

Cost and Returns Baseline for the Dryland Grain Annual Cropping Region of the Pacific Northwest for 2011–2015 with a 2016 Comparison

Kathleen Painter

Preface

ENTERPRISE COSTS AND RETURNS VARY due to inherent differences in farming operations as well as in response to differing conditions. Variability stems from many sources, including

- Capital, labor and natural resources
- Type and size of machinery
- Cultural practices
- Size of farm enterprise
- Crop yields
- Input prices
- Commodity prices
- Management skill

Costs calculations may also differ depending on the intended use of the budget, such as cash flow analysis versus overall profitability. The information in this publication draws upon five years of cost of production information from producers in the dryland annual cropping regions in eastern Washington, northern Idaho and southeastern Oregon (see Davis, 2014). A longitudinal survey of wheat producers included extensive interviews of production practices for 45 dryland producers across this three-state region as part of the REACCH-PNA project (Regional Approaches to Climate Change in Pacific Northwest Agriculture). However, results presented in this publication are dependent upon the underlying assumptions. Users will need to carefully examine the underlying assumptions in order to avoid drawing unwarranted conclusions.

Introduction

This publication provides benchmark estimates for farm-level costs and returns for the dryland crops typically produced in the annual cropping region of eastern Washington, northern Idaho and northeastern Oregon for the period 2011–2015 (Fig. 1). The crop budgets include soft white winter wheat, hard red winter wheat,

soft white spring wheat, hard red spring wheat, spring barley, spring peas, lentils, chickpeas (also known as garbanzos) and spring canola. The annual cropping area of this dryland production region typically produces a crop every year, in contrast to other areas in this

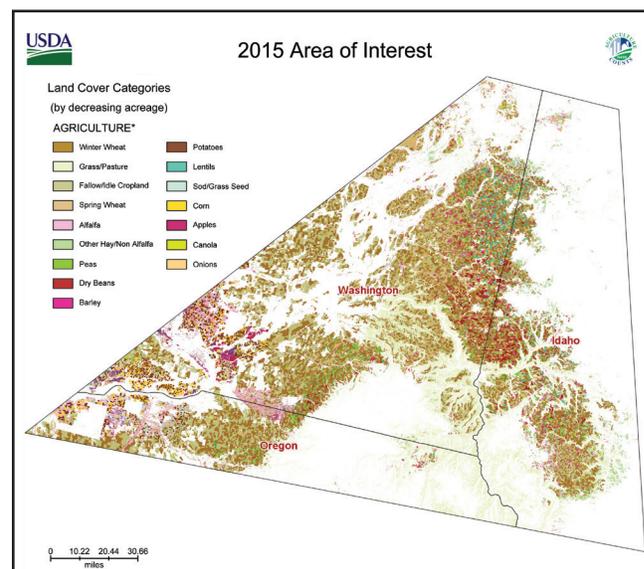


Figure 1. 2015 Cropland usage for the dryland annual cropping region in eastern Washington, northern Idaho and northeastern Oregon (Source: USDA Cropscape file)

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three-state region that are too dry for annual crop production. Precipitation for the annual cropping region is approximately 18 inches or more per year. The farming practices in this publication represent conventional tillage, using typical methods that conserve soil in this region that tends to be hilly and highly erodible.

In order to compare costs and returns for a specific time or situation, these budgets were built using detailed Excel spreadsheets that allow users to change many of the underlying assumptions, including yield, crop prices, input prices, and input quantities. For example, 2016 crop prices were considerably lower than the 2011–2015 crop prices used in this benchmark. In addition, input prices decreased for fuel and fertilizers in 2016. This publication includes a comparison using 2016 prices that shows how more recent conditions compare to this benchmark period.

Definition and purpose of crop budgets

An enterprise budget estimates revenue, costs, and returns for a particular enterprise, based upon a specific set of assumptions, for a specified time period, which is typically one year. In this publication, each crop represents a different enterprise. Assumptions on crop yields, field operations, and farm machinery are presented in detail throughout this report. This level of specificity is necessary in order to accurately estimate net returns over total costs, or profitability, for each crop during this time period. Relative profitability by crop and cropping system is thus determined using a detailed, systematic approach that clearly outlines cost assumptions and calculations for all factors of production.

Crop budgets allow managers to estimate economic impacts of different crop choices in advance. They are

very useful for making day-to-day decisions on cropping choices, inputs, marketing, and other operational decisions that are critical to profitable operations. They also provide the building blocks for a whole farm budget. Crop budgets are used for many other purposes as well, including loans, litigation, insurance, and lease negotiations.

The purpose of this particular set of enterprise budgets is to provide a benchmark analysis of profitability for this region over a five-year period. There is considerable fluctuation in relative prices from year to year and even within one year, depending on how and when each crop is marketed. In addition, supply and demand relationships vary by crop over this time period, as shown in figures 2 and 3 below. Thus, a five-year analysis using average prices received by farmers presents typical returns for this region averaged over a period of time that is long enough to mitigate short-run fluctuations but not long enough to significantly alter values of longer term resources such as land and machinery.

A realistic portrayal of farm income for this region needs to incorporate crop rotation dynamics. Crops in this production region typically follow a standard rotation to reduce weed and disease pressure, thus maintaining healthy crops. For example, winter wheat cannot be profitably produced without some type of crop rotation, which typically consists of winter wheat followed by a spring grain. The spring grain crop is then followed by a “break” crop that is not wheat or barley, such as peas or canola. This publication uses net returns by crop to calculate average earnings by rotation, which provides a more accurate picture of per acre profitability than an enterprise budget for one crop in isolation.

