OVERVIEW OF IRRIGATED AGRICULTURE IN BENTON COUNTY

Abstract

Irrigated agriculture in central and eastern Washington State is limited by the semiarid climate and water competition from other sectors. Managing irrigation systems is challenging for many farmers due to the complexity of the irrigation machine design, and many growers largely depend on their experience in deciding when and how much to irrigate. However, a data-based approach is more efficient for optimum crop yield and farm profitability. WSU-WISE (Water Irrigation System Efficiency) is a program funded by a United States Department of Agriculture Conservation Innovation Grant (USDA CIG) and is aimed at helping Washington State growers efficiently manage their irrigation systems to maximize crop yield. Efficient irrigation management can also help reduce water waste, save energy, and maintain healthy soil. This publication provides information on irrigated agriculture in Benton County based on data from the USDA National Agricultural Statistics Service (USDA-NASS) and the Washington State Department of Agriculture (WSDA).

Introduction

This publication discusses irrigated agriculture in Benton County, Washington, and is intended for use by elected officials, farmers, agencies, and other interested stakeholders.

Geography

Benton County (Figure 1) is located in south-central Washington on the Columbia Plateau. The majority of the county is located in the eastern Yakima River Basin within the greater Columbia River Basin. The Yakima River flows in a general easterly direction through the county's center into the Columbia River which defines the county to the north, east, and south. Elevations range from 250 feet in the southern part of the county along the Columbia River to 3,600 feet in the Rattlesnake Hills, one of two major uplifts in addition to the Horse Heaven Hills.

Figure 1. Benton County, Washington.

Benton County has loess soils common to the Columbia Plateau and Palouse, where "some of the deepest soils of Washington are the result of the return of windblown silts" (Steury 2011). The major soil types in Benton County are Ritzville silt loam (19.8%) and Warden silt loam (10.8%), with numerous other silt loams, sandy loams, and loamy sands (USDA NRCS, n.d.). Both Ritzville and Warden silt loam are suited to agriculture. The Warden silt loams at lower elevations are moderately to very deep and well-drained, and thus have high capabilities for irrigated agriculture.

The Yakima Valley is a natural desert in the rain shadow of the Cascade Range. As such, in this arid climate, irrigation is vital for fruit and vegetable production, and irrigation efficiency is important. In the early 20th century mostly forage crops were grown in the area, and irrigated agriculture depended on surface irrigation. Columbia River dams allowed the development of automatic irrigation systems which, combined with a sunny continental climate, allow for present-day production of a variety of fruit, vegetable, and field crops, including apples, pears, wine grapes, cherries, potatoes, hops, blueberries, grass seed, and dry beans, among others (Weaver 2019).

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Climate Summary

Benton County is located in a semiarid climate zone with 7.1 inches average annual rainfall. Six years of data (2015–2020) were downloaded from the automated agricultural weather station network AgWeatherNet at Benton City (Benton East station), operated by Washington State University. The data analysis shows the average daily minimum and maximum air temperature ranged from a low of 28.6°F to a high of 93.7°F. Figure 2 shows the monthly average temperature and precipitation (excluding snowfall) from 2015 to 2020. Wind speed averaged 4.4 mph. The growing season in Benton City lasts for six months from approximately April 14 to October 15 (NOAA 2020).

Irrigated Land Survey

In 2017, Benton County had a total of 1,520 farms, a 1% increase from 2012 (USDA-NASS 2017a). The number of irrigated farms in 2017 was 1,182 with a total irrigated land area of 204,309 acres, equal to 33% of land in farms (Table 1), a relatively high percentage compared with other counties in the state. The total irrigated land area and number of irrigated farms clustered by farm size is shown in Figure 3. The average farm size in 2017 was 404 acres. Most of the irrigated acres were located on farms greater than 2,000 acres. The irrigated land in orchards was estimated at a total of 44,078 acres across 341 farms (USDA-NASS 2017b). Given this information, the largest impact on irrigation efficiencies could be attained by working with large-scale producers.

Crop Status

As of 2020, Benton County's top harvested crop by acreage was wheat (grain) at 105,839 acres, equal to 36% of total cropland. The second crop category was vegetables at 91,556 acres. Other major crops include potatoes, grapes, field and sweet corn, pasture, onions, apples, hay, and hops (Figure 4 and Table 2). Benton County was home to 22,500 planted acres for wine grapes in 2019, representing 38% of all wine grape planted acreage in Washington State (Community Attributes, Inc. 2020). In 2020, Benton County had 11,723 acres in apples (WSDA 2021), making it one of the top contributors of the state's major export. Growing blueberries in eastern Washington is common due to the dry climate that reduces pest problems (Washivore, n.d.). The total acreage of blueberries in Benton County in 2020 was estimated at 3,480 acres. Crops grown in 2020 and corresponding acreage is shown in Table 2 (WSDA 2021).

