

FINAL REPORT

Analysis of Agricultural Water Supply Issues

National Summary

Agriculture and Agri-Food Canada

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EXECUTIVE SUMMARY

The National Water Supply Expansion Program (NWSEP) is a four year \$60 million Agriculture and Agri-Food Canada (AAFC) investment in secure water supplies for agriculture. The intent of the program is to improve the capacity of agricultural producers to deal with drought and other agriculturally related water supply constraints through the development and expansion of water supply systems on a cost-shared basis.

Regional consultations were undertaken to identify the agricultural water supply issues and constraints throughout the country such that program options and priorities could be established. Information from these consultations is provided in five separate reports, each focusing on a specific region: British Columbia, the Prairies, Ontario, Quebec and the Atlantic Provinces. This summary report provides an overview of the findings at national and provincial scales.

Water supply constraints to agricultural production were evident in all provinces except Newfoundland/Labrador; however, even in Newfoundland/Labrador, a lack of information on water supply needs for the various agriculture sectors was identified, which in itself could be considered a constraint. In total, twelve main constraints were identified in the five regions. The types of constraints vary across the country and are generally related to climate, poor information on groundwater resources, commodity group needs, or allocation rights. Constraints were most widespread in location and type in the Prairies and British Columbia. In the central and eastern provinces, constraints were primarily related to irrigation supplies.

In general, the reports identified four main priorities for agricultural water supply expansion:

- Improved knowledge of our surface water and groundwater resources, specifically in terms of the available supply and the demand placed upon them by all sectors.
- Encouragement of more efficient use of available water.
- Improved planning and communication among all parties responsible for aspects of water supply development and withdrawal.
- Additional water supply and distribution infrastructure to support sustainability and growth of the agricultural sector.

Several initiatives were identified that would begin to address some of the constraints. These projects range from providing support for water supply infrastructure, to supporting development of information, or supporting initiation of local water management structures. A general consensus was found that the time frame of the NWSEP was too short, and that the available funds under the NWSEP would be insufficient to address the constraints in the long-term. Some feedback indicated that a long-term program with substantially more funding would be required to adequately

address water supply issues. Nevertheless, the general recommendations from all provinces include funding and technical assistance for the two broad categories of:

- Strategic work, which includes: information gathering, technology transfer, feasibility assessment and planning; and,
- Infrastructure, which includes: new capital works or improvements to existing water supply infrastructure.

Other main recommendations include an allowance for flexibility in program delivery to accommodate regional differences, and the development of criteria to allow for prioritization of projects.

Table of Contents

Executive Summary	i
1.0 Introduction	1
1.1 Background	1
1.2 Objective of Study	1
1.3 Methodology	2
2.0 Provincial Summaries	3
2.1 British Columbia	3
2.2 Alberta	5
2.3 Saskatchewan	7
2.4 Manitoba	9
2.5 Ontario	11
2.6 Quebec	13
2.7 New Brunswick	15
2.8 Nova Scotia	17
2.9 Prince Edward Island	19
2.10 Newfoundland and Labrador	20
3.0 National Summary	21
3.1 Overview	22
3.2 Recommendations	28
4.0 References	29

List of Tables

Table 3.1	Summary of water supply constraints in each province	23
Table 3.2	Examples of potential eligible projects under the proposed National Water Supply Expansion Program	26

1.0 INTRODUCTION

Recent drought, depleting and/or fully allocated water supplies, contaminated water supplies, and water supplies of poor quality have heightened the awareness of the importance of reliable water supplies for domestic, industrial and agricultural use. The need for improved water management strategies continues to be expressed across the country, particularly as increased conflicts over water supply needs occur among agriculture, industry and municipalities.

In the agriculture sector, water shortages directly limit yields and result in economic hardships that spread well beyond the farm gate. Water constraints vary across the country and within commodity groups, and can range from a physical constraint to a regulatory constraint. Regardless of the issue, there is a need to develop a long-term strategy to remove water supply constraints to agriculture throughout the country. Without such a strategy, agricultural growth cannot continue.

This report summarizes the results of regional consultations that focused on identifying the agricultural water supply issues and constraints in each province. The report provides recommendations for agricultural water supply programming options and priorities at national and provincial scales.

1.1 Background

The National Water Supply Expansion Program (NWSEP) is a four year \$60 million Agriculture and Agri-Food Canada (AAFC) investment in secure water supplies for agriculture. The intent of the program is to improve the capacity of agricultural producers to deal with drought and other agriculturally related water supply constraints through the development and expansion of water supply systems on a cost-shared basis.

The \$60 million program budget will be distributed as follows: \$10 million in 2002/03; \$20 million in 2003/04; \$20 million in 2004/05; and \$10 million in 2005/06. In 2002/03 the dollars were allocated primarily towards relieving the water supply situation on the drought-affected Prairies. However, some of the allocation was also directed towards assisting the provinces of Nova Scotia and New Brunswick to address regional droughts, and towards conducting a scoping study on agricultural water supply issues across Canada. The results of the scoping study will be used to determine program options and priorities for the remaining 3-year \$50 million allocation.

1.2 Objective of Study

The intent of the scoping study is to identify:

- The scope of agricultural water supply needs;
- The nature and extent of water supply constraints on agriculture; and,

- The priorities for agricultural water supply expansion across Canada.

The results of this study will be incorporated into negotiations/consultations between the federal government, provincial governments, and agricultural stakeholder groups for developing immediate and future programming options.

1.3 Methodology

Consultative studies were undertaken in five regions: British Columbia, the Prairie Provinces, Ontario, Quebec and the Atlantic Provinces. Each study incorporated:

- A review of existing or readily available documentation on agricultural and rural water supply needs and problems specific to the region of study;
- Individual or small group consultations with pertinent municipal, provincial and federal agencies, and key stakeholder groups; and
- An advisory group workshop to: review findings, confirm issues, and identify and prioritize possible activities for funding.