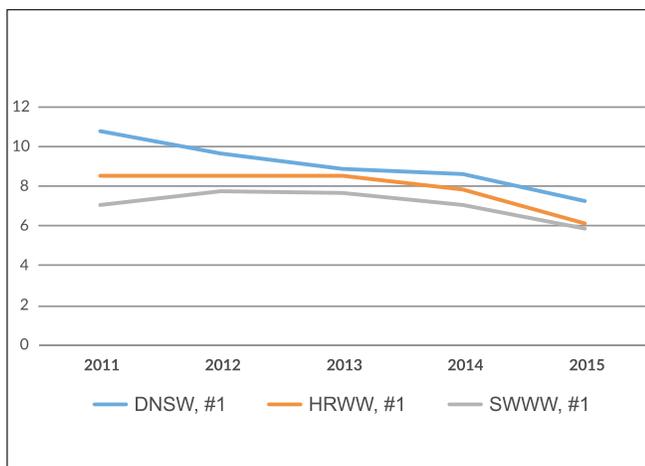


Figure 2. Average farmgate prices by wheat class, 2011–2015, based on the midpoint bid for 30-day delivery to Portland, Oregon and a \$0.65 per bu transportation price. Source: USDA-AMS

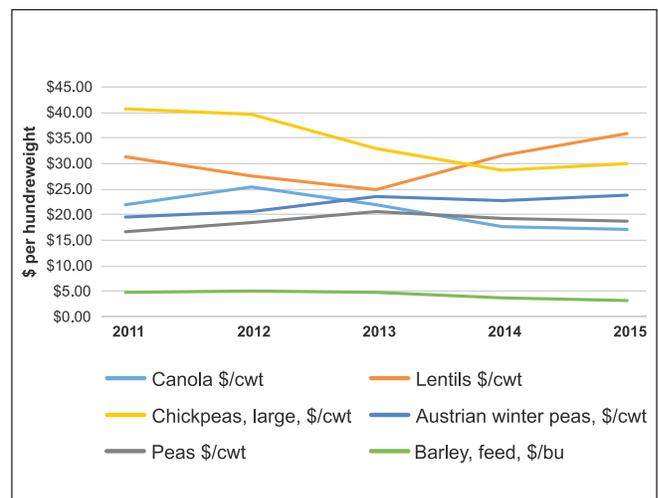


Figure 3. Average marketing year prices received by growers for 2011–2015, \$/cwt, WA, OR, ID. Source: USDA-NASS Quick Stats

Sources of information

This detailed analysis provides a benchmark analysis using data from an extensive set of 45 grower surveys conducted over a five-year period in this three-state region (see Davis, 2014). The budget spreadsheets from which this analysis was constructed can be easily changed to reflect other periods in time or different assumptions. For example, the economic impact of the drop in grain prices in 2016 will be analyzed using this benchmark analysis. Crop budgets in Idaho are posted on the University of Idaho Extension Idaho AgBiz website: www.uidaho.edu/cals/idaho-agbiz. Any one year can thus be compared to this benchmark study using crop and input prices published in an annual budget. However, specific assumptions used in any budget need to be analyzed when using them for comparison. For example, the 2016 crop budgets on the Idaho AgBiz website were developed using crop price estimates for 2016, while the 2016 comparison budget used in this publication used average prices received by farmers in this region for 2016. Crop prices differ, as the Idaho AgBiz budget was created in early 2016 while the 2016 budget used in this publication was created in early 2017 using actual 2016 price data.

There are two main parts to a survey for developing an enterprise budget. The first part is a detailed schedule of farm operations that describes each farm operation, such as harrowing, planting, spraying or harvesting, including machinery, other inputs and timing. The second part of the survey includes a detailed list of farm machinery and equipment necessary for raising that crop, from tractors and four wheelers to farm trucks, combines, harrows, drills, tools, and machine sheds. Identifying a typical set of machinery for a particular crop is difficult, as this is an area in which operations can really differ. Some farmers maintain and repair older machinery while others invest much more capital in newer machinery. Others use custom operators for some of their operations. Individual preferences vary in terms of brands and types of machinery. Regardless, investment in farm machinery is a necessary capital expense and should not be underestimated.

In order to develop an accurate economic budget for a farm enterprise, the detailed list of the farm machinery and equipment for the survey needs to include estimates of current market value, annual repair costs, number of years of service, salvage value, and fuel consumption for each piece of machinery. In addition, overhead expenses such as utilities, phone, accounting, and insurance should be estimated. Farmers do make estimates of various expense categories for tax purposes each year. However, these are typically for the entire farm operation. In order to estimate profitability for a particular crop, farm costs and returns will be estimated separately for each enterprise in this publication.

Background and Specific Assumptions

Economic costs are used in these costs and returns estimates. All resources are valued based on their current market value. For items such as land that is owned by the operator or owner labor, an opportunity cost is used. This represents the value of the next best use for that resource. For example, this could be wages you might earn if you were not farming, or what you could receive for land rent if you were not farming. Valuing all factors of production allows you to determine if your enterprise is profitable. If you are not earning fair market returns on all of your factors of production, at some point you may want to reconsider how you are using your resources.

The model farm

Based on a survey of 45 growers conducted as part of the REACCH-PNA project, the average farm size for the annual cropping region was 2467 acres (Davis, 2014). This publication assumes a 2500-acre farm uses a typical 3-year rotation of winter wheat followed by a spring grain and then a break crop, which is a grain alternative such as peas, chickpeas, lentils or spring canola. In a typical year, approximately equal proportions would be devoted to winter wheat, spring grain, and a break crop. Crop choices will vary by year, depending on relative crop prices and other management considerations.

Input prices and crop prices

Input prices for this study are based on the University of Idaho's 2013 survey of agricultural supply companies, which includes companies in eastern Washington as well as northern Idaho. This year represents the midpoint of the study period, and is representative of input prices throughout this five-year period. These can be found on the Idaho AgBiz website, www.uidaho.edu/cals/idaho-agbiz/crop-budgets, under the links for Crop Input Price Summaries. In the spreadsheet version of this report, input prices can be changed on the Input Prices tab, and all of the cost calculations will be automatically updated. Input cost changes can also be made on individual crop budget sheets, overriding the input cost formula for that particular crop.

