Alberta's irrigation - a strategy for the future

2022/23 Strategy Measures

Alberta

Alberta’s Irrigation – A Strategy for the Future – 2022/2023 Strategy Measures | Alberta Agriculture and Irrigation

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Alberta's Irrigation - a strategy for the future

2022/23 Strategy Measures Report

The Irrigation Strategy aligns with the Alberta Agriculture and Irrigation's Business Plan. The irrigation sector also plays a key role in the Alberta Recovery Plan.

Alberta's irrigation industry is a global leader in the efficient, productive, and sustainable use of water resources. The industry is committed to increasing its economic contribution in Alberta, while improving conservation, efficiency, and productivity of water use. The industry is also committed to promoting water supply options that will ensure long-term needs are met while supporting environmental stewardship and contributing to vibrant rural communities. To this effect, the economic value of development within the irrigated region of Alberta is significant. Based on the 2021 "Economic Value of Alberta's Irrigation Districts" report, irrigation-related agriculture and agricultural processing generated $5.4 billion to the Alberta Gross Domestic Product, more than $3.2 billion in direct labour income and more than 46,000 full-time jobs.

Five key strategies reflect the department's blueprint for the future of the irrigation industry in Alberta.

- Productivity – Increase the primary and value-added productivity of the water used by the irrigation industry.
- Efficiency – Improve the efficiency of water conveyance and on-farm irrigation systems.
- Conservation – Promote the effective use and management of water to ensure that only the water required for irrigation, and other uses supplied by irrigation infrastructure, is diverted from the rivers.
- Water Supply – Assess management options for existing reservoirs, and the potential for new reservoirs to enhance water security to meet future needs in the South Saskatchewan Region.
- Environmental Stewardship – Manage the effects of irrigation on surface and ground water quality, and promote beneficial management practices for irrigation and handling of crops to ensure they are safe for consumption.

In an effort to manage and measure each of these strategies, an annual measurement of results identified in the following strategy targets is reported.

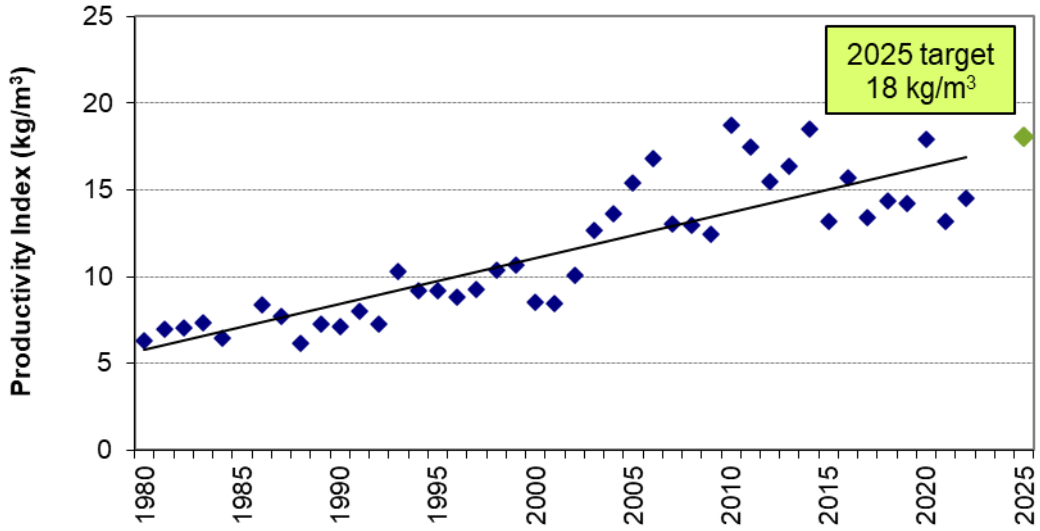
Strategy targets

1. Irrigation productivity

The Water for Life Strategy had a target to improve the 2005 overall efficiency and productivity of water use in Alberta by 30 per cent by 2015. The irrigation sector has exceeded this target and Alberta Agriculture and Irrigation continues to work with the sector to promote the growth of a greater diversity of crops that can be processed in Alberta, and increase crop yield.