The information derived from each activity was synthesized into a report that discussed:

- The water supply issues and constraints in the agricultural areas of the study region;
- The existing programming available for water supply infrastructure and information development;
- The gaps in information with respect to water supply needs;
- Possible solutions to the identified water supply constraints;
- Prioritized regions for funding (where appropriate); and
- Programming options.

The five studies were contracted out as follows:

- British Columbia – Golder Associates
- Prairie Provinces – UMA Engineering Ltd.
- Ontario – Marshall Macklin Monaghan Ltd.
- Quebec – BPR Groupe Conseil
- Atlantic Provinces – CBCL Ltd.

Specific details on the literature reviewed, lists of people consulted and workshop formats are discussed in each report, which are listed as references in Section 4.

In this report, Section 2 summarizes the key findings of each report and is presented by province. Section 3 provides an overall summary from a national perspective, and provides recommendations for the development of the National Water Supply Expansion Program.

2.0 PROVINCIAL SUMMARIES

2.1 British Columbia

The following text summarizes information from the report titled *Analysis of Agricultural Water Supply Issues – National Water Supply Expansion Program – British Columbia*.

2.1.1 Issues/Constraints and Information Gaps

The agricultural regions within British Columbia vary significantly in type of agriculture and in water availability. Within the agricultural producing zones precipitation varies from less than 300 mm to greater than 2500 mm. In the drier areas, prolonged periods of lower than normal precipitation have led to water shortages. Interestingly, even the wettest areas can face water shortages in late summer when water demand is highest, because the majority of the precipitation occurs in the winter months.

While British Columbia is perceived to have an abundance of water, it is not always accessible because of allocation restrictions. Competing uses create high demands, particularly on surface water because the lack of information on groundwater availability often restricts development of potential groundwater sources.

There is a general gap in the information needed to make decisions about water use. These gaps include the quantification of regional water needs on a commodity basis, the availability of groundwater resources, accurate water budgets (i.e. assessing true water availability versus amounts allocated), and limited information on in-stream needs for preservation of aquatic life.

Irrigation is important for the production of several commodities in British Columbia, ranging from forage crops to high value fruit crops. In some regions, where commercial agriculture cannot thrive without irrigation, challenges occur due to seasonal shortages of water.

Water conservation measures are adopted in an inconsistent manner throughout the province. Water storage, improved water conveyance systems, irrigation equipment efficiencies, water metering and irrigation scheduling are all examples of conservation measures that could be implemented more consistently throughout the province.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Availability / distribution of water to agriculture;

- Competition for limited water resources with non-agricultural users;
- On-farm efficiency (education and resources to improve efficiency);
- Lack of Information (water needs, water availability, knowledge of sources, etc.);
- Public awareness of agriculture’s water needs and how water can be shared; and,
- Policy issues related to existing and future allocation of water for agricultural use.

2.1.2 Priorities

In each region of the province, the availability of long-term water supply is a limiting factor to agricultural expansion. The inherent constraints vary among and within regions, and as such the priorities may differ slightly in each region. In general, recommendations call for:

- Addressing on-farm water conservation activities;
- Developing information specific to agricultural water use and availability of water in agricultural areas of the province;
- Developing on-farm and regional water supply infrastructure, including development of engineering plans; and,
- Contributing to effective partnerships and resolution of conflicts on water use objectives.

2.1.3 Recommended Program Principles, Elements, or Criteria

The general recommendations include funding and technical assistance for the two broad categories of:

- Information gathering, technology transfer, feasibility assessment and planning; and,
- New capital works or improvements to existing water supply infrastructure.

Recommended program elements or criteria include:

- Flexibility to address regional constraints and issues;
- Encouragement of on-farm water conservation activities;
- Filling information gaps on agricultural water use and availability of water in agricultural areas of the province;
- Development of water supply infrastructure for both on-farm and regional use;
- Inclusion of agreements with the responsible parties for long-term security of the water supply for infrastructure developments; and,
- Integration, to the extent possible, of the interests from all parties responsible for water.

2.2 Alberta

The following text summarizes information from the report titled *Analysis of Agricultural Water Supply Issues – Prairie Provinces – National Water Supply Expansion Program*.

2.2.1 Issues/Constraints and Information Gaps

In Alberta, the greatest demand for water lies in the central and southern parts of the province, whereas the greatest supply exists in the northern part of the province. The heavy demand for water in southern Alberta has resulted in the placement of moratoria on surface water withdrawals for some streams.

Many regions of Alberta experience greater losses of water through evaporation than gains from precipitation. Throughout time, drought has occurred through much of the agricultural region of the province, but it has been particularly prevalent in the southern and eastern parts of the province.

There is a general gap in the information needed to make decisions about water use. The relationship between surface water and groundwater systems, the sustainable yields of major aquifers, and the in-stream needs for river basins need to be assessed before water supply and demand can be adequately assessed.

Irrigation is required for a significant portion of agricultural production in southern Alberta. The majority of surface water consumptive use in the province is accounted for by irrigation. Water conservation strategies are constrained by a lack of adequate hydrological and climate monitoring networks.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Lack of information on sustainable yields of groundwater aquifers;
- Lack of a long-term water supply development strategy;
- Existing surface water supplies are diminished due to drought and increasing fluctuations in long-term weather patterns;
- Surface water license moratoria exist in the south;
- Majority of water supply is in the north, whereas demand is in the south;
- Lack of information on sustainability of agriculture with available water supply; and,
- Existing downstream water apportionment agreements must be met.

