Water management

Water management is an essential part of berry production. Plant growth and yield can potentially be optimum when a reasonable measure of control of water in the soil is achieved. Too little or too much water can result in crop losses as natural conditions rarely satisfy crop needs. In some berry operations, water is also required for pest control (cranberries) and nutrient application, harvesting, and market preparation. Water quality must be considered, as unsuitable water can impact berry yields and quality.

Drainage

Removing excess water in spring, fall and winter is usually necessary in South Coastal BC and, to a lesser degree, in some Interior areas. In the Interior, drainage is frequently required for reclamation and control of soil salinity and alkalinity. Drainage systems give the following benefits:

- increased trafficability,
- extended crop season,
- increased crop yields due to improved nutrient uptake,
- improved aeration of the root zone,
- warmer soil temperatures,
- crop protection from "drown-out",
- control of water erosion, and
- increased land values.

Drainage systems usually have a surface and a subsurface component. Both must be well-planned, installed and maintained to be effective. Subsurface drainage with a functioning outlet is the best way to control water on most soils. Lightweight, continuous, flexible, perforated plastic drain pipe is used. On sloping land, porous surface or blind inlets may be needed to lead water to the subsurface drains in order to reduce overland flow and erosion. On sandy soils, geotextile filters are needed around the perforated pipe to prevent sand from clogging the drain tube. Filters should not be used on organic soils.

Plastic drain pipe is quickly installed by drainage contractors using specialized equipment. Installation depth and spacing differs with fields and is mainly based on the climatic conditions and soil type. Pumps are sometimes needed in low lying areas that lack gravity outlets.

Drainage systems must be maintained. This includes periodic cleaning of drain pipes, outlets and ditches, and careful soil management.

Refer to the BCAF publication, "BC Agricultural Drainage Manual", and BCAF factsheets for more information and details on designing, installing and maintaining a subsurface drainage system.

Irrigation

In almost all parts of the province, the natural rainfall is not sufficient to replace water lost from the soil due to evaporation or crop usage, for at least part of the growing season. At these times, irrigation can result in higher yields and, in some cases, prevent crop failure. Irrigation is especially necessary in new plantings where plants have small and shallow root systems.

Irrigation systems include subirrigation, trickle and overhead sprinkler irrigation. Each have their own merits. The systems must be properly designed, installed and maintained to be effective. It is best to use water conserving and efficient delivery systems. Applying too much water or having leaky pipes may lead to soil erosion, crop losses and higher pumping costs. Over application of water will also result in leaching of nutrients (such as nitrogen & boron). Check and repair or replace pipes, pumps and sprinklers on a regular basis. The Irrigation Industry Association of BC (IIABC) has Certified Irrigation Designers (CID) , Certified Irrigation Technicians (CIT), and Certified Irrigation Scheduler (CIS) who provide services to design, install, operate and maintain irrigation systems for growers.

For more information on irrigation systems, assessment, and management, refer to "BC Trickle Irrigation Manual" (IIABC), "BC Sprinkler

Irrigation Manual" (IIABC), Irrigation System Assessment Guide, and BC Irrigation Management Guide,.

A water license is required to divert, store and use surface water or groundwater for non-domestic use purposes, e.g., agricultural use. Contact the FrontCounter BC office of the Ministry of Forests to enquire about licensing application processes.

Chemigation

Chemigation refers to the injection and application of pesticides or fertilizers (fertigation) through an irrigation system. Growers who have solid set sprinkler or trickle irrigation systems may use chemigation as a method of applying nutrients. However, pesticides must be registered for application through an irrigation system. Check the label to make sure this method can be used for applying the pesticide. For more information, refer to the booklet "Chemigation Guidelines for British Columbia", available from IIABC.

Water quality for irrigation

Irrigation water comes from surface or groundwater sources. In many areas, ditch water is used for irrigation. Ditch water may contain high levels of bacteria, salts, metals or organic compounds that can affect the performance, quality, or safety of food crops. Ditch water should not be used for overhead irrigation after the fruit has formed unless a lab analysis has shown it to be acceptable. Some ground-water sources may also contain high levels of ions or nutrients that may impact crop performance.

Water quality should be checked at a laboratory before planting a crop. If the crop is established, check the water before using for crop production. Water tests should assess salt levels (both electrical conductivity [EC] and sodium adsorption ratio [SAR]), pH, metals, nutrients, possible toxic elements and E. coli (see Tables 5 and 6). Also check the ratio of bicarbonate (HCO_3) to calcium and magnesium. This ratio must be correct to avoid precipitates forming on the fruit or in the irrigation system. Table 5 shows the acceptable levels of some chemical aspects of water.

Protecting water quality

Waste products generated during agricultural production and other activities may have negative impacts on water. Growers who operate at the highest environmental standards will be better able to protect themselves from possible challenges to their operations. Proper use and storage of pesticides, fertilizers, manure and wood waste will help to protect water quality. Inspect ditches beyond the farm boundaries to ensure they are free of visible sources of contamination.

Table 6 shows some of the characteristics used to evaluate water quality and their potential impact.

Table 5. Guidelines for irrigation water quality

Crop Test	Safe for all Berries	Safe for Most Berries	Injurious to Most Berries
SAR (sodium absorption ratio)	<6.0	6.0-9.0	>9.0
EC (Salinity)	<0.5 dS/m	0.5-3.0 dS/m	>3.0 dS/m
PH	6.0-8.5	5.0-6.0 or 8.5 – 10.0	<5.0 or > 10.0
Boron (B)	< 0.5 mg/L	1.0-2.0 mg/L	>2.0 mg/L
Chlorine (Cl)	<50 mg/L	50-350 mg/L	>150 mg/L
Total Dissolved Solids (TDS)	<500 mg/L	500-800 mg/L	>800 mg/L
Iron (Fe)	1.0 - 2.0 mg/	2.0 - 5.0 mg/L	>5.0 mg/L
Sodium (Na)	<115 mg/L	115 - 460 mg/L	>460 mg/L
Irrigation System Test	**Low Probability of Precipitates**	**Moderate Probability of Precipitates**	**High Probability of Precipitates**
Iron (Fe) Drip Systems	<0.2 mg/L	0.2 – 1.5 mg/L	>1.5 mg/L
Calcium (Ca) Magnesium (Mg)	< 10 mg/L	10 – 50 mg/L	> 50 mg/L
Bicarbonate (HCO3)	< 30 mg/L	30-120 mg/L	>120 mg/L

Table 6. Water quality evaluation characteristics

Characteristic	Level that indicates contaminated water	Concern
Biological Oxygen Demand (BOD)	> 40 for small streams > 60 for larger streams	Danger to fish stocks
Total Iron (Fe)	> 3 mg/L	Crop staining
Nitrate (NO_3-N)	> 5 mg/L	Danger to human health
Total Suspended Solids (TSS)	> 75 mg/L	Danger to fish stocks
Ammonia (NH_4-N)	> 10 – 15 mg/L (depends on pH and temperature)	Danger to fish stocks
E. Coli	> 200 CFU/100 mL (CFU = coliform forming units)	Increased risk to human health See “Food Safety” chapter.
Tannin and Lignin (resin acids)	a) > 9 µg/L TRA or b) > 80 µg/L DHA (TRA = total resin acids) (DHA = dehydroabietic acid)	a) Danger to fish stocks b) Crop staining