours.
- Expansion-only benefits based on difference between expansion plus intensification and intensification only.



value-added impact would climb to \$483 million. To put the size of this impact into perspective, a value-added expansion of \$483 million would represent an approximate 10% increase in the total Alberta agri-food GDP. Total direct and indirect employment increases would be in excess of 5,000 person-years. The indirect impacts would increase at an even greater rate than the primary production impacts of irrigation.

D. CONCLUSIONS

The following conclusions have been drawn from the Irrigation Water Management Study on the potential benefits of irrigation development.

Irrigation intensification and expansion will contribute positively to Alberta's agri-food strategy and the province's social and economic objectives.

For example, the agricultural development strategy in Alberta calls for livestock diversification and growth, which in turn is dependent on increased forage production and an assured and adequate supply of water. The irrigated southern portion of the province has high potential to supply both the water and forage needs for an expanded livestock industry. Irrigation also contributes to sustaining the province's agricultural resource base by increasing the productivity of the land by 250% to 300%. The simulation modelling in the Irrigation Water Management Study indicates that intensification alone will increase irrigation-related agri-processing by 32% – from \$536 million to \$711 million – by the year 2010. A 20% expansion of irrigation area would increase agri-processing by about 60%, to \$853 million.

To be successful in meeting the province's growth targets for the agri-food processing industry, a disproportionate amount of growth must take place in the irrigated south.

The irrigated region has the longest growing season, combined with high heat units and relatively secure water supply. This can provide stable, high quality production of value-added crops.

Expansion and intensification of irrigation in southern Alberta will continue to improve the sustainability of the family farm and contribute to the economic and social well-being of its rural communities.

The trend toward consolidation of farming enterprises, increased input costs and reduced profit margins poses a threat to the family farm business and the sustainability of rural communities. Irrigation improves the long-term sustainability of smaller farm units by increasing yields, facilitating the growth of a wider variety of higher value crops, and reducing financial risks. The need for irrigation supplies and services supports rural agri-business enterprises. Higher labour requirements for primary production on irrigated land increase rural populations and contribute to more vibrant communities and greater infrastructure development.

Expansion within the context of conservation safeguards already in place or being developed will also benefit wildlife and the environment.

The irrigation industry has become increasingly aware of the need to be responsible stewards of land and water resources and is working – both as an industry and as individuals – toward sustainable growth. For example, the control of canal seepage has helped reduce soil salinity. Water management and conservation have helped develop and sustain wetland habitat crucial to birds and other wildlife.

Innovation, research and improved technology will continue to be critical components of agricultural growth and will add to long-term success in primary production and value-added processing.

Innovation and research have brought new ideas, new resources and greater potential for economic synergies to the agricultural industry, including the establishment or expansion of several multi-national agri-processors in the irrigated south. Potential for similar growth in the future is excellent.