2.2.2 Priorities

The study identified some regions that had specific water supply constraints that impacted agricultural production. The constraints in these regions varied and consequently the recommended approaches to solving the constraints varied. In general, there is a need for targeted assessments of water supplies and targeted infrastructure development. Recommended funding options included:

- Programs to monitor water use/diversions;
- Programs to increase education on water conservation and efficient use of water;
- Programs to support collection of groundwater data and assessments of the resource;
- Targeted community water supply development, for example, regional pipelines and tank loader facilities to distribute good quality water from reliable sources to areas where water supply issues exist;
- Programs to develop web-based accessibility to all water databases;
- Feasibility studies for water storage opportunities; and,
- Test well/supply well programs in low yield/poor water areas.

2.2.3 Recommended Program Principles, Elements, or Criteria

The general recommendations include funding for the two broad categories of:

- Program development – targeted funding to assist with planning studies, investigations of the water resources, or database management
- Project work – specific projects, generally infrastructure, that address short-term and long-term water supply problems

Recommended criteria for program design and implementation include:

- Programs/projects should get priority in critical areas where constraints are most evident;
- Program/project should demonstrate it will lead to risk reduction;
- Water source developments should supply safe water for human and livestock consumption;
- Measures that increase efficiency of water use are most appropriate;
- Programs/projects that provide economic benefit to many people are more desirable;
- Initiatives that address a regional issue are more desirable;
- Flexible contribution scales depending on project rating and ability of proponents to cost-share; and,
- Projects should stabilize or enhance rural development.

2.3 Saskatchewan

The following text summarizes information from the report titled *Analysis of Agricultural Water Supply Issues – Prairie Provinces – National Water Supply Expansion Program*.

2.3.1 Issues/Constraints and Information Gaps

Similar to Alberta, much of the water supply in Saskatchewan exists in the northern part of the province where little agricultural production occurs. As well, drought often affects much of the agricultural region of the province, but it has been particularly prevalent in the southern and western parts of the province.

For the bulk of its consumptive use, the Province relies almost equally on groundwater and surface water. Irrigation use accounts for the highest portion of surface water consumption, whereas municipal/domestic and industrial use accounts for the greatest portion of groundwater consumption.

Much of the groundwater in Saskatchewan has very high total dissolved solids concentrations, which severely limit its use. Although water treatment is feasible for municipal and industrial uses, the cost is too expensive for most agricultural uses.

There is a lack of water distribution infrastructure to move sufficient quantities of high quality water to regions that are prone to water shortages. The lack of funding for regional water supply networks limits the number of projects that can be built. There are also a number of large infrastructure projects that require rehabilitation and/or major maintenance.

There is a need for information on surface water availability and on the sustainability of groundwater aquifers. A need also exists for development of plans for long-term water supply projects.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Groundwater quality limits its use for agricultural purposes;
- Drought, unreliable surface water supplies;
- Lack of large infrastructure and distribution infrastructure;
- Limited information on water availability (groundwater and surface water);
- Poor on-farm water quality; and,
- Limited local capacity to fund regional water supply development.

2.3.2 Priorities

The study identified the south, southwest, northwest, west-central and central areas of the province as having been the most impacted by the recent drought. The study did not illustrate whether the eastern part of the province had other water supply constraints. Recommended funding options included:

- Planning, regional water supply studies including short and long-term planning;
- Programs to increase education on water conservation and efficient use of water;
- Programs to support collection of groundwater data and development of a groundwater information database;
- Development of a Saskatchewan Centre of Excellence focussed on all aspects of water supply, conservation and water quality;
- Targeted community water supply infrastructure, primarily regional pipelines;
- Programs to support groundwater investigations and long-term groundwater monitoring to determine availability, quality and sustainability of supply; and,
- Assisting on projects that would allow existing infrastructure to be used at its potential capacity.

2.3.3 Recommended Program Principles, Elements, or Criteria

The general recommendations include funding for the two broad categories of:

- Program development – targeted funding to assist with planning studies, investigations of the water resources, or database management; and,
- Project work – specific projects, generally infrastructure, that address short-term and long-term water supply problems.

Recommended criteria for program design and implementation include:

- Sustainability of supply;
- Extent of contribution to rural development/renewal;
- Extent of value added from project;
- Dynamic rural community;
- Extent of diversification benefits;
- Extent of population benefiting from project; and,
- Over-sizing of infrastructure facilities to accommodate 10-20 year time frame should occur at the expense of the program.

2.4 Manitoba

The following text summarizes information from the report titled *Analysis of Agricultural Water Supply Issues – Prairie Provinces – National Water Supply Expansion Program*.

2.4.1 Issues/Constraints and Information Gaps

The agricultural region in Manitoba is diverse and can range from being flood-prone in some areas to drought-prone in other areas. Manitoba has not recently experienced the same severity of drought as the other Prairie Provinces; however, severe water supply constraints exist in many parts of the province.

The drought prone regions are primarily the Red River valley west of the Red River, the Plumas-MacGregor region, and the southwest portion of the province. Currently there are no strategies to address long-term water supply needs in these areas. There is limited information on alternative water sources and limited funding for development of regional water supply networks.

Specific commodity groups continue to grow in the province and require constant supplies of good quality water. In particular the use of irrigation for high-value crops has created high demands for water supplies. For example, the number of irrigated acres in potatoes increased from 8,600 in 1988 to 54,000 in 2001. The Provincial strategy is to increase the irrigated acres in the Province and as such there is a need for funding to support the development of large-scale irrigation infrastructure. The hog sector has also experienced growth and a need for improved water supplies.

Although information on groundwater availability exists for those aquifers that are well documented, there is a need for further exploration in some areas. In particular there is a lack of information on groundwater resources in the southwestern part of the province. A comprehensive groundwater database does not exist for the whole province.

