B.C. IRRIGATION MANAGEMENT GUIDE

Chapter 1

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LIMITATION OF LIABILITY AND USER'S RESPONSIBILITY

The primary purpose of this B.C. Irrigation Management Guide is to provide irrigation professionals and consultants with a methodology to assess the irrigation system performance and manage the system effectively.

While every effort has been made to ensure the accuracy and completeness of these materials, additional materials may be required to complete more advanced assessments. Advice of appropriate professionals and experts may assist in completing assessments that are not covered in this Guide.

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1 INTRODUCTION TO AN IRRIGATION MANAGEMENT PLAN

Agricultural irrigation requires reliable supplies of fresh, clean water from ground and/or surface water sources. This B.C. Irrigation Management Guide will assess the irrigation system requirements of farms with respect to the quantity and quality of ground and/or surface water.

1.1 What is an Irrigation Management Plan ?

An Irrigation Management Plan ensures that the irrigation system is operated to match the crop, soil and climate conditions present. Irrigation is scheduled to replace the climate moisture deficit in a manner that does not exceed the crop's ability to utilize the water, or the soil's capacity to store the water applied.

A key objective of an Irrigation Management Plan is to ensure that water is used efficiently and will meet the crop's water needs while preventing water loss due to surface flow, leaching or drift. Appropriate irrigation equipment selection and design, as well as good management and scheduling, will conserve water supplies while supporting crop growth. Evapotranspiration (ET) is the driver that determines how much water is being used by the plant. The climate moisture deficit is the difference between the accumulated ET and the effective rainfall. ET is used to determine the irrigation system peak flow rate and annual crop water requirement.

1.2 Benefits of an Irrigation Management Plan

Irrigation is an essential part of crop production in water deficit areas. Plants require water to grow. Applying the right amount of water at the right time will maximize crop yield. Both too much and too little water can reduce crop yield. An Irrigation System Assessment can benefit farm productivity, enhance protection of the environment, as well as benefit the environment by conserving water and preventing nutrient losses.

Irrigation accounts for a large percentage of consumptive water use during the summer months in British Columbia. Most B.C. farmers pump their own water. Studies conducted in the early 1990's showed that considerable water savings can be achieved on a provincial scale by converting to more efficient irrigation systems and better irrigation management.

For the farm, good water management means:

- Knowing the farm's irrigation requirements and reducing unnecessary water usage. Where water storage is available, saved water may be able to be used later in the irrigation season.
- Saving energy by operating the system efficiently. The energy savings on larger systems may be significant.
- Reducing leaching of nutrients beyond the plant's rooting depth. The nutrients are retained within the root zone and remain available to the plant throughout the growing season.
- Maximizing crop yield.

For the environment, good water management means:

- Saving water which will then be available for other needs in the watershed, such as additional agricultural land that is currently not irrigated, fish, wildlife or other competing uses.
- Reducing runoff from excessive irrigation which may deliver contaminants to surface water supplies.
- Reducing nutrient leaching which will help protect groundwater supplies from contamination

1.3 How to Develop an Irrigation Management Plan

This publication provides a comprehensive Irrigation Management Plan for sprinkler, trickle, centre pivot and travelling gun systems. To complete an Irrigation Management Plan, irrigation systems must be assessed for distribution uniformity (DU) and application efficiency. Once irrigation system performance has been checked and improved if necessary, an irrigation schedule can be developed.

DU is a measurement of the evenness of water application over a field, and is expressed as a percentage. Application efficiency is an indication

of the percentage of water applied by the irrigation system that is actually available to the crop. Irrigation scheduling is applying irrigation in the correct amount to the right place at the right time.

1.4 Protecting the Environment while Improving Farm Production

Over-irrigation can have negative effects on the environment and farm production. In drier climates, under-irrigation can limit plant growth and fruit development. Table 1.1 lists the impacts of over- and under-irrigation. The environmental concerns are discussed in Chapter 2.

Table 1.1 Impacts of Over- and Under-Irrigation

Over-Irrigation	Under-Irrigation
▪ drowns roots, stressing plants ▪ leaches nutrients and pesticides from the root zone to ground water ▪ reduces nutrient uptake ▪ cools soil; thus, reducing root growth ▪ encourages root disease ▪ reduces crop quality ▪ increases system operating costs ▪ may impact unnecessarily on water resources and impact fish and wildlife resources that rely on adequate and sustained water quality and quantity	▪ reduces crop yield ▪ reduces crop quality (fruit and vegetable size) ▪ reduces plant growth ▪ weakens plant

Considerable amount of nitrogen is lost from waterlogged soil through denitrification and leaching of nutrients below the root zone.

Aside from possible losses of nutrient available to the plant, too much water can also affect plant growth. In poorly-drained areas, it is possible to see that plants with waterlogged roots can be stunted in growth, pale in colour, and may not produce quality fruit. This can also happen to plants that are over-irrigated and their roots remain wet. It is a concern especially in heavy soils that have a high moisture holding capacity.

Plants need to be able to take up oxygen through their roots. Waterlogged soils reduce the oxygen supply by replacing the oxygen in the soil with water. The lack of oxygen impairs the plant's respiration, which in turn limits nutrient uptake. The root growth is also restricted since roots will not grow into areas where oxygen is limited.

Excessive water application increases the cost of energy due to pumping needs, and may increase system delivery infrastructure and associated labour costs.