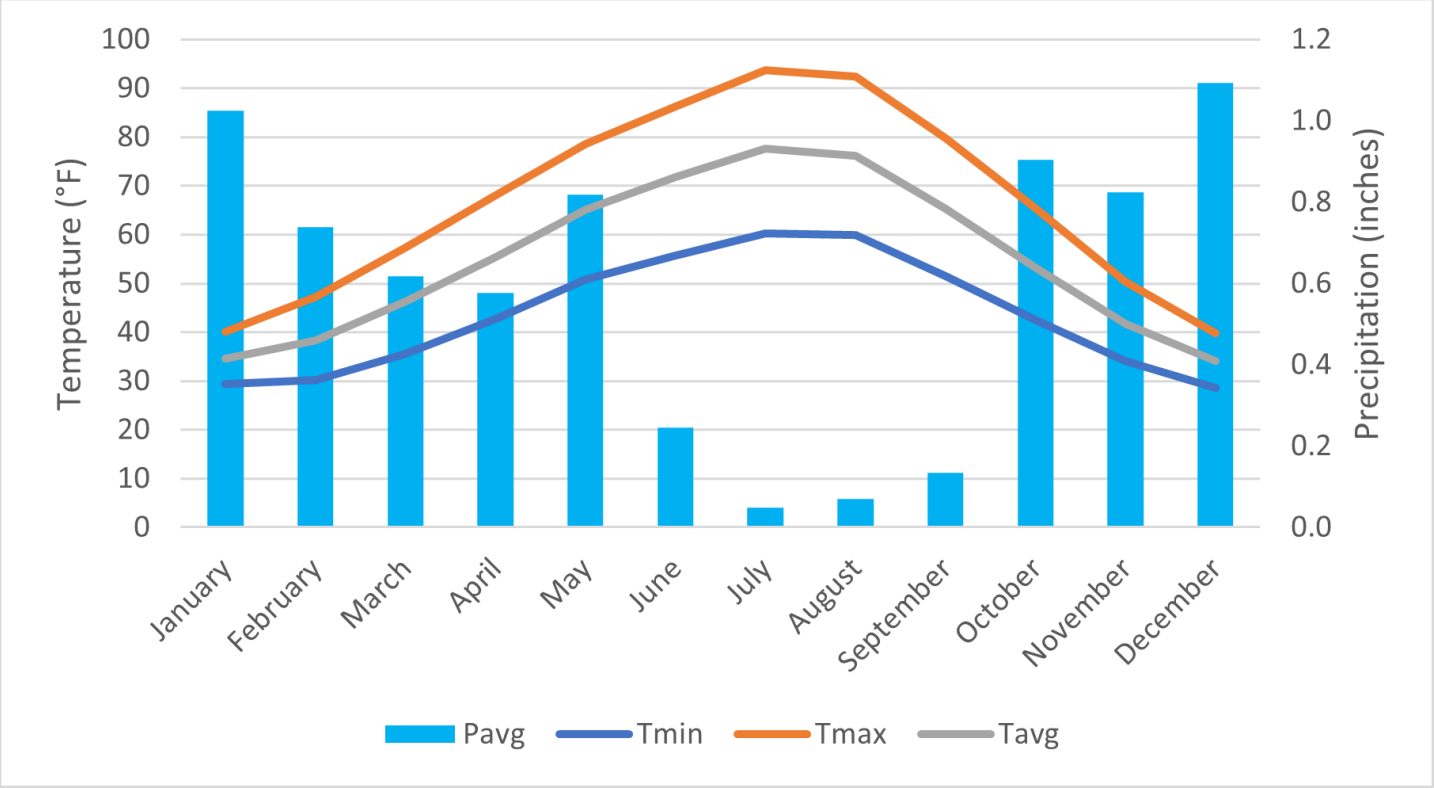

Figure 2. Monthly average air temperature and precipitation for Benton City, within Benton County, 2015–2020.