Crop prices are an average of 2011–2015 farmgate prices for growers in this three-state dryland cropping region. These prices represent average marketing year prices received by growers after paying transportation charges. These prices are available from a database maintained online by the United States Department of Agriculture (USDA) National Agricultural Statistical Service (NASS), available at: <https://quickstats.nass.usda.gov/>. Average prices by year for non-wheat crops

Table 1. Average marketing year prices received by growers for 2011–2015, \$/cwt, WA, OR, ID

Year	Canola \$/cwt	Lentils \$/cwt	Peas \$/cwt	Chickpeas, large, \$/cwt	Austrian winter peas, \$/cwt	Barley, feed, \$/bu	Barley, feed, \$/ton
2011	\$22.03	\$31.45	\$16.66	\$40.65	\$19.50	\$4.77	\$198.65
2012	\$25.30	\$27.50	\$18.42	\$39.55	\$20.70	\$5.13	\$213.75
2013	\$21.83	\$24.85	\$20.64	\$32.90	\$23.50	\$4.76	\$198.24
2014	\$17.70	\$31.50	\$19.26	\$28.70	\$22.70	\$3.66	\$152.31
2015	\$17.00	\$35.85	\$18.72	\$29.95	\$23.80	\$3.20	\$133.13
2011-2015 average	\$20.77	\$30.23	\$18.74	\$34.35	\$22.04	\$4.36	\$181.78

Source: USDA-NASS Quick Stats

in Washington, Oregon, and Idaho from this database are presented in Table 1.

Prices by wheat class, such as hard red spring or soft white winter, are available from a database maintained by the USDA Agricultural Marketing Service (AMS), available at: www.ams.usda.gov/market-news/custom-reports. While the USDA-NASS database provides farmgate price data, prices in the USDA-AMS reports are collected at off-farm marketing sites, so individual transportation charges are not reflected in these prices. Port prices from Portland, Oregon, are used as the source for wheat prices by class. An estimate of typical transportation charges for growers in this region of \$0.65 per bushel is subtracted from these port prices. This price will vary depending on farm location. Average wheat prices by class for Washington, Oregon and Idaho (using the midpoint bid and a 30-day delivery price) from the USDA-AMS database for 2011 through 2015 are presented in Table 2.

In the spreadsheet version of this report, crop prices can be adjusted on the Summary tab of the worksheet and the effects of this change will be reflected

Table 2. Wheat prices by class, 2011–2015, average bid, 30-day delivery, 2011-2015, Portland, OR

Year	Wheat by class		
	Dark Northern spring, 14% protein, #1 \$/bu	Hard red winter, 10.5% protein, #1 \$/bu	Soft white winter, #1 \$/bu
2011	\$/bu	\$/bu	\$/bu
2012	\$9.70	\$8.55	\$7.75
2013	\$8.90	\$8.52	\$7.67
2014	\$8.64	\$7.87	\$7.09
2015	\$7.27	\$6.14	\$5.88
2011–2015 average	\$9.06	\$7.91	\$7.09
Transportation cost estimate, \$/bu	\$0.65	\$0.65	\$0.65
Farmgate average price estimate by class	\$8.41	\$7.26	\$6.44

Source: USDA-AMS, Portland, OR

throughout all the budgets. (Yields can be adjusted similarly.) The spreadsheet version of this publication is included as an appendix as well. The spreadsheet version is particularly useful for examining impacts of changes in prices or yields on profitability. For this reason, a table showing breakeven price and yield data at various prices and yields is provided at the bottom of each budget. The user can input a certain percent above or below the assumed price or yield that they wish to examine, and the yield or price necessary to cover various cost levels at that level will be automatically calculated. For example, with a base winter wheat yield assumption of 80 bushels (bu) per acre, a price of \$5.63 per bu is needed to cover total costs of production (line 3, column 2 in Fig. 4). If the yield is 10% higher, at 88 bu per acre, the breakeven price to cover all costs is \$5.12 per bu (line 3, column 3 in Fig. 4). The breakeven tables in the appendix examine impacts of both crop price and yields that are 10% above and below the budget assumptions.

Machinery costs

Background information on typical farm machinery used in this publication are based on extensive grower

	Price		
	- 10%	Base Yield	+ 10%
	72.00	80	88.00
Operating Cost Breakeven	\$3.57	\$3.21	\$2.92
Ownership Cost Breakeven	\$2.69	\$2.42	\$2.20
Total Cost Breakeven	\$6.26	\$5.63	\$5.12
	Yield		
	10%	Base Price	10%
	\$5.80	\$6.44	\$7.08
Operating Cost Breakeven	44.4	39.9	36.3
Ownership Cost Breakeven	33.4	30.1	27.3
Total Cost Breakeven	77.8	70.0	63.6

Figure 4. Breakeven Analysis for Winter Wheat, 2011–2015.

interviews conducted from 2011 through 2014 (see Davis, 2014). Fixed and variable costs of machinery operation are calculated using a budget calculator program, University of Idaho Crop Machinery Cost Program, available as a downloadable file at from <http://www.uidaho.edu/cals/idaho-agbiz/tools>. Details on the machinery complement assumptions, including current value, salvage value, annual usage, years of life, repair costs, labor requirements, and fuel usage, are presented in Table 5. The machinery cost program uses the assumptions outlined in this bulletin to estimate costs per hour and per acre for each machinery operation as presented in Table 6. For more information on the equations used to calculate machinery costs, please see Painter, 2011.

Land costs

In a cash budget, actual land use charges might range from zero (for a landowner) to cash rent or a crop-share for a tenant, in which the owner receives a portion of the revenue and might pay for a portion of the expenses. In this publication, we are creating an economic budget in order to determine if our enterprise is profitable, in other words, if we are earning returns on all the factors of production involved in producing this crop. Land is an expensive factor of production, and the landowner should be earning returns on this vital factor of production. While the owner-operator will not actually need to pay for land rent, this cost represents the minimum return owner-operators must receive to

justify growing the crop themselves. To determine the profitability of crop production relative to other activities, the owner-operator may want to consider these forgone rental returns along with the usual production expenses.