A productivity index target of 18 kg/m^3 for the contracted commodities (potatoes and sugar beets) has been established for 2025. The index calculation is based on data received from commodity boards and estimated water deliveries. The trend line shown below indicates that the productivity index has doubled over the last 30 years. The productivity index for 2022 was

14.5 kg/m^3. Continued improvement in irrigation water management and agronomic practices will contribute to achieving the 2025 target.

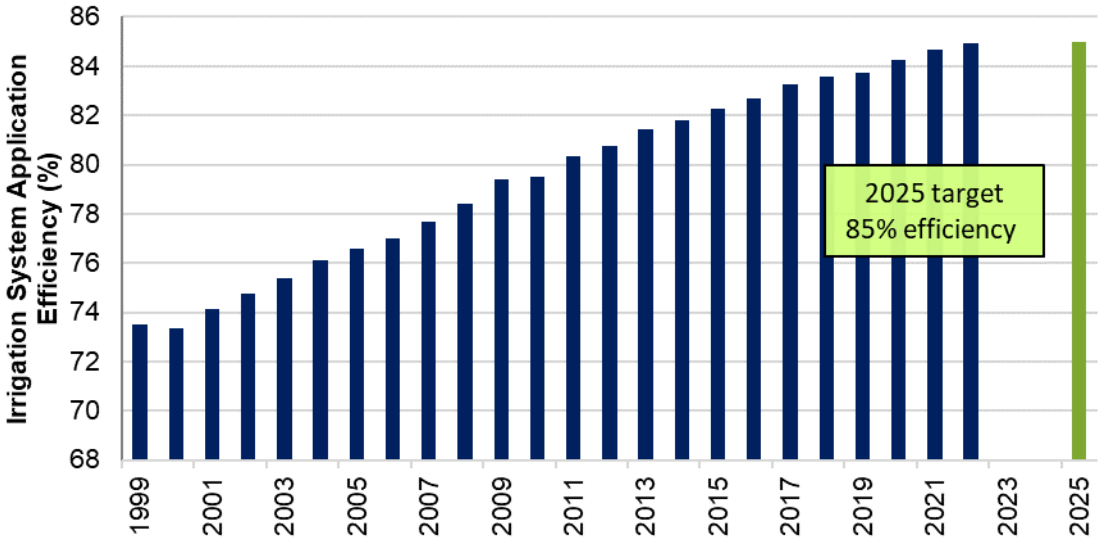


Irrigation water use productivity index - gross diversion (sugar beet & potatoes)