The primary constraint to water supply development for agriculture in Manitoba relates to limited financing for, and a high demand for, large infrastructure development. The main issues, constraints or knowledge gaps identified in the consultative process included:

- Lack of water in specific regions (*e.g.* Red River Valley, SW portion of province, Plumas-MacGregor region);
- Lack of groundwater information (*e.g.* poor database);
- Inadequate large-scale irrigation infrastructure for growth in value-added crops sector;

- Lack of good quality water for domestic use to ensure populated rural areas;
- Lack of long-term stable funding for water supply development; and,
- Lack of research and development related to water supply issues.

2.4.2 Priorities

The study identified several regions where water supply constraints are a continuing concern. Many of these constraints are related more to a general lack of good quality water rather than to drought vulnerability. Recommended funding options included:

- Water supply developments for the irrigation of high-valued crops in selected areas;
- Water supply development for hog and potato production;
- Infrastructure (community or individual) to improve access to safe and reliable water supplies for rural, municipal and on-farm domestic use (including source development, distribution and treatment);
- Programs to support collection of groundwater data and development of groundwater assessments in select areas; and,
- Programs to support construction of off-stream storage reservoirs or other water supply impoundments in select areas.

2.4.3 Recommended Program Principles, Elements, or Criteria

The general recommendations include funding for the two broad categories of:

- Program development – targeted funding to assist with planning studies, investigations of the water resources, or database management; and,
- Project work – specific projects, generally infrastructure, that address short-term and long-term water supply problems.

Recommended criteria for program design and implementation include:

- Improves quality of life (health and safety of water supply);
- Extent of contribution to rural development/renewal;
- Extent of economic benefits from project;
- Promotes conservation of resource;
- Extent of population benefiting from project (Public versus Private good);
- Regional equity;
- Extent of commitment in place; and,
- Extent of cost-sharing.

2.5 Ontario

The following text summarizes information from the report titled *Analysis of Agricultural Water Supply Issues – National Water Supply Expansion Program – Province of Ontario.*

2.5.1 Issues/Constraints and Information Gaps

Most agricultural production occurs in southern Ontario; however, some production does occur in northern Ontario. For example, the area around Sudbury has a significant amount of agricultural production in the vegetable sector. Irrigation is almost exclusively a feature of agriculture in southern Ontario, and it makes up the bulk of the agricultural water use in southern Ontario. Irrigation was estimated at 54% of total agricultural water use in 1996.

Precipitation in southern Ontario varies between 600-1000 mm across the region and it is generally distributed uniformly throughout the year. Runoff in the same region varies from 200 – 500 mm, with the lowest amounts coinciding with the areas of highest agricultural water demand.

Throughout the provinces there are examples of inadequate management systems, information systems and regulatory systems designed for water management. Various measures have been implemented in an attempt to address these inadequacies but most of the programs are pilot projects specific to small geographic areas, whereas the problems are generally much more widespread. The local capacity to implement such measures varies across the Province.

There are regional variations in the extent to which farmers face agricultural water supply constraints. These variations are generally a function of factors such as moisture deficits, commodity type, presence of water sources, competition for water sources, and administration of the water allocation system. There are specific regions that were consistently identified as having water supply constraints that impact agricultural production. These are areas where for the most part irrigation is important. However, in the livestock sector, different areas of the province were impacted by the 2002 drought and were eligible for tax deferral. This highlights the need to consider the various agricultural sectors when designing programming options.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Insufficient water to meet demand in periods of low water in particular regions of the province;
- Inadequate management of available water supply and demand;

- On-farm efficiency (education and resources to improve efficiency);
- Information (water demand, water availability at critical times, knowledge of sources, etc.); and
- Ineffectiveness of the Permit To Take Water system.

2.5.2 Priorities

Specific regions were identified as having significant water supply constraints that impacted agricultural production. The constraints in these regions were primarily associated with irrigation activity. However, the study also illustrated that other regions, which were not identified as critical areas, suffered from drought and received tax deferral status. Therefore, it was recommended that in designing a water supply enhancement program, it would be important to develop criteria that are sensitive to sectoral needs. Recommended funding options included:

- Funding for studies to better understand water systems/capacities;
- Programs to increase education on water conservation;
- Programs to increase adoption of water conservation measures;
- Programs to improve participation in local initiatives such as the irrigation advisory committees or low water response teams; and,
- Funding for infrastructure improvements where immediate change/improvement can be achieved, targeted primarily at increased storage.

2.5.3 Recommended Program Principles, Elements, or Criteria

General program recommendations include assistance for broad categories of:

- On-farm infrastructure;
- Data collection and synthesis of information; and
- Start-up or operation of local initiatives (seed money).

Recommended criteria for program design and implementation include:

- Programs should be led by local stakeholders and involve partnerships;
- Existing institutional arrangements and resources should be used where possible;
- Programs that produce immediate results are more desirable;
- Measures that increase efficiency of water use are most appropriate;
- Programs should have positive benefit-cost ratios;
- Initiatives that fill knowledge gaps are desirable; and
- Programs that encourage water storage during times of adequate supply should be emphasized.

2.6 Quebec

The following text summarizes information from the report titled: *Analyse des questions d'approvisionnement en eau pour le secteur d l'agriculture – Programme national d'approvisionnement en eau – Province de Québec.*

2.6.1 Issues/Constraints and Information Gaps

Although as a province, Quebec may be seen as having an apparent abundance of water resources, there are localized areas where constraints are evident. The regions with the most severe constraints include the Montérégie, Lanaudière, Quebec City and Magdalen Islands regions. The primary constraints in these regions are related to irrigation requirements of field-grown crops.