The lease agreement used in this publication is a one-third landlord and two-thirds tenant crop-share, with the landlord paying land taxes, one-third of the fertilizer cost, one-third of the chemical cost and one-third of the crop insurance premium. The tenant covers all other production expenses. This crop-share percentage can be adjusted in the spreadsheet version of this publication. If the percentage is adjusted on the Summary tab, it is changed for all crops. If you want different crop-share percentages for different crops, adjust the percentage on the budget sheet for that crop. This valuable tool reveals how factors such as changes in crop and input prices as well as cropping choices affect revenue for tenants and landlords differently. Note that pea, lentil and chickpea crop-share percentages are typically 75/25 rather than the 67/33 used for grain crops.

Labor costs

Labor rates include a base wage plus a percentage for Social Security, Medicare, unemployment insurance and other labor overhead expenses. In the spreadsheet version of this publication, this rate can easily be changed on the Input Prices tab of the worksheet.

Table 3. Yield, Price, Revenue, Costs, and Net Returns by Crop, 2011–2015 Average Farmgate Prices (\$/acre)

Crop	Unit	Yield per acre	2011-2015 Price ¹ per unit	Revenue per acre	Total Cost (TC) of Operation	Returns over TC (\$/acre)	Total Variable Costs (VC) (\$/acre)	Returns over VC (\$/acre)	Land Cost (Cost-Share ²) (\$/acre)	Percentage Share Tenant/Landlord
Soft White Winter Wheat (SWWW)	bu	80	\$6.44	\$515	\$451	\$64	\$257	\$258	\$125	67/33
Hard Red Winter Wheat (HRWW)	bu	75	\$7.26	\$545	\$0	\$545	\$0	\$545	\$0	67/33
Soft White Spring Wheat (SWSW)	bu	58	\$6.44	\$374	\$347	\$27	\$211	\$162	\$76	67/33
Hard Red Spring Wheat (HRSW)	bu	58	\$8.41	\$488	\$428	\$60	\$259	\$229	\$107	67/33
Spring Barley (SB)	ton	1.5	\$181.66	\$272	\$297	-\$24	\$193	\$80	\$53	67/33
Peas (P)	lb	1700	\$0.19	\$319	\$326	-\$7	\$205	\$114	\$65	75/25
Austrian Winter Peas (AWP)	lb	2000	\$0.22	\$441	\$0	\$441	\$0	\$441	\$0	75/25
Lentils (L)	lb	1100	\$0.30	\$333	\$314	\$18	\$138	\$195	\$70	75/25
Chickpeas (CP)	lb	1200	\$0.34	\$412	\$350	\$63	\$199	\$213	\$90	75/25
Spring Canola (SC)	lb	1500	\$0.21	\$312	\$347	-\$35	\$226	\$86	\$65	67/33

¹Average farmgate prices for Washington, Oregon, and Idaho for 2011-2015. Sources: USDA-NASS and USDA-AMS.

²In a cost-share arrangement, the landowner and the farm manager split the crop and specified costs. In these budgets, they split costs for fertilizer, chemicals and crop insurance.

Interest and overhead costs

Interest on operating capital is charged on total operating costs for six months for spring crops and for nine months for winter crops. The operating interest rate can be changed on the Input Prices worksheet in the spreadsheet version of this publication. A general overhead charge of 5 percent of operating expenses is included to cover unallocated costs such as office expenses, phone service, legal and accounting fees, and utilities.

Please examine closely the assumptions we have used and make adjustments to reflect your particular operation. Adjustments in the variable costs can easily be made without affecting the overall accuracy of the budget information. Machinery costs are more difficult

to adjust, due to the underlying complexity of machinery cost calculations. A separate machinery cost calculator program is used to develop the costs used in these budgets, which are based on specific machinery widths, tractor horsepower, type of operation, length of life, and salvage value.

Summary of Costs and Returns by Crop and by Rotation for 2011–2015

Over this five-year period, 2011–2015, winter wheat was the most profitable crop, averaging \$64 per acre, assuming an 80 bu per acre yield, using average prices received by farmers in the PNW (see Table 3 and Fig. 5). Chickpeas were nearly as profitable as winter wheat, at \$63 per acre, followed by hard red spring

Table 4. Yield, Price, Revenue, Costs, and Net Returns by Rotation, 2011–2015 Average Farmgate Prices (\$/acre/year)

By Rotation:	Revenue per acre (\$/acre)	Total Cost (TC) (\$/acre)	Returns over TC (\$/acre)	Total Variable Costs (VC) w(\$/acre)	Returns over VC (\$/acre)	Crop-Share Land Cost (\$/acre)
SWWW, SWSW, P	\$402	\$374	\$28	\$224	\$178	\$89
SWWW, SWSW, CP	\$434	\$382	\$51	\$223	\$211	\$97
SWWW, SWSW, L	\$407	\$371	\$36	\$202	\$205	\$90
SWWW, SWSW, SC	\$400	\$381	\$19	\$231	\$169	\$89
SWWW, HRSW, P	\$441	\$401	\$39	\$240	\$200	\$99
SWWW, HRSW, CP	\$472	\$409	\$62	\$239	\$233	\$107
SWWW, HRSW, L	\$445	\$398	\$48	\$218	\$227	\$101
SWWW, HRSW, SC	\$438	\$408	\$30	\$247	\$191	\$99
SWWW, SB, P	\$369	\$358	\$11	\$218	\$150	\$81
SWWW, SB, L	\$373	\$354	\$20	\$196	\$177	\$83
SWWW, SB, CP	\$400	\$366	\$34	\$216	\$184	\$89
SWWW, SB, SC	\$366	\$365	\$2	\$225	\$141	\$81
HRWW, SWSW, P	\$412	\$389	\$24	\$241	\$171	\$86
HRWW, SWSW, CP	\$443	\$397	\$47	\$239	\$204	\$94
HRWW, SWSW, L	\$417	\$385	\$32	\$219	\$198	\$88
HRWW, SWSW, SC	\$410	\$396	\$14	\$248	\$162	\$86
HRWW, HRSW, P	\$450	\$416	\$35	\$257	\$193	\$96
HRWW, HRSW, CP	\$481	\$424	\$58	\$255	\$226	\$105
HRWW, HRSW, L	\$455	\$412	\$43	\$235	\$220	\$98
HRWW, HRSW, SC	\$438	\$423	\$16	\$264	\$174	\$96
HRWW, SB, P	\$379	\$372	\$7	\$235	\$144	\$78
HRWW, SB, L	\$383	\$368	\$15	\$213	\$171	\$80
HRWW, SB, CP	\$410	\$380	\$30	\$233	\$177	\$87
HRWW, SB, SC	\$376	\$379	-\$3	\$242	\$134	\$78

