

B.C. IRRIGATION MANAGEMENT GUIDE

How to Use This Publication

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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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HOW TO USE THIS PUBLICATION

Irrigation management is an integral part of good farm management. This B.C. Irrigation Management Guide consists of information and exercises to improve irrigation management on farms. Completing the worksheets at the end of this publication will provide a better understanding of how to meet the crop's water requirements while managing water more efficiently.

Contents of This Publication

Levels within an Irrigation Management Plan

There are three levels of an Irrigation Management Plan outlined in this publication:

Level 1 should be completed by everyone that is irrigating. The steps required to complete Level 1 of an Irrigation Management Plan and the related information to complete the steps are covered in Chapters 2, 3 and 4 of this Guide.

Level 2 should be completed by irrigators who:

- are in regions of water shortages,
- are optimizing water use or irrigation system efficiency, or
- wish to improve system performance.

Chapters 5 through 8 provide the steps and information required to complete Level 2 of an Irrigation Management Plan.

Level 3 should be completed by farmers who:

- are applying chemicals to the crops through their irrigation system,
- are using reclaimed water, or
- wish to assess the performance of their irrigation systems with respect to energy.

Chapters 9, 10 and 11 provide information on these topics.

Chapters in this Guide

A summary of each chapter and the levels of an Irrigation Management Plan are as follows:

Chapter 1. Introduction to an Irrigation Management Plan

An effective Irrigation Management Plan not only benefits the environment, but also

- increases farm productivity
- increases in yield and drought resistance
- improves fertilizer use

Chapter 2. Environmental Concerns of Irrigation Water Supply

Information on legislation and concerns related to an irrigation water supply are discussed in this chapter. The chapter also provides beneficial management practices for protecting water supplies and meeting legislations.

Information in a Level 1 Irrigation Management Plan is contained in Chapters 3 and 4.

Chapter 3. Climate

The climate plays an important role in irrigation design and scheduling. The amount of water a crop requires is directly related to the climate. This chapter contains general information on B.C. climate, and on how to gather climate information for a specific farm location.

Chapter 4. Basic Environmental Farm Assessment for Irrigation

Basic information on the components of a good irrigation management plan is outlined in this chapter. Examples in this chapter show how to easily check if the actual irrigation water use on the farm meets the water required by the crop, or the water licence for surface water withdrawal.

The steps to complete a Level 2 Irrigation Management Plan are discussed in Chapters 5 through 7. These chapters are *not* to be used for planning or designing new irrigation systems. Refer to the **B.C. Sprinkler Irrigation Manual** or the **B.C. Trickle Irrigation Manual** when designing new systems. An Irrigation Industry Association of British Columbia (IIABC) Certified Irrigation Designer (CID) will be able to provide you with a certified irrigation system that matches the crop, soil and current climate conditions.

Chapter 5. Soil, Plant and Water

Understanding how soil, water and plants work together is important to both the design and operation of an irrigation system. This chapter contains background information that will be used throughout this Guide.

Chapter 6. Irrigation System Assessment

This chapter uses the information from existing irrigation systems to answer questions and complete worksheets on water usage, and to create a basic irrigation schedule.

Chapter 7. Irrigation Scheduling

Even the most efficient irrigation system can use excessive water if not managed properly. This chapter provides information on how to manage water more efficiently using irrigation scheduling techniques.

A Level 3 Irrigation Management Plan provides an assessment of energy usage and the application of fertilizers or other chemicals through an irrigation system. Chemical application requires an irrigation system that provides exceptional uniformity. Ideally, the system must meet the standards of a certified plan, and be managed and scheduled according to the information provided in this document. Chapters 8 through 10 present information on energy conservation, alternative uses of irrigation systems, and the use of reclaimed water for irrigation. The information presented in Level 2 must be understood and incorporated before addressing those in Level 3.

Chapter 8. Energy Conservation and Operational Costs

A complete environmental farm plan should also assess energy consumption. To determine whether an irrigation system is energy efficient requires assessing the distribution system, pump selection and efficiency. This assessment can only be done properly if the information from the preceding chapters has been incorporated into the plan.

Chapter 9. Chemigation, Frost Protection and Crop Cooling

Irrigation systems may be used to apply fertilizers and other chemicals. They are also often used as a frost protection system, or for crop cooling during hot weather conditions. The management of irrigation systems for these purposes is different from that for normal irrigation.

Chapter 10. Use of Reclaimed Water

In some parts of the province, reclaimed water is a reliable water source for agricultural irrigation. Provincial guidelines must be followed when using reclaimed water on agricultural crops.

Appendices

Appendix A. Unit Conversions

Imperial to metric units

Appendix B. Sprinkler and Gun Nozzle Specifications

Information on sprinkler and gun nozzles, pressures, spacings and corresponding application rates can be determined using the tables in this appendix.

Appendix C. Blank Worksheets

This section contains the worksheets that must be completed to meet the requirements of the basic Irrigation System Assessment. These worksheets are blank versions of the examples shown in the various chapters. The worksheets help to summarize the information required in the planning process.

Appendix D. Publications and Websites

The websites and/or organizations where publications and factsheets mentioned throughout this document can be obtained are provided in this appendix.

Appendix E. Glossary

The terminologies used in this document are described in this appendix.

Conventions Used in this Publication

Measurement

Throughout this publication, there is a mix of metric and imperial measurements. Although convention calls for the use of metric units, irrigation presents a special case. Most of the equipment used for irrigation is developed in the United States; therefore, most measurements are in imperial units. In this publication, metric units will be used in most cases; however, to conform to industry standards, water volumes and flow rates may be presented in US gpm/acres and acre-feet first with metric units in brackets. Check to ensure you are using the correct units when using the worksheets.

For all units used in this publication, a list of conversions from imperial to metric units is shown in Appendix A.

What the Colours Represent

Tables

Sorted data or information is tabulated.

Equations

Worksheet 15

On the right of the equation bar, reference is made to the worksheet number where the Equation will be used

Assessments

Step-by-step procedures for performing a check and/or assessment are provided.

Examples

This publication provides information on sprinkler, gun, centre pivot and trickle/drip systems. The examples and/or worksheets will indicate which type of system is being evaluated by using the following symbols:



Sprinkler System



Gun System



Centre Pivot System



Trickle/Drip System

Actions

If the results from a check and/or assessment indicate the system has problems, action items are provided that may be used to help remediate the situation.

Case Studies

Scenarios are provided to help explain how an action item may be applied to resolve problematic situations.

Acronyms

Commonly used acronyms in this publication are:

AWSC	=	Available Water Storage Capacity
CID	=	Certified Irrigation Designer
DU	=	Distribution Uniformity [%]
EC	=	Electrical Conductivity [dS/m]
ET	=	Evapotranspiration [mm/day or in/day]
IIABC	=	Irrigation Industry Association of British Columbia
LWBC	=	Land and Water British Columbia Inc.
MAFF	=	B.C. Ministry of Agriculture, Food and Fisheries
MSWD	=	Maximum Soil Water Deficit [mm or in]
MWLAP	=	B.C. Ministry of Water, Land and Air Protection
SAR	=	Sodium Adsorption Ratio [dimensionless]

Reference Information

Reference information is included within the text in each chapter. The following symbols indicate that reference information is available:

in other publications,



B.C. Sprinkler Irrigation Manual

in the world wide web, or



www.farmwest.com

within this document.



Assessment of Water Quality, Chapter 4