# 12.0 Management of Irrigation Systems

## 12.1 MANAGEMENT OF IRRIGATION DISTRICTS

The following is a partial list of the management alternatives as discussed in Section 0:

1. **Management by a Municipal Authority:** This is similar to the existing management used in NOTL, whereby the Municipality operates the irrigation system.

2. **Management by a Growers Organization:** Under this management alternative, the growers form a legal entity that may own and/or operate the irrigation system.

3. **Management by a Conventional (Profit Seeking) Company**: A private company may own and/or operate the irrigation system. A primary objective of such a company is to make a profit.

4. **Private Management by Individual Users:** This type of management system does not involve a formal organization. It is applicable to the smaller systems at farm level or a communal effort by a few neighbors. It is only applicable to the management of distributed source alternatives such as those recommended for the West District Zone B and South District.

A preliminary consultation during project meetings, indicated that the growers may not be interested in Alternative 3 (management by a private company). There appear to be a preference from the growers for management by a Municipal Authority. This may be due to the success of the NOTL Irrigation System. The following further points strengthen a preference for management by a municipal authority:

- Municipal administration and operation, either at the local or regional level, offers advantages such as the ability to enact bylaws that could require universal use of the system, set uniform and fair water rates, require operator monitoring, define minimum acceptable water-efficiency standards, and enforce good operating practices.

- Municipalities are more likely to be responsive to the expectations of senior governments.

- Municipalities have ready access to the types of information and know-how needed to make successful applications for water taking permits and other approvals.

- Municipalities are more likely to be able to facilitate expansion of production into new areas because they can upfront some of the costs.

- Grower cooperatives could work and probably do work well in rural areas where there is little existing capacity on the part of municipal governments. This is generally not the situation in Niagara.

This preliminary review, therefore, recommends pursuing Management by Municipal Authority as the preferred management alternative, given than there are two tiers of well organized municipal authorities present throughout the irrigation project, and that there is an existing successful model from NOTL that can be implemented in other irrigation districts.

It is desirable to manage each system by a separate organization or department. For example, the West Irrigation District would require three management groups: Zone A East Side, Zone A West Side, and Zone B. Breaking down the management groups to match the system will allow close communication, cooperation and responsiveness between the growers and the management team. The following outlines potential municipal authorities to manage the irrigation systems:

| Irrigation System or Area | Potential Municipal Authority |
|---|---|
| East District | Niagara-on-the-Lake |
| West District - Zone A - East Side | St. Catharines and/or Lincoln |
| West District - Zone A - West Side | Lincoln |
| West District - Zone B | Grimsby and/or Lincoln |
| South District | Pelham |

It may be advantageous for the Town of Lincoln to take the lead in managing the three irrigated areas of the West District in order to take advantage of certain management economies of scale.

An organization would not be strictly required for the management of the proposed irrigation infrastructure in areas above the Escapement (Zone B and South District). The individual growers will manage the wells and off-stream reservoirs. However, an overall irrigation organization will still be desirable to support the growers in dealing with permit and monitoring requirements and obtaining financial and technical support.

At the regional level, an organization would be desirable to facilitate communication and cooperation between the five irrigation operating groups as well as represent the interest of the Niagara irrigators at the provincial and federal levels. The Regional Municipality of Niagara would be the logical choice to take this role.

The final management structure will depend on the final choice of irrigation infrastructures and further consultation with growers and the municipalities.

## 12.2 ON-FARM WATER MANAGEMENT PRACTICES

The objective of irrigation management is to obtain maximum benefit from the available irrigation supplies. Good irrigation management generally requires a method of ensuring that soil water content within the root zone remains sufficiently high to prevent plant water stress, while minimizing water loss due to drainage, evaporation and leaks.

To ensure proper soil water management, the following aspects will need to be considered:

- Soil moisture levels should be monitored to ensure that irrigation begins a pre-defined soil moisture threshold is reached. The soil moisture threshold is set based on the maximum allowable depletion of the soil water reservoir within the root zone (see Table 3-4). This will ensure that soil moisture is not a limiting factor for the growth and development of the crops. It will also minimize the frequency of irrigation without impacting the crop growth, because each application will involve a fixed evaporative loss due to wetting of soil and plant surfaces. Soil moisture monitoring can be done by several direct methods (e.g. using tensiometers) or by indirect methods such as monitoring weather parameters.

- Water should be applied relatively uniformly to the soils and at rates that do not exceed the infiltration capacity of the soils (to minimize runoff). This are design points, and can be addressed during the initial purchase and commissioning of the irrigation equipment.

- The quantity of water applied per irrigation should be sufficient to completely replenish the soil moisture levels to close to field capacity within the root zone without causing excessive leaching below the root zone. This will require knowing the soil moisture levels before the application of the irrigation water and the quantity required to fill the soil water reserves. Alternatively, soil moisture below the root zone can be monitored and irrigation can be stopped when the soils below the root zone begin the experience noticeable change in their water contents.

- Ensuring a proper state of repair of the irrigation equipment is an obvious part of proper water management. This includes checking and correcting items such as pipelines (for leaks), nozzles (for worn-out components), and flows and pressures. A maintenance program should be implemented and followed.

- The timing of water application is also important. Midday irrigation should be avoided if possible since the evaporation would much higher in the middle of the day. Also, irrigation during periods of high wind should be avoided. Wind will increase evaporation and drift and will dramatically reduce application uniformity of the sprinkler systems.

Proper on-farm management of the irrigation systems is of primary importance to good water management. Proper design and the choice of the irrigation equipment are also very important, but even the most efficient technologies can result in poor irrigation efficiency if not properly operated. The proper operation of the irrigation system will require a few instruments (e.g. tensiometers) and substantial skills. **A significant training program in water management is, therefore, strongly recommended in conjunction with the construction of the proposed irrigation infrastructure.**

Once the farm operators are sufficiently skilled in soil water management, a move toward more efficient irrigation technologies, such as drip systems, may occur naturally. In addition to using

less water, these technologies have lower pressure requirements and are not affected by wind conditions.

The increasing pressures coming from governments (all levels) on water-use efficiency and water conservation should be particularly noted. Agricultural literature is full of examples of grape and tender fruit growers throughout North America adopting drip technologies. Documented advantages extend beyond water-use efficiency to include, among others, reduced operating costs, better plant health, more uniform yields, and less susceptibility to water shortages in dry years, among others. The tender fruits in the Niagara Region are grown on light soils. This may explain some unsuccessful previous attempt to use drip systems if standard designs for heavier soils were implemented on these light soils. **We recommend that the applicability of low pressure irrigation technologies to the tender fruits of the Niagara Regions be researched as one of the lines of action in conjunction with the construction of the irrigation infrastructure.**