Legend:

SWWW = Soft White Winter Wheat
 HRWW = Hard Red Winter Wheat
 SWSW = Soft White Spring Wheat

HRSW = Hard Red Spring Wheat
 SB = Spring Barley
 P = Peas

CP = Chickpeas
 L = Lentils
 SC = Spring Canola

wheat at \$60 per acre. Returns for hard red winter wheat were slightly less, at \$51 per acre. Lentils and soft white spring wheat were also profitable, at \$29, and \$27 per acre, respectively. Peas, spring barley, and spring canola were not profitable under the price and yield assumptions used in this study. They averaged -\$7 per acre (peas), -\$24 per acre (spring barley), and -\$35 per acre (spring canola).

While choices such as peas, barley, or spring canola may be unprofitable in the year that they are grown, these rotational choices can improve overall returns on a rotational basis. For example, producing Roundup-Ready® spring canola can clean up a weedy field, increasing returns in subsequent years. Research in the Palouse region has shown yield increases in winter wheat following peas (19%) and spring canola (15%) (see Guy and Karow, 2009). Using the same assumptions in terms of crop prices and yields as above (see Table 3), average per acre returns by rotation are highest for a rotation of soft white winter wheat, hard red spring wheat and chickpeas at \$62 per acre per year (Table 4, Yield, Price, Revenue, Costs and Net Returns by Rotation (\$/acre/year) and Fig. 6, Net Returns over

Total Costs by Rotation, 2011–2015 Average Crop Prices (\$/acre)). Returns for hard red winter wheat, hard red spring wheat and chickpeas are next highest, at \$58 per acre per year. The top twelve most profitable rotations are listed in Fig. 6. Net returns for all rotations are listed in Table 4.

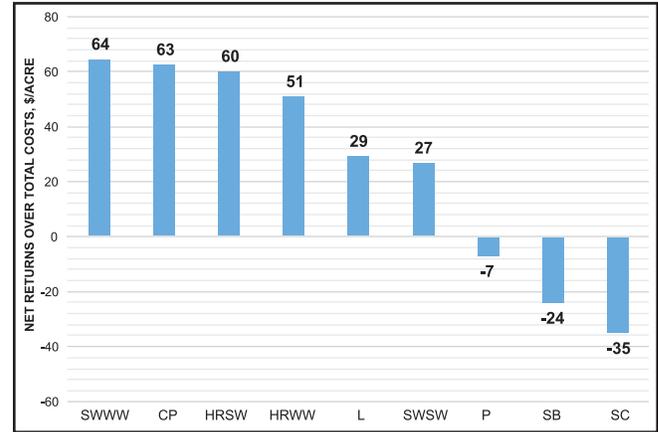


Figure 5. Net Returns over Total Costs by Crop, 2011–2015 Average Crop Prices (\$/acre)

Table 5. Machinery Complement for Annual Cropping Region, Dryland Grain Rotations

Type of Machine	Replacement Value	Age When Purchased	Years of Life	Annual Hours of Use	Salvage Value \$	Annual Repairs (Materials & Labor) \$	Gallons of Fuel/Hr.	Taxes, Housing, Insur., Licences %	Labor Multiplier	Acres per Hour
Tractors, ATVs:										
4WD-ATV	7,000	0	10	150	2,000	100	1.2	1.2	1.1	
50HP-WT w/Bucket	16,000	5	20	150	3,500	300	3	1.2	1.1	
200HP FWA Tractor	85,000	2	10	300	40,000	1000	9	1.2	1.1	
350HP-WT	110,000	5	10	550	45,000	3,000	15	1.2	1.1	
Equipment:										
Bankout Wagon	15,000	0	15	100	3,000	500	10	0.6	1.1	-
10-Bottom Plow	18,000	10	15	80	5,000	600	15	0.6	1.1	7
23' Chisel Plow	18,500	0	15	40	2,000	700	15	0.6	1.1	12
36' Cultivator w/Harrow	19,200	5	15	150	3,500	750	15	0.6	1.1	17
36' Multiweeder, used	23,500	5	15	35	4,000	750	9	0.6	1.1	26
40' Heavy Harrow	21,500	0	15	40	2000	750	15	0.6	1.1	23
60' Flex Harrow	10,000	5	15	25	1000	550	9	0.6	1.1	37
100' Pull Sprayer	35,000	0	20	200	5000	1,700	8	0.6	1.2	51
40' Ripper Shooter (Rental)	-	-	-	-	-	-	14	-	1.2	19
36' JD 455 Drill	40,000	2	10	180	10,000	2,800	15	3.0	1.2	16
36' Combine	300,000	2	10	250	100,000	7,500	10	2.6	1.25	13
Trucks:										
				Miles/year:			MPG:			
2-Ton Truck	20,000	15	15	1,000	2,000	1,250	6	10.1	1.2	
40' Grain Trailer+Tractor	35,000	10	15	7,500	14,500	2,000	6	10.1	1.2	
Trap Wagon	15,000	10	10	500	3,000	400	12	3.8	1.2	
3/4-Ton Pickup	23,000	5	7	12,000	7,500	1,500	12	6.8	1.2	

Note: Farm size is assumed to be 2500 acres for the purposes of machinery cost calculations.

