Wheat production challenges and opportunities: Creating a baseline

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Forty-eight wheat farmers across various wheat production areas of the inland Pacific Northwest are participating in a 4-year in-person survey that collects detailed annual data on their social, economic, agronomic, biotic, and climatic challenges. This is a unique approach to grower involvement and data collection that allows REACCH scientists to interact among themselves and to transcend their disciplines as they observe patterns across the region.

IMPACT

The longitudinal survey will gather social, economic, agronomic, biotic, and climatic data from a set of 48 growers distributed across the REACCH study area for 4 years. Farming differs each year, so the longitudinal approach will provide a more representative sample of how production differs by grower, by year, and by sub-region. Detailed feedback from growers helps scientists better understand their challenges and the best ways to help them deal with the challenges of climate change.

Participating farmers answer both a fixed and a new set of REACCH scientists' questions each year, regarding wheat production practices and timing, technology use, pests, university Extension services, demographics, and more. Insect pests and earthworm populations are sampled at different times at these growers' farms. Details of each farming operation are recorded in the grower surveys, such as timing of tillage operations, planting and harvesting dates, and pest outbreaks. This holistic approach will help scientists understand agroecological impacts and trade-offs of different farming practices by zone across this region.

Four agroecological zones are delineated across our study area (Figure 1). Zone 1, the dryland annual cropping area, typically receives 21 inches or more of precipitation annually. Average farm size for the surveyed growers in this zone was just over 2,500 acres. Average winter wheat yield was 91 bu/acre in 2011 (a year with higher than average rainfall) and 83 bu/acre in 2012 (Figure 2).

Zone 2, the intermediate area, is the transitional zone between annual cropping and the grain/fallow zones. Growers in this zone typically plant winter wheat following summer fallow, with a spring cereal crop following winter wheat production. Rainfall varies from approximately 15 to 20 inches of annual precipitation. Average farm size for surveyed growers in this zone, at 3,128 acres, was about 25% higher than in the annual cropping zone. Winter wheat yields averaged 83 bu/acre in 2011, about 10% less than in Zone 1, and 78 bu/acre in 2012, about 6% less than in Zone 1 (Figure 2).

Zone 3, the grain/fallow region, is typified by large farms (averaging more than 6,000 acres for the growers in our survey), low rainfall (9 to 15 inches annually), and low yields. This zone comprises the largest percentage of the farmland in the study area, but has the lowest productivity and presents many challenges to growers, from economics to weeds and wind erosion. An analysis of soil-disturbing passes for the surveyed growers revealed that Zone 3 had, on average, 2.1 soil disturbances for winter wheat production, compared to 1.62 for Zone 2 and 1.71 for Zone 1. Yields for Zone 3 averaged 65 bu/acre in 2011, a year of record precipitation for most growers in this zone, and 47 bu/acre in 2012, which was a more typical precipitation year (Figure 2). These yields are considerably lower than the yields in Zones 1 and 2; 2011 yields in Zone 3 averaged just 71 and 78% of the yields in Zones 1 and 2, respectively, while 2012 yields in Zone 3 averaged 56 and 60 % of the yields in Zones 1 and 2, respectively.

Zone 4 refers to irrigated winter wheat production and includes farmland in central Washington that is part of the Columbia Basin Irrigation Project. Just two irrigated wheat growers are