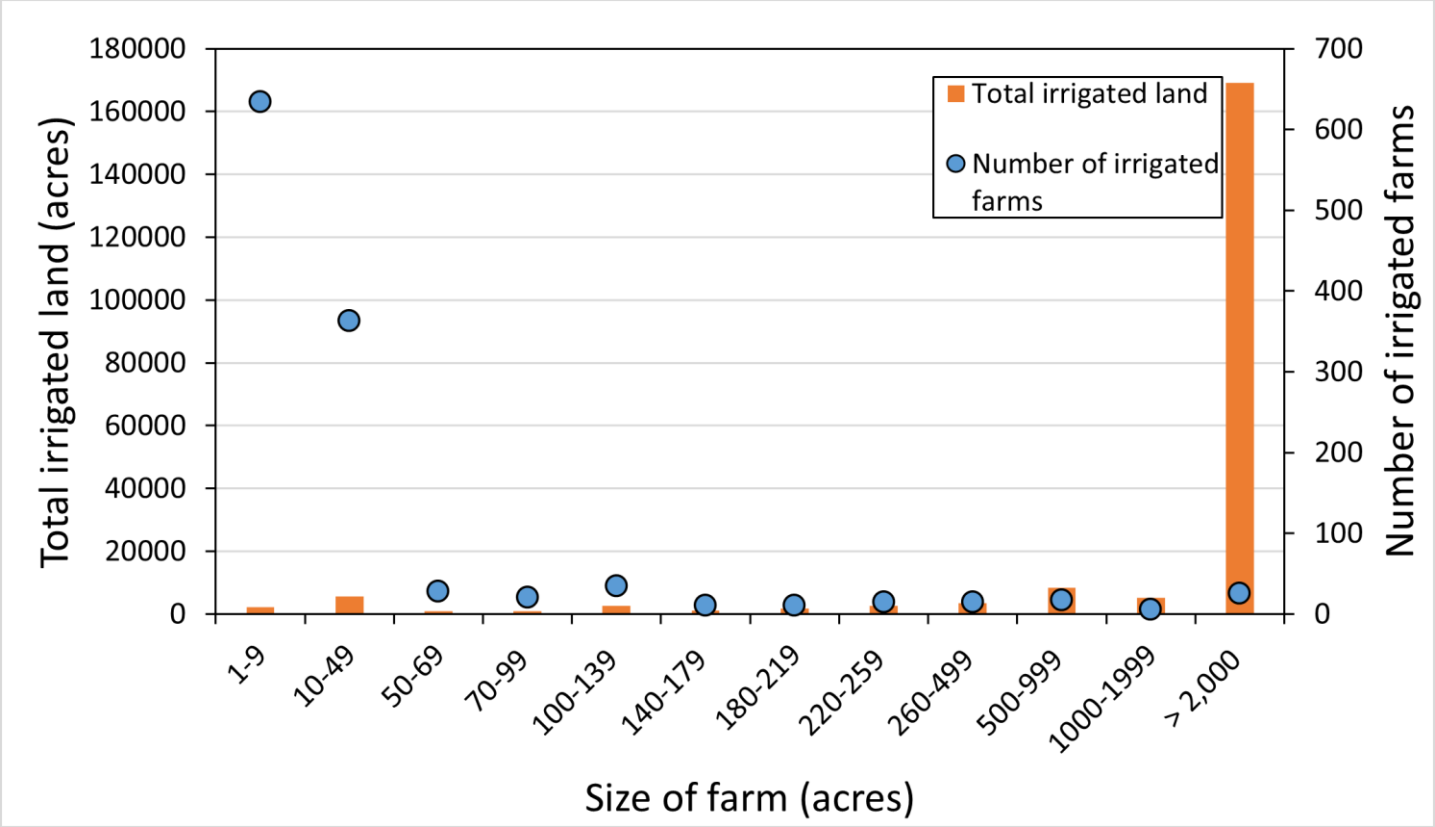

Figure 3. Total irrigated land and number of irrigated farms by farm size, Benton County, 2017.