The spreadsheet version of this publication can be used to easily adjust crop yield or other assumptions such as crop or input prices in order to compare economic impacts of different rotational choices. For example, a version of the spreadsheet could be created that included an increase in winter wheat yields following pea production. Comparisons across rotations can easily be made by making multiple copies of the spreadsheet using different file names. See color coding information below for more information on using the spreadsheet version of this file.

Comparing 2011–2015 Benchmark Values with 2016 Farm-Level Returns

In 2016, wheat prices fell dramatically, with a season average price of \$3.70 per bushel nationally (USDA-ERS). Average farmgate prices for this study area were \$3.61 per bu for spring white winter wheat in 2016. With this price, net returns over total costs for winter wheat, the main cash crop in the region, fell from the most profitable crop, at \$64 per acre, to one of the least profitable crop choices

Table 6. Machinery Complement for Annual Cropping Region, Dryland Grain Rotations

	Ownership Costs (\$/acre):				Operating Costs (\$/acre):				Labor		Fuel Use	Total Cost (\$/acre)
	Depreciation	Interest	Taxes, Housing, Insurance, License	Total Ownership Costs	Repairs	Fuel	Lubricants	Total	(\$/acre)	(hr/acre)	(gal/acre)	
0.75-Ton 4WD Pickup	\$0.85	\$0.63	\$0.64	\$2.12	\$0.24	\$1.48	\$0.22	\$1.94	\$2.40	0.12	0.42	\$6.46
2-Ton Truck	\$0.48	\$0.30	\$0.44	\$1.22	\$0.40	\$0.29	\$0.04	\$0.73	\$0.60	0.03	0.15	\$2.55
Bankout Wagon w/ 350HP	\$0.79	\$0.62	\$0.09	\$1.51	\$0.42	\$1.40	\$0.21	\$2.03	\$0.88	0.04	0.70	\$4.41
Trap Wagon	\$0.48	\$0.24	\$0.14	\$0.86	\$0.16	\$0.06	\$0.01	\$0.23	\$0.16	0.01	0.02	\$1.25
4WD-ATV	\$0.20	\$0.12	\$0.02	\$0.34	\$0.04	\$0.26	\$0.04	\$0.33	\$1.32	0.07	0.07	\$2.00
50HP Wheel Tractor w/ Bucket	\$0.17	\$0.18	\$0.03	\$0.37	\$0.08	\$0.42	\$0.06	\$0.56	\$0.88	0.04	0.21	\$1.82
36' JD455 Drill w/ 350HP	\$1.83	\$1.21	\$0.38	\$3.42	\$1.35	\$3.45	\$0.52	\$5.32	\$1.42	0.10	1.73	\$10.16
30' Combine	\$6.55	\$4.42	\$1.70	\$12.67	\$2.46	\$2.86	\$0.43	\$5.75	\$2.05	0.28	1.43	\$20.47
60' Flex Harrow w/ 200HP	\$0.96	\$0.81	\$0.11	\$1.88	\$0.86	\$0.85	\$0.13	\$1.84	\$0.59	0.03	0.43	\$4.31
36' Cultivator with Harrow	\$0.89	\$0.88	\$0.13	\$1.90	\$0.63	\$2.94	\$0.44	\$4.01	\$1.32	0.07	1.47	\$7.23
36' Cultiweeder w/ 350HP	\$2.01	\$1.56	\$0.19	\$3.76	\$0.96	\$1.21	\$0.18	\$2.35	\$0.85	0.06	0.61	\$6.96
23' Chisel Plow w/ 350HP	\$2.95	\$2.23	\$0.27	\$5.45	\$1.91	\$4.48	\$0.67	\$7.06	\$1.83	0.13	2.24	\$14.34
10 Bottom Plow w/ 350HP	\$3.26	\$2.76	\$0.36	\$6.38	\$1.86	\$7.72	\$1.16	\$10.74	\$3.16	0.24	3.86	\$20.28
40' Heavy Harrow w/ 350HP	\$1.91	\$1.26	\$0.15	\$3.32	\$1.04	\$2.31	\$0.35	\$3.70	\$0.95	0.06	1.16	\$7.97
36' Ripper Shooter w/ 350HP	\$0.61	\$0.49	\$0.09	\$1.19	\$0.28	\$2.53	\$0.38	\$3.19	\$1.13	0.07	1.27	\$5.51
100' Sprayer w/ 200HP	\$0.44	\$0.40	\$0.06	\$0.90	\$0.24	\$0.55	\$0.08	\$0.87	\$0.43	0.02	0.28	\$2.20
40' Grain Trailer & Tractor	\$0.60	\$0.69	\$1.04	\$2.33	\$0.80	\$1.75	\$0.26	\$2.81	\$2.11	0.05	0.88	\$7.25

Note: Farm size is assumed to be 2500 acres for the purposes of machinery cost calculations. In the spreadsheet version of this bulletin, per hour machinery costs can be changed in this master table and they will be updated throughout the bulletin. Per acre costs are calculated in the Machine Cost program using the values listed in the Machinery Complement tab.