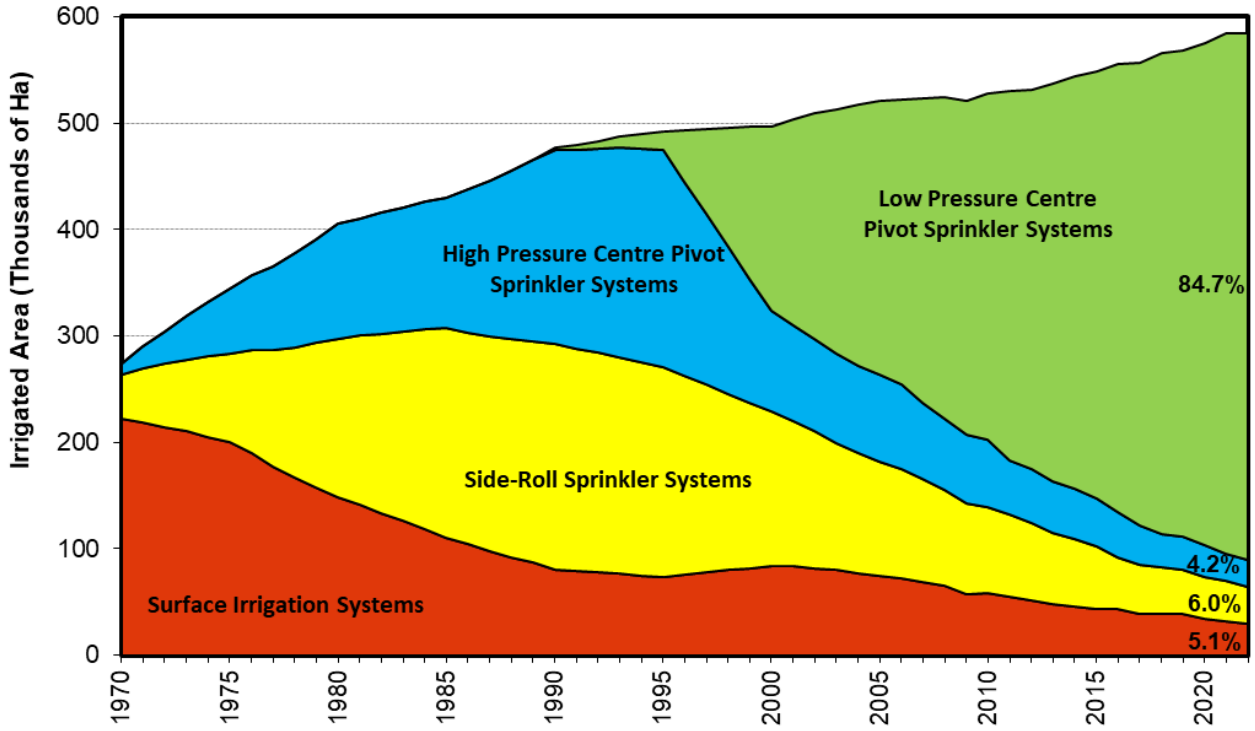
2. Irrigation application efficiency

The target for irrigation efficiency is to achieve a four per cent increase in average on-farm irrigation efficiency from about 81 per cent in 2012 to 85 per cent by 2025. This could be accomplished through improved on-farm irrigation technologies and continued replacement of less efficient irrigation systems with low-pressure drop-tube pivot systems.

Based on reported on-farm infrastructure and the assumed application efficiencies of 89 per cent for low pressure pivots, 73 per cent for high pressure pivots, 70 per cent for wheel lines and 60 per cent for gravity, the weighted-average efficiency in 2022 was 84.9 per cent.



On-farm irrigation system efficiency



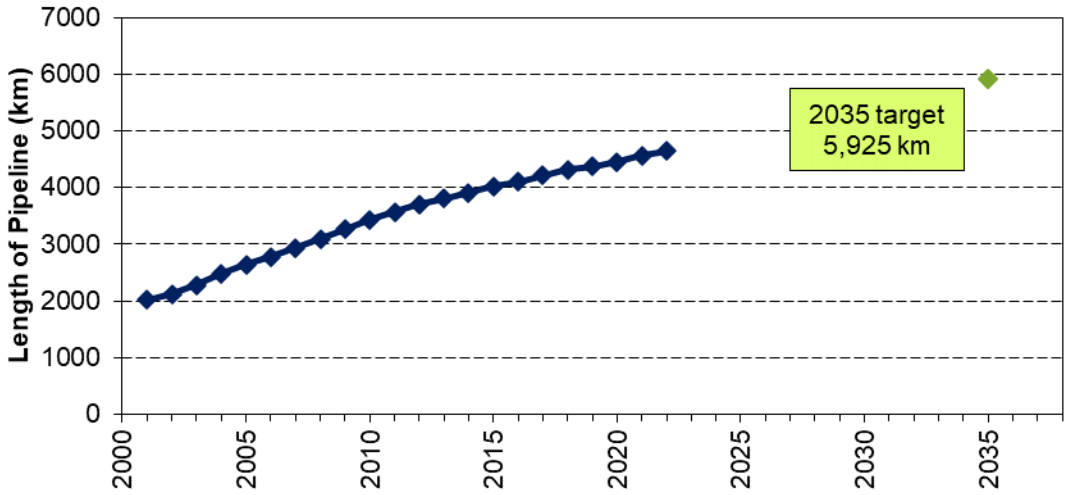
Evolution of on-farm irrigation method

3. Irrigation district system conversion

Ongoing rehabilitation of irrigation water conveyance infrastructure with newer technology has facilitated continued improvements in water conservation. Irrigation districts are replacing open channel canals with buried pipelines, reducing water conveyance losses and improving water delivery efficiencies. The Irrigation Strategy target for water conservation is to replace all technically feasible open channel canals in the irrigation districts with pipelines by 2035. As a result, about 75 per cent of the 7,900 km of the irrigation network should be in pipelines and an additional 50 million cubic metres of water will be conserved annually. In 2022, the length of pipeline in the irrigation districts was 4,645 km.