Total water demand for agricultural production in Quebec is estimated at 174.1 million m³ per year. Aquaculture accounts for the largest component (42%), followed by the livestock sector (32%) and crop production (26%). Although each of these sectors experience some water supply problems, the short-term constraints experienced by the crop production sector are seen as the highest priority.

The crop production sector, in particular production of field-grown vegetables, has been under increasing pressure to maintain minimum irrigation standards to improve harvesting and production efficiencies. Constraints include a lack of water supply, inadequate infrastructure and a limited knowledge on some of the technical and economic aspects of crop irrigation.

Throughout Quebec, and relevant to all sectors, there is a lack of information on water supply, particularly with respect to measures of actual consumption by each sector, and on the capacity and the sustainability of groundwater aquifers utilized by rural communities. There is also a lack of support available for development of information on irrigation risk management (advanced technologies, water conservation etc.), and for the transfer of such technical information to the appropriate sectors.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Lack of sufficient knowledge of aquifers used by rural communities
- Lack of sufficient knowledge of the type of water supply used by farms, the amount used by each sector, and how water is stored
- Lack of sufficient knowledge to address specific water quality issues
- Lack of support for development of knowledge/tools for improved water management (e.g. irrigation efficiency and alternative irrigation technologies);

- Poor quality water for agricultural use (some regions); and,
- Lack of proper water storage facilities (ponds) including poor management and design.
- Conflicts between users from different sectors could become an issue in some areas
- Lack of infrastructure to manage irrigation water in areas where vegetable production is intense.

2.6.2 Priorities

The Quebec study recommended that although the program should be accessible to all sectors, priority should be given to the crop production sector, particularly towards solving constraints related to the irrigation of field-grown vegetables. Although the study identified particular regions where the constraints were more severe, or well documented, the report recommended that the program should be accessible to all regions, provided that the funding remains targeted towards the established priorities.

Recommended funding priorities included:

- Studies to accurately assess water use, demand and availability by the agriculture sector;
- Support for development of new irrigation technologies promoting irrigation efficiency, water conservation or technology in the vegetable production sector;
- Studies to identify solutions for specific regional water supply issues, including addressing water quality problems associated with supplies.
- Support for development of community infrastructure: feasibility studies, water supply infrastructure

2.6.3 Recommended Program Elements/Criteria

General program recommendations include assistance for broad categories of:

- Knowledge development: aquifer characterization, water quality, and water use studies
- Community water supply infrastructure

Recommended criteria for program design and implementation include:

- The use of a community approach
- Potential benefits for the agricultural community
- Involvement from many different partners
- Requirements under pending regulatory changes

2.7 New Brunswick

The following text summarizes information from the report titled *Agricultural Water Supply Issues: Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador.*

2.7.1 Issues/Constraints and Information Gaps

There are four key agricultural regions in New Brunswick, which are differentiated based on farm concentrations and commodity type. Each of the four regions has suffered in the past from seasonal water shortages; however, traditionally agricultural water supply issues have focused on managing surplus water. In general, most stakeholders believe there is sufficient water to meet agricultural demands, but that there is a need to better manage the water supply such that seasonal shortages can be accommodated.

Because water supply has not historically been a problem, producers have seldom had to manage water on their farms. In many cases, producers are not aware of the permitting requirements for water supply development, use and protection, and they do not have the experience or knowledge base necessary to deal with the constraints they are currently confronting. There is no consistent delivery mechanism by which producers might learn of best management practices for water conservation and water management or how to implement them on-site.

The most common water supply constraint in the Province that affects agricultural production appears to be seasonal moisture deficits for crop production. A number of studies on the feasibility and benefits of supplemental irrigation have been conducted in the province. The conclusions of the studies vary in terms of the benefits of implementing supplemental irrigation. Some of the studies illustrate the importance of the adoption of other best management practices to address moisture deficits, in addition to irrigation. Although the results vary widely, most areas appear to make some use of supplemental irrigation. Obstacles to the implementation of effective irrigation include the long approval process for construction of storage ponds, high capital costs and poor implementation methods.

There is a general gap in the information required for implementing water management strategies. These gaps include knowledge of the quantity and quality of water available for use, and assessments of the seasonal supply and demand for water.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- Lack of information on cumulative demands of water resources;

- Lack of information of surface and groundwater availability;
- Need for feasibility studies for site-specific uses of water;
- Limited information on environmental permitting and excessive time requirements to obtain permits;
- Absence of meaningful pilot demonstrations;
- Lack of educational information available to producers on water conservation;
- Lack of technical and financial support to facilitate access to water resources; and,
- Lack of funding for irrigation equipment.

2.7.2 Priorities

The main priorities identified included:

- Technical assistance for water management;
- Technical assistance for on-farm water development;
- Funding for information development on groundwater and surface water availability and demand; and,
- Extension services related to water conservation and research results, including demonstration projects.

Secondary priorities included:

- Regional-specific funding targeted to the primary constraints of the region; and,
- Financial assistance for irrigation equipment.

2.7.3 Recommended Program Principles, Elements, or Criteria

General recommendations include funding for:

- Strategic studies including monitoring, assessment and centralized database development;
- Funding for specialist staff to provide technical assistance; and,
- Incentives for on-farm water supply development.

Possible program criteria that were identified included:

- Delivery of fund in cooperation with existing groups or the provincial government; and,
- Potential targeting of funds to specific issues in specific regions.

2.8 Nova Scotia

The following text summarizes information from the report titled *Agricultural Water Supply Issues: Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador.*

2.8.1 Issues/Constraints and Information Gaps

The perception among stakeholders and water specialists in the province is that there is sufficient water in Nova Scotia to meet agricultural demands, as well as the demands of municipalities and industry. Constraints arise because the water is not always available at the times of greatest need. Most agriculture in the province relies on surface water sources, which can be limited in quantity and quality during dry growing seasons. In the past 3-5 years, prolonged periods without rain have increased in severity and duration.