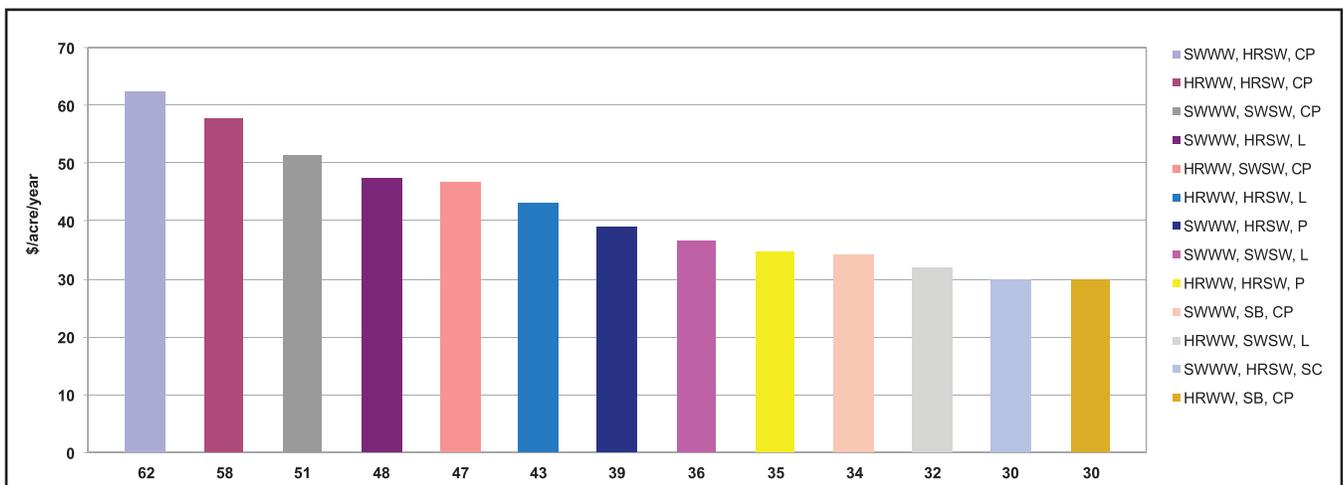


Figure 6. Net Returns over Total Costs by Rotation, 2011-2015 Average Crop Prices (\$/acre)

at -\$82 per acre (Fig. 7). This crop is grown on over 40% of all acreage in the dryland crop producing region of the inland Pacific Northwest (USDA-NASS). While some of the non-grain crops were profitable, such as peas (\$50 per acre) and chickpeas (\$40 per acre), rotational returns were negative for all crop rotations, with a rotation of hard red winter wheat, hard red spring wheat and peas being the least negative, at -\$27 per acre (Fig. 8). The twelve least negative systems are presented in Fig. 8.

Summary

A unique five-year survey of producers in the dryland wheat producing region of the inland Pacific Northwest helped provide five years of detailed costs and returns data for producers in the study area, which is a dryland annual cropping region characterized by 18 inches or more annual precipitation (Davis, 2014). In-person interviews

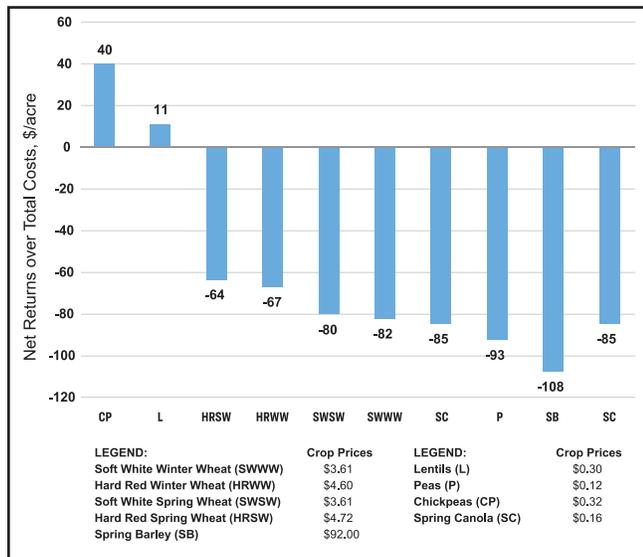


Figure 7. Net Returns over Total Costs by Crop, 2016 Average Farmgate Crop Prices (\$/acre)

provided specific details on costs and returns, including machinery complements and specific input levels. This analysis provides a baseline study of farm-level profitability for the 2011–2015 time period. In general, growers had returns above total costs of production averaging from \$27 to \$64 per acre for wheat production, depending on crop choice (winter or spring wheat, soft white or hard red). Returns for chickpeas (\$63 per acre) were comparable to soft white winter wheat (\$64 per acre), which was the most profitable crop. Returns for spring peas (-\$7 per acre) and spring barley (-\$24 per acre) were the only unprofitable crops. However, crops are typically grown in rotation, thus average returns for the six most profitable rotations ranged from \$43 to \$62 per acre.

Net returns from the 2016 season were markedly different, in which the only profitable crops were peas (\$50 per acre), chickpeas (\$40 per acre) and lentils (\$11 per acre). Returns for soft white winter wheat, the dominant crop in this region, were estimated at -\$82 per acre, compared to \$64 per acre for the baseline period. Returns for other wheat classes were also negative: -\$64 per acre for hard red spring wheat, -\$67 per acre for hard red winter wheat and -\$80 per acre for soft wheat spring wheat. When economic returns for the dominant crop are \$146 per acre below average, negative economic repercussions will be felt throughout the farm sector as well as in the larger regional economy.