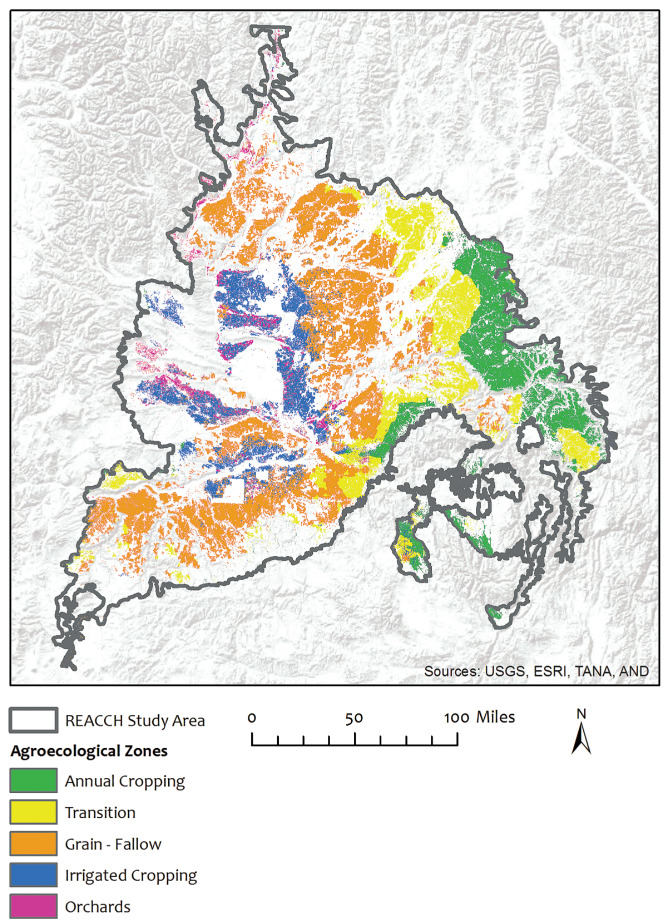

Figure 1. *Dynamic REACCH agroecological zones as defined by land use where Zone 1 = dryland annual cropping; Zone 2 = transition; Zone 3 = grain/fallow; Zone 4 = irrigated winter wheat.*

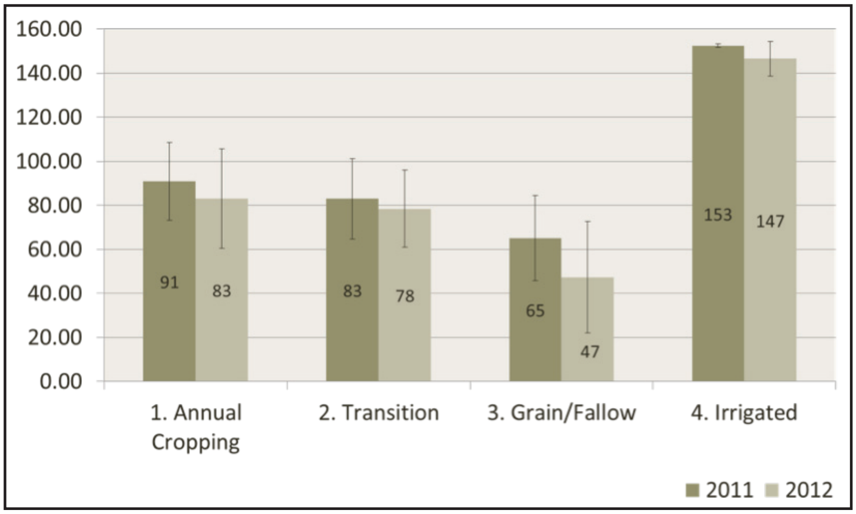

Figure 2. *Average winter wheat yield (bu/acre) by agroecological zone (2011–2012).*