There have been several changes in the agricultural sector that have increased the demand for water. From 1996 to 2001, the number of irrigated hectares in the Province increased by 56%. Some of this growth relates to an increase in horticultural production, which has a high demand for irrigation. In addition, consumer expectations with respect to both the quality and quantity of produce have increased, necessitating development of reliable and predictable sources of water.

Recently, the dairy and beef sectors have also been affected by water shortages. Dry summers have reduced yields from feed crops, and dry ponds and wells necessitated water hauling for both livestock watering and milkhouse cleaning.

The recent water shortages were a catalyst in initiating a number of regional studies and/or initiatives throughout the province on water management issues. Some studies have identified currently untapped agricultural water supply opportunities and the main constraints to accessing those supplies. Other studies identified short-term and long-term options for mitigating the effects of water shortages in the Province. In addition, some watershed-scale initiatives were undertaken to identify and implement solutions to region-specific supply and demand problems.

There are regional differences in water supply constraints in the Province. These differences reflect differences in commodity production and differences in water availability (both the actual presence of water and the amount available under the regulatory framework). In many cases, the issues and solutions are known, but are not being implemented due to a lack of funding.

The main issues, constraints or knowledge gaps identified in the consultative process included:

- An inability of producers to readily access information with respect to new technologies or to attain the expertise necessary to implement the best technology to meet production-specific water requirements;
- Lack of funds to offset capital costs of farm water supply developments;
- Incomplete databases with respect to both groundwater and surface water sources;
- Insufficient monitoring programs; and,
- Ineffectiveness of the water permitting and approval procedures.

2.8.2 Priorities

Feedback from the consultations suggested there should be no attempt to prioritize funding by region. Rather, funding should be directed at provincially applicable and regionally adaptable programs. Priority programs and activities included:

- Funding for extension and educational services to farmers;
- Establishment of a comprehensive water resource database;
- Incentives for on farm or group-based solutions to sourcing and distribution of water resources; and,
- Financial and technical support to the existing Water Management Clubs and for formation of new clubs in other areas of the province.

2.8.3 Recommended Program Principles, Elements or Criteria

Recommendations include assistance for:

- Funding small-scale on-farm infrastructure development;
- Funding education/extension and resource assessment opportunities; and,
- Providing technical assistance through AAFC-PFRA.

Specific program criteria that were recommended include:

- Funds for infrastructure development should be delivered in cooperation with existing provincial programs where possible;
- Infrastructure should be targeted to farm-specific solutions;
- Water supply development options should allow for sustained water use;
- Linkages should be created between water development and monitoring the water use;

- Funds for education should be delivered in cooperation with existing water clubs; and,
- Studies should target assessment of supply and demand of water resources.

2.9 Prince Edward Island

The following text summarizes information from the report titled *Agricultural Water Supply Issues: Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador.*

2.9.1 Issues/Constraints and Information Gaps

The primary water supply constraints in Prince Edward Island relate to the need for supplemental irrigation for cash crops, particularly for potatoes and other vegetables. Increasingly, producers rely on irrigation as a tool for managing risks associated with crop production. In addition, research on the island has illustrated significant increased yields for potatoes under irrigation.

The groundwater resources of PEI have been well documented, and reports indicate that extraction for supplemental irrigation would have no impact on the supply. One of the main concerns related to extraction of groundwater for irrigation, is the impact on surface flows; groundwater discharge accounts for 60-70% of stream flow on an annual basis and approaches 100% during the growing season.

At the moment, a moratorium exists on the development of new groundwater extractions (>50 gpm). The Department of Fisheries, Agriculture and Environment is currently conducting a study which will set the basis for planned and equitable access to water and for policies related to water management.

Because of the moratorium of high capacity wells for irrigation, some producers have had to develop other water supplies in order to irrigate. Most of these supplies are off-stream storage structures. In many cases, producers have not been able to access technical expertise to help identify options for water source development and distribution for irrigation purposes.

The main issues, constraints or knowledge gaps identified through the consultative process included:

- The provincial moratorium on drilling of high capacity wells for irrigation;
- Public concern over the use of groundwater for irrigation; and,

- Lack of accessibility by producers to expertise on irrigation technologies and water conservation techniques

2.9.2 Priorities

Priority programs and activities included:

- Development and dissemination of information on best management practices for irrigation, including funding for field-scale research;
- Provision of technical assistance for water supply development alternatives to deep wells; and,
- Financial assistance for on-farm or group-based water supply development.

2.9.3 Recommended Program Principles, Elements, or Criteria

Recommendations include assistance for:

- Funding for research and development of information specifically related to irrigation technologies;
- Funding for individual and group water supply development; and,
- Funding for, or provision of, technical assistance.

Specific program criteria that were recommended include:

- Funding for research activities should be limited to multi-stakeholder initiatives; and
- Funding for infrastructure should be accessible to individuals and groups of producers.

2.10 Newfoundland and Labrador

The following text summarizes information from the report titled *Agricultural Water Supply Issues: Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador.*

2.10.1 Issues/Constraints and Information Gaps

Availability of sufficient water for agriculture in Newfoundland and Labrador is not an issue. There is, however, a general lack of information available on the current and future water needs, uses, and management practices of both the producers and food processors.

Some concerns were expressed over the quality of water for dairy production. However, there is virtually no information available on the extent or the severity of the problem. In addition, there was some concern expressed over limited access to good quality water (primarily groundwater). In this case, surface water is available, but seen to be of poor quality for the intended use.

