“Cut-off” Flood Irrigation

A management practice that works for the Inland Rogue Basin

Introduction

Flood irrigation is an ingenious, inexpensive means to grow tens of millions of dollars worth of agricultural produce.

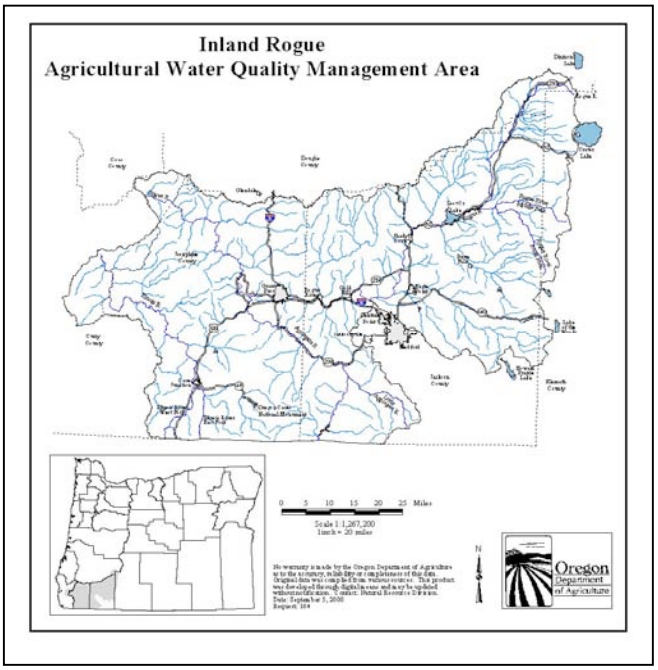
While current flood irrigation methods result in 40% to 45% efficiency, compared to 70% or greater for sprinkler systems, research shows that flood systems can be as efficient as most other irrigation methods. Such efficiency requires knowing how much water is applied and scheduling applications according to soil water levels and crop needs.

Some irrigators have started using a method known as “cut-off” irrigation. Cut-off irrigation is the practice of cutting off the inflow of water onto a field just as (or before) the surface wetted front reaches the lower end of the field or section of field to be irrigated. Infiltration will continue for many hours so that the entire field will essentially get the same amount of water with little to no return flow.

Eliminating or reducing return flows is vital for protecting water quality. Warm return flows can threaten cold-water fish in the late summer. The Inland Rogue Agricultural Water Quality Management Area Plan specifically cites surface irrigation return flows as a basin-wide contributor of warmed water into area streams and rivers.

Jackson County farmers irrigate about 25,000 acres of pasture. Figures from local irrigation districts indicate approximately 19,000 acres are still flood irrigated.

Inland Rogue Basin irrigation rule states: “…unmanaged surface irrigation returns from unchanged sets that are above state standards and that flow into waters of the state are unacceptable.”



A case study sponsored by Oregon Department of Agriculture (ODA) and Jackson Soil and Water Conservation District (district) sought to evaluate the effectiveness of “cut-off” irrigation. The results were very encouraging.

Study design

District and ODA staff placed groups of soil moisture sensors about 250 feet apart down slope from a headgate or distribution ditch on two fields in the Eagle Point area.

Each group had a sensor at one, two and three feet depths. Each field had three groups of sensors: at the top, middle, and bottom of the field, or nine sensors per field. After collecting pre-irrigation soil moisture readings, water was turned into the field. The surface water front was mapped and the moisture levels were read every 15 to 30 minutes until the soil was saturated or the readings at a particular depth stabilized.

Results

Initial data suggests flood irrigated fields on particular soils are being over-irrigated throughout the season. This is due to a number of on-farm and irrigation district management decisions regarding set length and irrigation frequency.

On at least three irrigation events during the study, there was a quick wetting of the surface down to the two-foot depth, probably due to the cracking characteristic of the Carney clay soils so prevalent in the area.

The subsurface wetted front continued to move down through the soil, however, and soil moisture at the three-foot depth was saturated or approaching field capacity within 24 hours.

On all the sensor groups, the soil profile was wetted to saturation or near field capacity within 24 hours after the water was turned off. **Some fields reached saturation with water being turned onto the field for only 2.5 hours.** This was surprising. Many irrigators, including the manager of these properties, historically apply flood irrigation water on much longer sets.

Recommendations

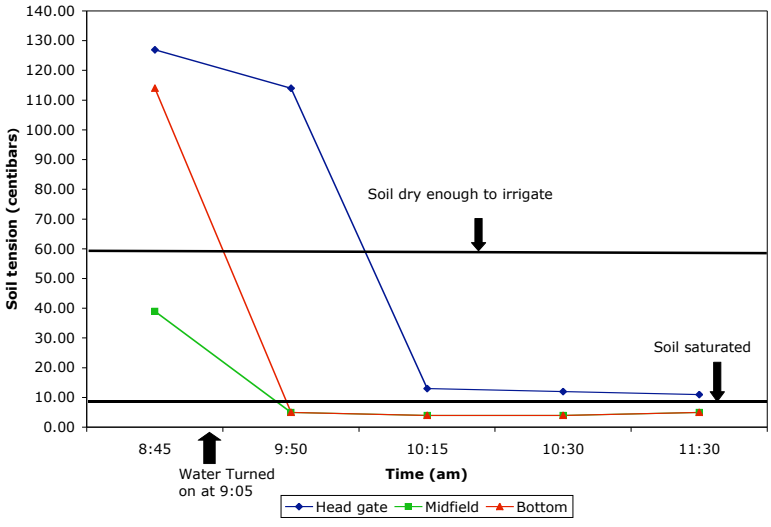
Anecdotal evidence given by the property manager during the trial confirmed what is instinctive for most grass farmers. That is, saturated soils make a poor growing environment for grass roots, and pastures could produce more with less water. This potential productivity boost, along with the reduced time and money required to irrigate for shorter sets or less frequent intervals, provides enough incentive to try "cut-off" irrigation.

While a stream may benefit from the cooled water percolating through the soil back into the stream, far more water, super-heated by the summer sun, flows across the surface of a saturated pasture and adds to the heat of the already warmed, low-flow stream or ditch water.

Irrigators must take the responsibility to prevent water pollution while maintaining optimum production. Cut-off irrigation is one way to accomplish this delicate balance.

Here are things to consider:

- Knowing when your soil has reached the "half-way" point in water consumption is the key to knowing how frequently you must irrigate.
- Gypsum block soil moisture monitors, while not essential, are an inexpensive tool to aid in the correct timing of irrigation water applications. Knowing when the three-foot root zone is getting wet or saturated is more easily done with a soil moisture sensor.
- One of the fallacies of irrigating is that the whole field must be soaked. Some landowners "push" water up to a knob or knoll. Ask yourself, "Is it worth harming production on the 90% of the field that is over-watered to adequately water the other 10%?"



Soil moisture readings at a depth of 1-foot from a flood irrigated pasture.

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