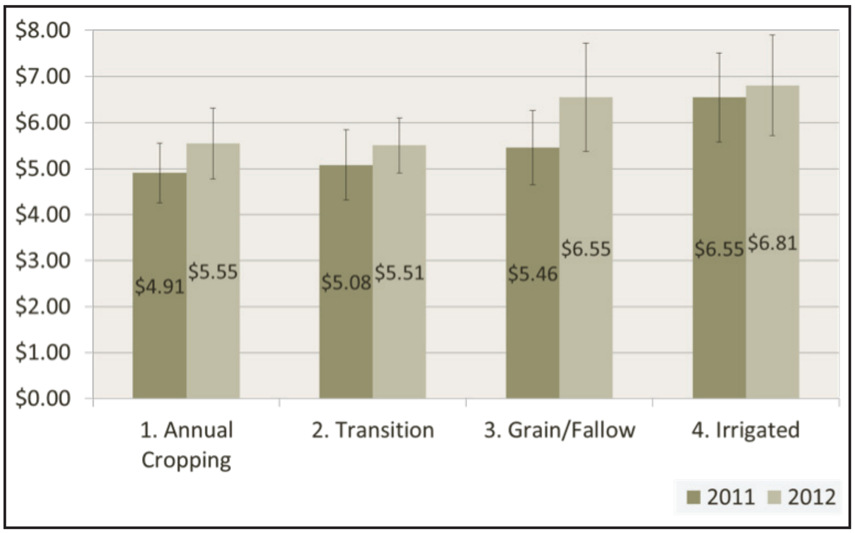

Figure 3. *Average winter wheat cost ($/bu) by agroecological zone (2011–2012).*

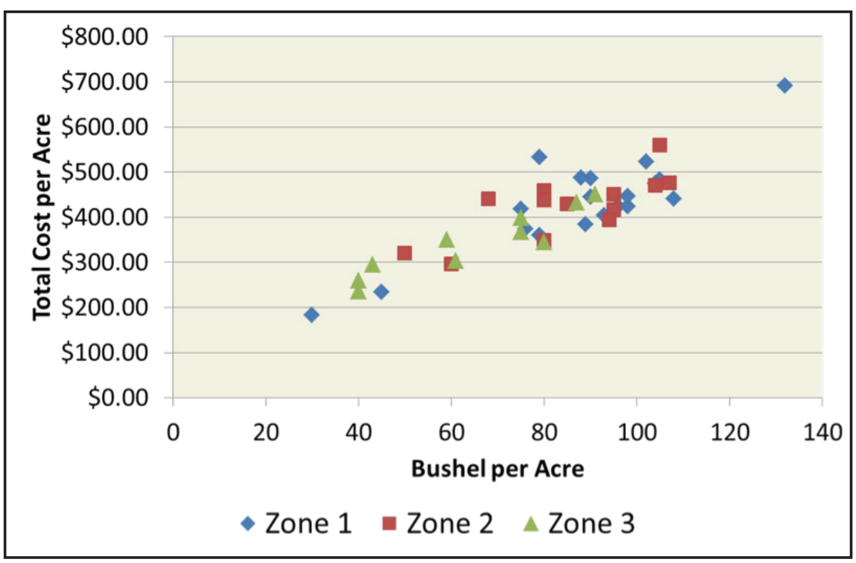

Figure 4. *Total cost ($/bu) and average winter wheat yield (bu/acre) by agroecological zone (2011–2012).*

currently participating in the longitudinal survey. Average acreage for these two farms was just over 2,500 acres. At 149 bu/acre, average winter wheat yield for 2011 and 2012 is highest under irrigated production (Figure 2). Nonetheless, profitability is lowest, at $69/acre in 2011, due to the higher costs associated with irrigated production.

Each of the longitudinal survey growers provided detailed economic data on their machinery, field operations, and input usage so that we could accurately calculate their per-bushel costs. Costs per bushel increased as zone numbers increased. Zone 1, annual cropping, had the lowest production costs—$4.91/bu in 2011 and $5.55/bu in 2012 (Figure 3). Higher than average yields were experienced across all dryland zones in 2011, which accounts for the reduction in per-bushel costs. Zone 4, the irrigated zone, had the highest production costs, at $6.81 per bushel in 2012, due to additional expenses associated with irrigation as well as higher input levels for this high-yielding area. Zone 3, the least productive dryland zone, also had higher per-bushel production costs than Zones 1 and 2, at $5.46/bu in 2011 and $6.55/bu in 2012, due to its lower productivity. High-yielding scenarios reduce costs per bushel for fixed costs such as land rent and machinery ownership, but they may increase other costs, such as fertilizer and fuel requirements.

These growers serve as a critical source of primary data on this project. Documenting interregional differences will help others understand the complexity of farming operations as well as the unique characteristics of different cropping systems in place across this varied region. However, each grower has different resources, in terms of land, capital, management, and machinery, and no two growers farm alike. This individual variation across zones is illustrated in Figure 4, which compares total costs per acre with productivity (bu/acre) by zone for each grower. While there is a general trend of increasing costs as productivity increases, there is a surprising amount of diversity among growers in each zone. Given the average values presented in Figures 1 and 2, the point that there is a large variation among individual growers should be underscored.