Some irrigation is used in the province, but the use is primarily for frost protection. Although occasional moisture deficits may occur, producers have not found that irrigation is not cost-effective, given the infrequency of the events.

The main issues, constraints or knowledge gaps identified through the consultative process included:

- Lack of information on agricultural water needs and uses; and,
- Potential concern over access to good quality water year-round;

2.10.2 Priorities

The priorities identified included:

- Determination of the suitability and availability of water supply for agricultural operations;
- Assessment of water quality in specific watersheds where producers and processors utilise surface water from the same source as municipalities; and,
- Development of groundwater wells.

2.10.3 Recommended Program Principles, Elements, or Criteria

The general recommendations include financial assistance for:

- A study on producer and food processor water supply needs and uses;
- Development of groundwater wells; and,
- Water quality monitoring.

The only criteria that was identified was that assessments of agricultural water constraints or identification of ways to address those constraints should be carried out on a farm-by-farm basis due to the distances between farms.

3.0 NATIONAL SUMMARY

Water supply constraints to agricultural production were evident in all provinces except Newfoundland/Labrador; however, even in Newfoundland/Labrador, a lack of information on water supply needs for the various agriculture sectors was identified, which in itself could be considered a constraint. The types of constraints vary across the

country and are generally related to climate, poor information on groundwater resources, commodity group needs, or allocation rights. Constraints were most widespread in location and type in the Prairies and British Columbia. In the central and eastern provinces, constraints were primarily related to irrigation supplies.

3.1 Overview

Summary of Water Supply Constraints

Similar water supply constraints are experienced throughout the country, though not necessarily in all provinces (Table 3.1). The main constraints can be summarized as follows:

- *Fully allocated water supplies* – water is not available for use because it has been fully allocated. In some cases, the allocations are not fully used, but no new licences can be granted because the permitting process always assumes that each individual allocation is being fully used all the time.
- *Limited surface water or ground water supplies* – although supplies may not be fully allocated, there are insufficient supplies to sustain agricultural needs (either surface water or ground water).
- *Lack of information on groundwater resource* – availability, quality and/or sustainability of groundwater resource is not known, and people are unwilling to risk fronting the cost for test drilling in case there is no supply.
- *Lack of information of water supply and water demand* – there is limited information on how much water is really available, when it is available and what the demand for the water is from all sectors.
- *Seasonal water shortages* – there is sufficient water on an annual basis to cover all water supply demands, but there are times (generally during the growing season) when the available water supply cannot meet the demand.
- *Regulatory/Licensing issues* – there is sufficient water for all demands, but the permitting or licensing process doesn't allow for (immediate) withdrawal, either due to temporary moratoria or an inefficient process (i.e. long waits for license approvals).
- *Poor quality of water* – a water supply exists but cannot be utilized because of poor quality. This affects both surface water supplies and groundwater supplies. In many cases, treatment systems could render the water useable, however in most cases it is uneconomical to implement treatment.

- *Lack of water supply infrastructure* – a water supply exists, but there is no infrastructure available to distribute the water where it is needed. This is typically associated with large-scale irrigation systems or regional water pipeline supplies.
- *Limited uptake of water conservation strategies* – a sufficient supply of water may exist if conservation strategies/techniques were adopted. This is often a result of limited education, extension or technical assistance opportunities in an area.
- *Limited local capacity for funding regional water supply development* – there are limited means for the local producers to build capacity to fund a regional water supply development.
- *Competition from industry or environmental uses* – there is a lack of water for agricultural use because other uses have priority. This constraint in some cases may be a subset of the first, however it is kept separate to illustrate that in some areas, agriculture cannot compete for its water needs.
- *Lack of technical assistance* – there are limited resources available to producers to access information or assistance on water development options.

Table 3.1: Summary of Water Supply Constraints in each Province. The main constraints for each province are identified in bold text.

Constraint	BC	AB	SK	MB	ON	PQ	NB	NS	PEI	N/L
Fully allocated supplies	x	X			x					
Limited supply	X	X	x	x						
Lack of information on groundwater resources	x	x	X	X	x	X	x	x		
Lack of information on supply/demand	X	X	X	x	X	X	X	X	x	X
Seasonal water shortages	x				X	x	X	X	X	
Regulatory/Licensing issues	x				X		X	X	X	
Poor quality			X	x		x				x
Lack of infrastructure	x	x	X	X		X				
Limited uptake of water conservation	X	x	x		x	x	X	X	X	
Limited local capacity	x	X	X	X	x		x	x	x	
Competition	X	x			X		x	x		
Lack of technical assistance	x					x	x	X	x	

Regional Priorities

Although the study teams were able to identify regions within a province that suffered constraints, most groups were not able or unwilling to prioritize funding by region. The main reasons for this include:

- *A lack of comprehensive information for the entire province* – In some areas of a province, information does not exist to allow identification or quantification of the constraint. This is particularly apparent in terms of information on groundwater resources. Therefore, although a constraint may be identified in some regions because information is available, it does not necessarily imply that the constraints do not exist elsewhere.
- *Differences in commodity group requirements* – Some regions have specific constraints that have been identified because the region primarily supports a specific commodity group. Other regions have different constraints because they support other commodities. The study format did not allow for a process to evaluate the severity of one type of constraint over another. Therefore it is difficult to prioritize one region over another.
- *The study was not intended to create new information* – In some cases, there may be statistical information available that would allow more in-depth analyses of water supply constraints; however, the study timeframe and format did not allow for new data collection or interpretation. Therefore, although it may be possible to construct an analysis to determine regional priorities, such an analysis was not part of this study objective.

