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	ECONOMIC ANALYSIS OF ALTERNATIVE IRRIGATED WHEAT ENTERPRISES, WALLA WALLA COUNTY, WASHINGTON	
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PREFACE

Enterprise costs and returns vary from one farm to the next and over time for any particular farm. Variability stems from differences in:

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

Costs can also be calculated differently depending on the intended use of the cost estimate. The information in this publication serves as a general guide for analyzing the economics of alternative wheat enterprises for a well-managed Walla Walla County irrigated farm. To avoid drawing unwarranted conclusions for any particular farm or group of farms, you must examine closely the assumptions used. If they are not appropriate for your situation, adjust the costs and/or returns to fit.

TABLE OF CONTENTS

ECONOMIC ANALYSIS OF ALTERNATIVE IRRIGATED WHEAT ENTERPRISES WALLA WALLA COUNTY, WASHINGTON

By

Gayle S. Willett and Walter J. Gary*

INTRODUCTION

This publication presents estimated revenues, costs, and various measures of net returns for selected irrigated wheat crops produced in Walla Walla County of southeastern Washington. The specific enterprises included in the study are: (1) soft white winter wheat, (2) dark northern spring wheat, and (3) soft white spring wheat. It is hoped that producers, agricultural credit providers, and others will find this information useful in evaluating the economics of competing wheat enterprises, determining financing requirements, making marketing decisions, and addressing numerous other business management issues.

SUMMARY OF RESULTS

Study results are summarized in Table 1. As indicated, dark northern spring wheat is estimated to have the highest profit at protein levels ranging between 12% and 15%, followed by soft white winter wheat, and soft white spring wheat. Under the base assumptions adopted for the study and assuming dark northern spring wheat tests 13¼% protein (a typical outcome), that crop's profit advantage is $26.77 and $48.13 per acre relative to soft white winter wheat and soft white spring wheat, respectively. Profit should be interpreted as returns to risk, since the costs used to compute profit reflect a cost for all resources, including operator labor, management, and equity capital. Also, wheat prices are farm level prices, net of transportation and marketing fees, and reflect price relationships by protein level and variety in the Portland market, 1995-1996.

Considerable uncertainty exists about dark northern spring protein levels, the associated price premiums/discounts, and the extent of the yield advantage typically associated with soft white winter wheat relative to dark northern spring wheat. This uncertainty is addressed by computing the dark northern spring price premium (cents per bushel) that must be received relative to the soft white winter wheat price to result in equal returns over variable costs for the two competing crops, assuming various spring wheat yield and winter wheat yield advantages. As reported in Table 2, the break-even dark northern spring wheat price premium ranges from $0.05 (110-bushel spring wheat yield, zero winter wheat yield advantage) to $1.65 (70-bushel dark northern spring wheat yield, 30-bushel winter wheat advantage). Assuming a 100-bushel yield from dark northern spring wheat and a 10-bushel yield advantage for winter wheat (the base assumptions), the break-even protein price premium for dark northern spring wheat is $0.43 per bushel. Thus, if the price premium for dark northern spring wheat exceeds $0.43, the spring wheat will be more profitable than winter wheat, assuming all other variables in the study remain unchanged from the base assumptions.

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Table 1. Summary of an economic analysis of alternative wheat enterprises, Walla Walla County, Washington, 1997.

Wheat Enterprise	Yields (bu./ac.)	Price[1] ($/bu.)	Gross Revenues ($/ac.)	Cost ($/ac.)			Profit[4] ($/ac.)
				Variable[2]	Fixed[3]	Total	
Dark Northern Spring:							
15% Protein	100	4.75	475.00	198.04	208.73	406.77	68.23
14% Protein	100	4.55	455.00	198.04	208.73	406.77	48.23
13¼% Protein	100	4.37	437.00	198.04	208.73	406.77	30.23
13% Protein	100	4.31	431.00	198.04	208.73	406.77	24.23
12% Protein	100	4.21	421.00	198.04	208.73	406.77	14.23
Soft White Winter	110	3.65	401.05	191.80	206.24	398.04	3.46
Soft White Spring	100	3.65	365.00	179.21	203.69	382.90	-17.90

[1]Net of transportation and marketing costs.
[2]Includes seed, fertilizer, pesticides, fuel, lubrication, labor, machine rent, irrigation district fee, miscellaneous, and interest on operating capital.
[3]Includes machinery ownership costs (depreciation, interest, property taxes, housing, and insurance), real estate taxes, land net rent, and management.
[4]Profit is gross revenue minus total costs and should be considered a return to risk.