References

- Davis, Hilary M. 2014. *An Economic Analysis of a Longitudinal Survey of Wheat Growers in the Inland Pacific Northwest*. Master's thesis, Department of Agricultural Economics and Rural Sociology, University of Idaho, Moscow.
- Guy, S., and R. Karow. 2009. Alternate Crops for Direct Seeding in the Dryland Inland Northwest. <http://pnwsteep.wsu.edu/directseed/conf98/alternat2.htm>

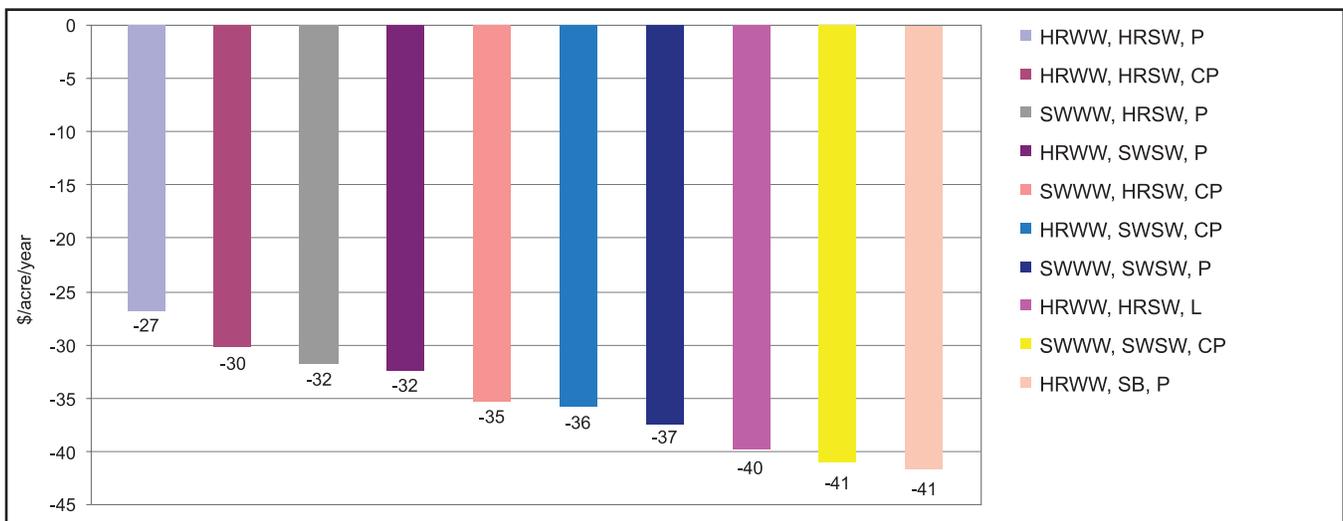


Figure 8. Net Returns over Total Costs by Rotation, 2016 Average Farm Gate Crop Prices (\$/acre)

Additional Resources

- Painter, K. 2011. *Costs of Owning and Operating Farm Machinery in the Pacific Northwest: 2011*. PNW 346. University of Idaho, 106 pp. <http://www.cals.uidaho.edu/edComm/pdf/PNW/PNW0346/PNW346.pdf>.
- Patterson, P., Painter K., Ruhoff, N., Eborn, B. 2016. *Idaho Crop Input Price Summary for 2015*. AEES No. 2016-04, Department of Agricultural Economics and Rural Sociology, University of Idaho. <https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets>.
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- Patterson, P. and Painter, K. 2013. *Crop Input Price Summary for 2013*. AEES No. 2013-03, Department of Agricultural Economics and Rural Sociology, University of Idaho. <https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets>.
- Patterson, P. and Painter, K. 2012. *Crop Input Price Summary for 2012*. AEES No. 2012-04, Department of Agricultural Economics and Rural Sociology, University of Idaho. <https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets>.
- Patterson, P. and Painter, K. 2011. *Crop Input Price Summary for 2011*. AEES No. 2011-04, Department of Agricultural Economics and Rural Sociology, University of Idaho. <https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets>.
- U.S. Department of Agriculture National Agricultural Statistical Service, Quickstats program, available at https://www.nass.usda.gov/Quick_Stats/.

Website Resources

Crop budgets

<http://www.uidaho.edu/cals/idaho-agbiz/crop-budgets>.

Machinery cost calculators

University of Idaho Crop Machinery Cost Calculator – current version 1.40 (EXE file) and other tools can be found at <http://www.uidaho.edu/cals/idaho-agbiz/tools>.

Kansas State Machinery Cost Resources: Machinery cost calculators and many more decision making tools. <http://www.agmanager.info/machinery>.

Iowa State Machinery Cost Resources: Crop decisions and machinery information and companion tools. <http://www.extension.iastate.edu/agdm/cdmachinery.html>.

Alberta Machinery Cost Calculator: This tool allows you to calculate ownership and operating costs of common farm equipment. Use the drop-down list to choose the power unit or self-propelled machinery that will be used. When doing calculations for implements, select both a power unit and the implements that will be used. <http://www.agric.gov.ab.ca/app24/costcalculators/machinery/getmachimpls.jsp>.

Appendix

Enterprise Budgets for the Dryland Grain Annual Cropping Region of the Pacific Northwest, Using Conservation Tillage, 2011-2015 Average Farmgate Prices with a 2016 Comparison

This is available both as an [excel file](#) and a [pdf spreadsheet](#). They are available directly from the author, Kathleen Painter (kpainter@uidaho.edu), or as an excel file at the following link:

<https://www.reacchpna.org/farm-enterprise-budgets>.

Note on color coding in the spreadsheet version

In the [spreadsheet version of this publication](#), a color coding system is used to indicate the source of the data for each budget and to show which data can be adjusted in the spreadsheet version. Data in orange type can be changed without affecting the underlying equations in this cost calculator. Data with purple type are from the Summary sheet. In the Summary sheet, crop price and yield have orange type. Adjusting any of those numbers will automatically update all calculations throughout the spreadsheet so you can quickly compare price and yield changes on net returns. Input prices can be easily updated by making changes in the green Input Prices sheet. All calculations will again be updated throughout the spreadsheet. You will notice that data from the Input Prices tab appears in green ink on the Budget sheets.

About the Author:

Kathleen Painter, PhD, Extension Educator, University of Idaho Extension, Boundary County

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Additional budget spreadsheets for Idaho are available at: www.uidaho.edu/cals/idaho-agbiz/crop-budgets.

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Trade Names—To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.