The difficulties in identifying regions within provinces where constraints are more critical, and in determining the value of one constraint over another suggest that it may be inappropriate to prioritize by region. Instead of identifying regions that are eligible for funding, the consultations suggested it would be more appropriate to develop program criteria that could help target where funds should be directed.

Programming Options

In general, the reports identified four main priorities for agricultural water supply expansion:

- Improved knowledge of our surface water and groundwater resources, specifically in terms of the available supply and the demand placed upon them by all sectors.
- Encouragement of more efficient use of available water.

- Improved planning and communication among all parties responsible for aspects of water supply development and withdrawal.
- Additional water supply and distribution infrastructure to support sustainability and growth of the agricultural sector.

Several initiatives were identified that would begin to address some of the constraints. These projects range from providing support for water supply infrastructure, to supporting development of information, or supporting initiation of local water management structures. A general consensus was found that the time frame of the NWSEP was too short, and that the available funds under the NWSEP would be insufficient to address the constraints in the long-term. In many cases, workshop participants suggested that a long-term program with substantially more funding would be required to adequately address water supply issues. Nevertheless, the general recommendations from all provinces include funding and technical assistance for the two broad categories of:

- Strategic work, which includes: information gathering, technology transfer, feasibility assessment and planning; and,
- Infrastructure, which includes: new capital works or improvements to existing water supply infrastructure.

Typical examples of projects that could be funded under each category are illustrated in Table 3.2.

Table 3.2: Examples of potential eligible projects under the proposed National Water Supply Expansion Program

Major Category	Project Type	Examples of Eligible Projects
Strategic Work	Studies/Data Collection	Technical studies on water use
		Investigative studies on groundwater availability in a particular area
		Development of web-based water supply monitoring database
		Water use or diversion monitoring
		Studies for policy purposes (e.g. in stream flow needs, water needs by commodity group etc)
		Applied research on water conservation technologies
		Applied research on water treatment technologies
	Extension/Education	Demonstration projects to illustrate water conservation technologies
		Development of educational material on water conservation
	Group Stewardship	Operational support for initiation/geographical expansion of water management boards, irrigation advisory committees, or other bodies designed to improve water management/allocation
		Development of web-based irrigation scheduling information
		Well plugging program in depleted aquifers or aquifers at high risk for contamination
	Feasibility Planning	Assessment of water supply options to improve water quality
		Assessment of water storage options
		Assessment of regional water supply options
Infrastructure	Regional Water Supply	Regional water supply pipelines
		Water transfer stations (Tankloaders)
	Irrigation Infrastructure	Canal lining to decrease seepage losses in conveyance
		Installation of flow meters throughout an irrigation district
		Upgrade of canals to piped conveyance
	On-farm water infrastructure	Off-stream storage reservoirs
		Water supply development
Conversion to more efficient irrigation equipment		

Program Principles

Many of the consultations identified a need for an individual incentive program for water supply development or distribution; however, some also suggested that the available funding was inadequate to initiate such a program. Some consultations identified a need

for flexibility in contribution amounts depending on the relative need of the project and the ability of the proponent to pay. Many consultations suggested third party delivery through existing groups or programs and emphasized the importance of partnering with the provincial governments on final program development and delivery. A summary of the identified principles that could be used to guide program development is as follows:

- Flexibility to address regional constraints and issues;
- Assistance for water supply infrastructure should be accessible for both on-farm and regional solutions;
- Water supply infrastructure projects should include some form of agreement with responsible parties for long-term security of the water supply;
- Water source developments should supply safe water for human and livestock consumption;
- Flexible contribution scales depending on project rating and ability of proponents to cost- share;
- Over-sizing of infrastructure facilities to accommodate 10-20 year time-frame at the expense of the program;
- Existing institutional arrangements and resources should be used where possible (*i.e.* directing funds through 3rd party);
- Linkages should be created between water development and monitoring the water use; and,
- Research activities should be multi-stakeholder oriented.

Project Rating Criteria

Most of the reports identified a need for development of a set of criteria to guide program delivery. Many suggested criteria were similar among provinces or among project type. A summary of the most commonly suggested criteria, grouped by project category is as follows:

- *Strategic work (information gathering, technology transfer, feasibility assessment and planning)*
 - Study must fill in identified knowledge gaps
 - Partnerships with other government agencies, NGO's and industry are desirable
 - Public benefits should be greater than private benefit
 - Promotion of conservation of water
 - Should support rural development/ sustainability
- *Infrastructure (new capital works or improvements to existing water supply infrastructure)*

- The extent of public benefits
- Proof of sustainability of the supply
- A positive benefit to cost ratio
- Provides opportunity for rural development / sustainability
- Promotes conservation of water
- Provides immediate results
- Local commitment illustrated

Program Management

Management of the NWSEP program should occur jointly between the provincial and federal governments. A Management Committee could be formed that would include membership from both the provincial and federal governments, and potentially relevant stakeholder groups. Program delivery could occur through either agency or through a third party delivery model, provided the Management Committee would have final authority on all strategic decisions related to project approval and compliance. Both the provincial and federal governments could provide technical support to the program.

3.2 Recommendations

The following list of recommendations is a summary of those recommendations that were offered with respect to the National Water Supply Expansion Program in the regional reports:

1. The program should be structured to allow funding for both strategic work and infrastructure development as described in Section 3.1.
2. The program should be structured to allow for variable contribution rates, including full federal funding on important strategic initiatives if a province does not have sufficient funds to cost-share.
3. The program should include criteria (see section 3.1) to allow for rating of projects.
4. The program should be flexible enough to address differences in needs among commodity groups and/or regions.
5. The program should be managed through a Management Committee that has joint federal and provincial membership.
6. Consideration should be given to development of a long-term program with substantially more funding in order to adequately address the long-term needs associated with water supply.

4.0 REFERENCES

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