Table 2. Dark northern spring wheat price premiums providing returns over variable costs that are equal for dark northern spring wheat and soft white winter wheat, selected dark northern spring wheat yields and soft white winter wheat yield advantages, Walla Walla County, Washington, 1997.

White Winter Wheat Yield Advantage (bu./ac.)	Dark Northern Spring Wheat Yield (bu./ac.)				
	70	80	90	100	110
	--Break-even Dark Northern Spring Wheat Price Premium (¢/bu.)[1]--				
0	9	8	7	6	5
5	35	30	27	25	22
10	61	53	47	43	39
15	87	76	67	60	56
20	113	99	87	78	73
25	139	122	107	96	90
30	165	145	127	114	107

[1]Equals [(winter wheat yield x winter wheat price - winter wheat variable cost + spring wheat variable cost) ÷ (spring wheat yield)] - winter wheat price, where winter wheat price = $3.65, winter wheat variable cost = $191.80 and spring wheat variable cost = $198.04.

SOURCES OF INFORMATION

The study is based on a consensus, well-managed farm as specified by a small group of cooperating Walla Walla County producers in terms of farm size, crop rotation, crop yields, field operations, and machinery complement. The types and quantities of inputs including seed, fertilizer, and pesticides, are based on widely used practices as determined by the cooperating producers and area suppliers. Local suppliers provided current prices for material and other services. Machinery costs are based on current replacement prices and rates of annual use considered to be typical for the consensus farm.

STUDY ASSUMPTIONS

The following assumptions were adopted for this study:

1. The consensus farm is located in the Touchet area of southeastern Washington and includes 600 acres with a rotation of alfalfa seed (3 years)[1] and wheat (1 year).[2]

2. The wheat enterprise is irrigated with a hand-line system drawing water from a nearby ditch.

3. Dark northern spring wheat and soft white spring wheat yields 100 bushels per acre and soft white winter wheat yields 110 bushels per acre.

4. The net farm level price for soft white winter and spring wheat is assumed to be $3.65 per bushel and dark northern spring wheat is valued at $4.37 per bushel at 13¼% protein. As shown in Table 1, a price discount of $0.06 per bushel for each ¼% below 14% protein is assumed for dark northern spring wheat. The $0.90 premium given to 14% dark northern spring wheat over soft white wheat is based on Portland markets, 1995 and 1996. Also, farm prices are based on Portland market prices minus $0.45 per bushel for transportation from the farm to Portland via barge on the Snake and Columbia Rivers.

5. For the purpose of computing machinery costs, machinery is valued at current replacement prices. The replacement price may be either a new or used machinery price depending on the replacement policy for a particular machine assumed for the consensus producer. While valuing machinery at replacement cost rather than original cost may overstate current production costs, it indicates the enterprise's ability to generate earnings needed to replace depreciable assets. Increases in prices mean that depreciation claimed on assets purchased before price advances understates the amount of capital required for asset replacement. When an enterprise is evaluated to determine its long-run viability, it is important to consider its ability to replace depreciable assets on a replacement cost basis.

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[1]Readers interested in the economics of area alfalfa seed production are referred to: 1996 Alfalfa Seed Enterprise budget, Walla Walla County, Washington, EB 1375, Cooperative Extension, Washington State University.

[2]Some producers will follow wheat with a second year of wheat. Costs for the first and second years of wheat are quite similar except that more nitrogen fertilizer is used the second year.

Machinery fixed costs (depreciation, interest, property taxes, housing, and insurance) and variable costs (repairs, fuel, and lubrication) are calculated by the computer program MACHCOST, developed by L. Stodick and R. Smathers, University of Idaho. The same cost calculation procedures appear in G. Willett's and R. Smathers', "The Cost of Owning and Operating Farm Machinery in the Pacific Northwest," PNW 346, Washington State University. Producers wishing to estimate machinery costs specific to their operation may find these sources useful.

