Available water and wheat grain yield relations in a Mediterranean climate

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1. Introduction

Dryland wheat farming is widely practiced in Mediterranean-like climates including numerous countries surrounding the Mediterranean Sea, the Inland PNW of the United States, parts of western and southwestern Australia, and central Chile. The Mediterranean climate is characterized by cool, wet winters and warm, dry summers. Dryland wheat production in these climates is generally heavily dependent on water stored in the soil during the winter in addition to spring rainfall (Arnon, 1972).

The dryland cropping region of the Inland PNW includes eastern Washington, north-central Oregon, and northern Idaho. Average annual precipitation ranges from 150 to 600 mm with 60–70% occurring from October through March. About 25% of annual precipitation occurs from April through June when most wheat growth occurs. Due to wide differences in the quantity of precipitation, the Inland PNW is divided into three annual precipitation zones: (i) low <300 mm of precipitation, (ii) intermediate 300–450 mm of precipitation, and (iii) high 450–600 mm of precipitation.

In the low-precipitation zone, the dominant crop rotation is WW–SF where only one crop is produced every other year. A 3-year WW–SW–SF rotation is commonly practiced in the intermediate-precipitation zone, with spring barley (Hordeum vulgare L.) sometimes substituted for SW. Annual cropping is practiced in the high-precipitation zone with WW mostly grown every third year in rotation with SW, spring barley, lentil (Lens culinaris...