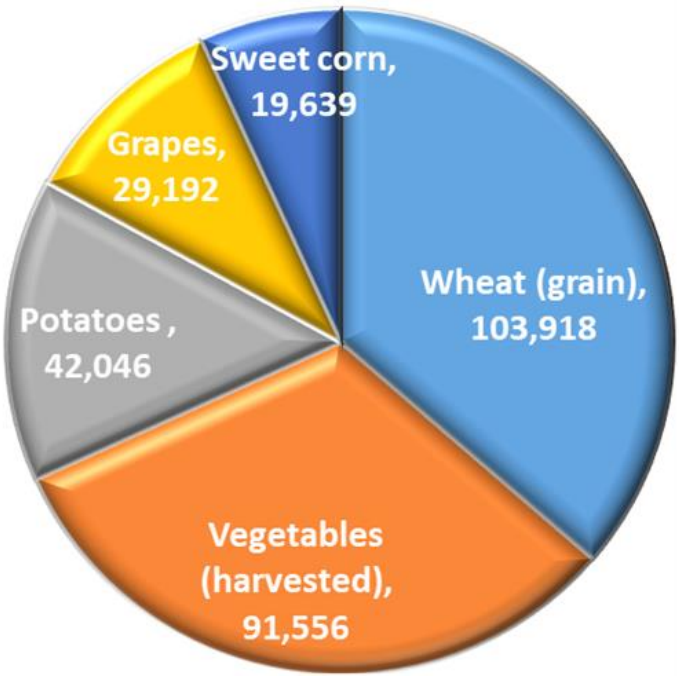

Figure 4. Top crops by acreage in Benton County, 2017.

Table 1. Benton County total and irrigated farmland acreage in 2017.

		% of total land in farms
Total land in farms	613,562 acres	-
Irrigated farmland	204,309 acres	33.29%
Harvested cropland	198,705 acres	32.39%
Pastureland and other land	5,604 acres	0.91%

Source: USDA-NASS 2017b.

Table 2. Crops grown in Benton County in 2021.

Crop	**Acres**
Alfalfa Hay	6506.93
Alfalfa/Grass Hay	1116.00
Apple	11723.36
Apricot	35.35
Asparagus	11.93
Bean, Dry	1287.87
Blueberry	3480.22
Bluegrass Seed	5825.18
Caneberry	3.37
Carrot	3973.19

Crop	Acres
Cherry	5208.84
Clover/Grass Hay	5.23
Corn Seed	12.34
Corn, Field	26531.18
Corn, Sweet	17679.41
Filbert	0.84
Garlic	19.67
Grape, Juice	4116.01
Grape, Unknown	25.20
Grape, Wine	20799.26
Grass Hay	1571.25
Grass Seed	459.93
Hemp	21.91
Hops	6205.71
Kiwi	1.93
Marijuana	63.69
Market Crops	59.56
Mint	2825.77
Nectarine/Peach	79.72
Nursery, Greenhouse	1.58
Nursery, Orchard/Vineyard	40.88
Nursery, Ornamental	34.06
Oat Hay	11.35
Onion	14781.01
Pasture	15328.10
Pea Seed	1138.68
Pea, Dry	265.58
Pea, Green	8807.53
Pear	250.47
Plum	36.53
Potato	29449.38
Pumpkin	252.73
Quinoa	2.67
Silviculture	2.52
Squash	24.18
Sudangrass	91.48
Sugar Beet	1856.93
Timothy	609.85
Triticale Hay	149.01
Unknown	122.37
Walnut	26.05
Wheat	105839.31
Wheat Fallow	88666.26
Wildlife Feed	135.89
Yellow Mustard	152.02

Source: WSDA 2021.

Market Value of Crops

In 2017, Benton County ranked third in Washington State for market value of agricultural products sold, totaling $1,005,288,000, a 9% increase from 2012 (USDA-NASS 2017a). The top crop category in terms of sales in Benton County was fruits, tree nuts, and berries, which accounted for $319 million. Vegetables, melon, potatoes, and sweet potatoes ranked second at $277 million. Table 3 shows the market value of crops sold by Benton County in 2017 (USDA-NASS 2017a).

Table 3. Market value of crops sold by Benton County, 2017.

Crops	Sales
Fruits, tree nuts, berries	$319,396,000
Vegetables, melon, potatoes, sweet potatoes	$277,820,000
Other crops and hay	$112,085,000
Grain, oilseeds, dry beans, dry peas	$5,733,000
Total	$769,417,000

Source: USDA-NASS 2017a.

Irrigation Practices

Farmers and food producers in Benton County should urgently increase the efficiency of their irrigation systems. The Yakima River watershed experiences shortages of surface water for irrigation purposes (Rajagopalan et al. 2018) and is projected to experience a 7% increase in irrigation demand annually between historical conditions and the 2030s.

According to a U.S. Geological Survey report, in 2015 the total withdrawals for irrigated crops in Benton County were 247.32 Mgal/d (million gallons per day), of which 205.18 Mgal/d was surface freshwater and 42.14 Mgal/d was groundwater (Dieter et al. 2018). The total consumptive use of water for irrigated crops was estimated at 196.36 Mgal/d. Water consumption is the lost portion of the withdrawn water due to evaporation, transpiration, or uptake by plants (Carr et al. 1990). Zero reclaimed wastewater was reported for agriculture use in Benton County in 2015.