Pipeline installation

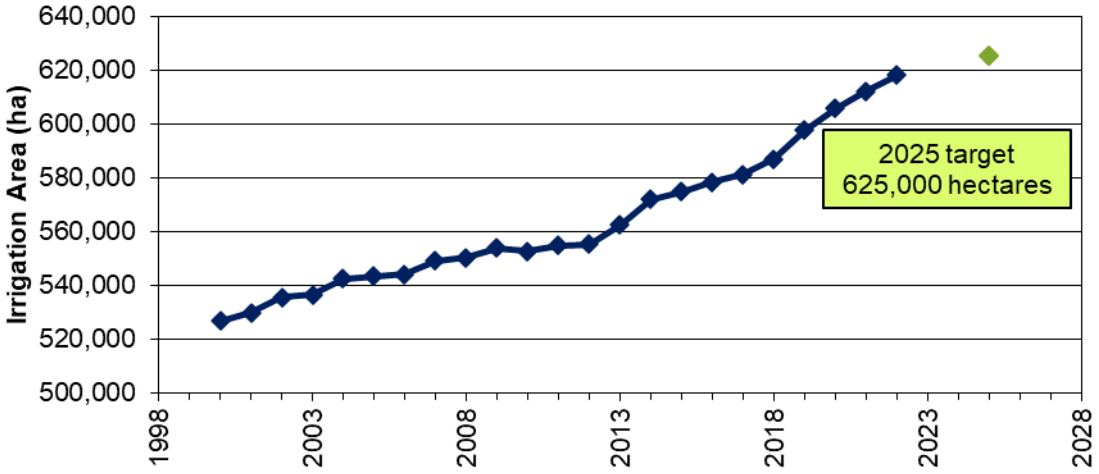
Closed pipelines eliminate seepage, evaporation, and reduce return flow. Pipelines also contribute to energy savings by providing gravity pressure, often facilitating reduced pumping energy requirements. Finally, each kilometre of buried pipeline adds about 1.5 to 2 hectares of land for crop production from previous severance due to land occupied by the canals and access roads.



Pipelines installed within irrigation districts

4. Irrigation expansion

The Irrigation Strategy target for irrigation expansion is to have about 12 per cent (70,000 hectares) expansion of the irrigation district assessed area by 2025. This increase from the 2012 assessed area should be achieved from the improvements in irrigation water-use efficiencies, including water conservation due to on-farm and conveyance improvements. Irrigation districts compile the number of hectares on their assessment rolls annually and report them in the Alberta Irrigation Information publication. In 2022, the assessed area was 618,057 ha.



Irrigation district assessment acres

5. Water storage

A study to assess potential water storage sites to improve water supply security within the South Saskatchewan River Basin was completed in 2014 with the publication of the “Water Storage Opportunities in the South Saskatchewan River Basin in Alberta” report.
Read the full report

Project Completed

6. Water quality and protection of aquatic environment

Strategies to effectively manage nitrogen and phosphorus associated with confined feeding operations will be developed and implemented in select Alberta watersheds by 2020. As a measure of success, annual reporting on the scientific assessment of beneficial management practices (BMPs) will be provided.

Nutrient beneficial management practices evaluation project (2007–2012)

The Nutrient Beneficial Management Practices (BMP) project was developed to assess the implementation of beneficial manure, livestock, and surface-water management practices to improve water quality leaving the farm, at the field scale. The final technical reports and recommendations were completed and publicly released in 2014. In general, the BMPs were found to be effective at improving the quality of water leaving the farm.