In the Yakima Valley, most farmers draw from the Columbia River or its tributaries and use sprinkler and drip irrigation. Sprinkler is typically used on field crops, while drip is often applied on fruit crops like tree fruit, grapes, and berries.

Sprinkler irrigation is the method of applying water to crops similar to rainfall. The water droplets break down before reaching the ground to achieve uniformity. Sprinklers can be classified as big gun, center pivot (Figure 5), wheel line, rill, and hand move. In 2018, Benton County contained 13% of all center pivot acreage in Washington State and 20% of all drip irrigation acreage statewide (Figure 6 and Figure 7) (WSDA 2021).

Figure 5. Center pivot system in mint crop, Benton County. Photo: A.Z. Mohamed.

Currently, farmers are beginning to independently convert center pivots to more efficient systems, such as Low Elevation Sprinkler Application (LESA) and Low Energy Precision Application (LEPA) systems, which apply water near the ground at low pressure (Peters et al. 2019) and thereby reduce water losses due to wind drift and evaporation. Mobile Drip Irrigation systems are another irrigation technology for improved water conservation. In these systems, sprinklers are replaced with a drip line. These systems show promise for water conservation in the Benton County area where there is low water availability.

For more information, please refer to the [Irrigation in the Pacific Northwest website].

Figure 7. Drip Irrigation in corn crop, Benton County. Photo: A.Z. Mohamed.

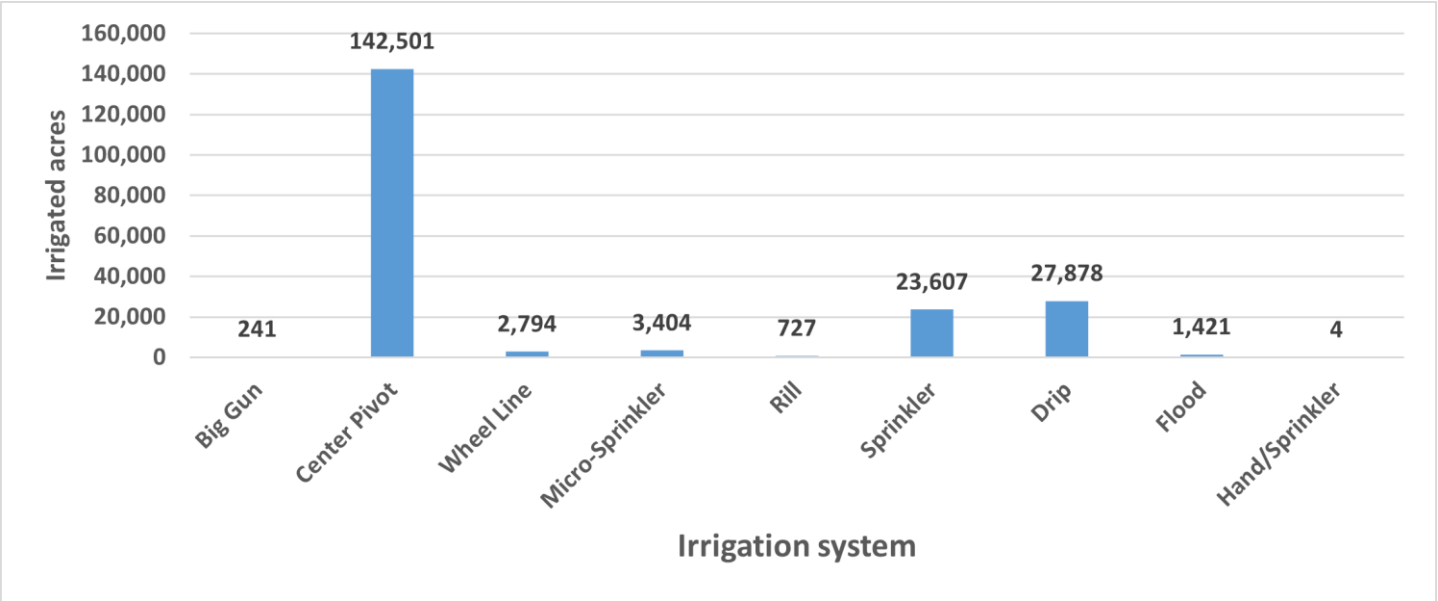

Figure 6. Irrigated acres by irrigation system type, Benton County, 2020.

Acknowledgements

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