Project Completed

Read the summary and recommendations report

Alberta phosphorus watershed project (2013–2019)

The purpose of this project is to determine if widespread adoption of BMPs improve water quality at the watershed scale. At the outset, the Alberta Phosphorus Management Tool (APMT) was developed to identify highest risks for P loss and propose BMPs to minimize those risks. This tool was applied in two model watersheds to prioritize strategic and widespread implementation of BMPs, and subsequently assess the influence of BMPs on nutrient concentrations, specifically phosphorus, within each watershed. An interim summary of the project findings was released, with key findings from 2013-2017.

Project Completed

The cumulative, longer-term effects of the BMPs on water quality was assessed for an additional three years in two Alberta watersheds, Tindastoll and Threehills. A report detailing the results of these assessments has been prepared and published.

Read the summary report

Nutrient objectives for small streams in agricultural watersheds project (2016-2021)

Motivated by previous initiatives, the Nutrient Objectives Project was developed to derive numeric nutrient targets for small streams in agricultural areas that can be used as measures of success for watershed-scale management programs. A stressor-response approach was applied to evaluate the impact of nutrient concentrations on aquatic ecosystem health in the Grassland, Parkland and Boreal natural regions. Numeric guidelines for concentrations of total phosphorus and nitrogen have been developed that reflect levels of risk for aquatic ecosystem impairment. Draft risk-based nutrient targets have been prepared for lower-order streams in the Grassland, Parkland and Boreal natural regions. The final targets will be published by 2024.

Project Completed

7. Groundwater quality

An assessment of manure management effects on shallow groundwater quality and mitigation strategies was completed.

Livestock manure impacts on groundwater quality in Alberta (2008–2015)

The objective of the groundwater research was to improve our understanding of the effects of manure storage and spreading on groundwater quality. Field work ended in 2015 and the data were analyzed and published in a the final report. Active feedlots appeared to present less risk to groundwater contamination than areas used for temporary or long-term solid manure storage. Results also suggest that shallow groundwater in coarse-textured soils is more vulnerable to contamination than groundwater in till and other fine grained deposits. The study has not found evidence of manure contamination at depths of more than 12 metres.

Project Completed

Read the full technical report

8. Water quality and food safety

A comprehensive assessment of irrigation water quality within the major irrigation districts was completed.

Water quality in Alberta's irrigation districts

Project Completed

Following a preliminary assessment of water quality in Alberta's irrigation districts in 2006-2007, a comprehensive five-year study was undertaken beginning in 2011. With support from AIDA and the irrigation districts, water quality monitoring has continued at many of the same sites from 2016 through 2023. Cumulatively, a comprehensive analysis of more than 200 parameters has continuously been evaluated at more than 75 sites, with selective inclusion of additional parameters as priorities have emerged. The conclusions of the 2011-2015 study are being integrated with previous and subsequent years of analyses for a 10-year summary of irrigation district water quality. A series of ten reports detailing different aspects of the program are being prepared and are expected to be completed by 2024.

All water quality data from recent and historic monitoring in the irrigation districts are publicly accessible via the online Irrigation District Water Quality Data Tool. In general, irrigation water quality remained consistent with previous years, with the majority of sites rated as "excellent".

Water quality indices of irrigation water of southern Alberta

Water quality trends in irrigation water of southern Alberta

Long-term patterns of pesticides in irrigation water of southern Alberta

Veterinary pharmaceutical analysis of irrigation water of southern Alberta

Irrigation District Water Quality Data Tool

Mitigating risk to market access for Alberta's irrigated agriculture through a next-generation approach to water quality (2016 – 2019)

Project Completed

Initiated in 2016, the overall goal of the Alberta Innovates-funded project was to assess the applicability of next-generation microbial source tracking technologies to identify sources of *Escherichia coli* (*E. coli*) in Alberta's irrigation districts. This information is useful to develop mitigation options that ensure farmers have access to irrigation water of sufficient quality to comply with food safety standards for crops. The project was completed in 2019, and manuscripts have been published in Water Research Agricultural Water Management journal, fulfilling the project deliverables.