6. The farm is owned, managed, and operated by the same person(s).

The wheat enterprise information reflects an above average consensus farm rather than a mathematical average of a large number of producers. Quite different enterprise costs and returns may result where factors such as farm size, machinery complement and use, cultural practices, and yields differ from those assumed in this publication. Note that blank spaces are provided in many of the following tables. Readers are encouraged to use these spaces to enter cost and revenue estimates that may differ from those identified by the study.

DISCUSSION OF WHEAT ENTERPRISE INFORMATION

The economic information for each wheat enterprise is reported in four tables:

Tables 1A, 1B, and 1C: Schedule of Operations and Costs Per Acre

A schedule of field operations and production costs are reported in Table 1A (soft white winter wheat), Table 1B (dark northern spring wheat), and Table 1C (soft white spring wheat). The information reported for each field operation includes month performed, type and size of machinery, machinery and labor hours, type and amount of materials, and associated costs. Costs are divided into two categories. The first is fixed costs which are outlays associated with the ownership of machinery, land, and management resources. Since these resources are already owned, the associated costs are incurred regardless of the variety of wheat. The second category of costs is variable costs which will vary with the acreage and type of wheat enterprise. Variable costs are associated with operating machinery, obtaining labor, and purchasing materials and services.

Machinery fixed costs include depreciation $\left(= \frac{initial\ cost - salvage\ value}{hours\ of\ lifetime\ use} \right)$, interest on the average investment (9½%) property taxes, housing, and insurance. These costs are incurred whether or not a crop is grown and do not vary with the enterprise, given the ownership of a specific machinery complement. Machinery fixed costs for a specific field operation are determined by multiplying the machine hours per acre times the per-hour fixed cost as reported in Table 5. Thus, machinery fixed costs are allocated to the wheat enterprise on the basis of hours of machine use. Irrigation system fixed costs are based on an investment in a new hand-line system of $210,000 for the 600-acre farm. The system includes buried mainline, laterals, pump, and motor. The irrigation equipment is depreciated over 20 years. Fixed costs for the irrigation system are allocated to the wheat enterprise on the basis of acre-inches of water applied to that crop.

Land fixed costs include property taxes and rent, with the latter based on a net rent concept. The net rent approach assumes the land cost experienced by the owner-operator is the rent given up by choosing to produce wheat rather than renting the land to another grower. If the land is rented out, the landowner will receive the rent (cash or crop-share) minus the land-related costs that are the owner's responsibility. A cash rent arrangement, with the owner responsible for real estate taxes, irrigation district charges, and irrigation system fixed costs (depreciation, interest, property taxes, and insurance) is assumed. Thus, a production year net rent of $72.94 per acre is calculated by subtracting real estate taxes ($15), irrigation district fee ($17), and irrigation system fixed cost ($30.06) from the assumed cash rent ($135).

As a result of investing capital in land, the farmer receives both current returns (losses) from crop production activities and appreciation (depreciation) in land value. However, the farmer continues to receive land value appreciation (depreciation) even if the land is rented out. Consequently, the appropriate land cost for growing the crop is only the foregone net rent. As used in this publication, the land cost is termed an opportunity cost to indicate that it is not an out-of-pocket expense, but rather a return that is foregone by the producer as a result of choosing to grow the crop. The producer may wish to substitute interest on debt and equity capital used to buy the land or rent payments if the land is rented.

These tables also include management as a fixed cost. A management charge of 7% of gross receipts is used. This is representative of management fees charged by professional farm managers in Washington and is an estimate of the value of the operator's management skills.

Variable costs depend directly on the number of crop acres and type of enterprise. Variable costs include fuel, electricity, oil, repairs, fertilizer, chemicals, custom work, miscellaneous (telephone, utilities, legal, accounting, dues, etc.), interest on operating capital, and labor. A cost is assigned to both operator and hired labor at the rate of $10 per hour. Miscellaneous costs were estimated by cooperating producers. Interest on operating capital was computed at an annual rate of 10% over the period of time between the expense outlay and harvest.

Tables 2A, 2B, and 2C: Summary of Costs Per Acre

Fixed and variable costs are reported in these tables according to the resource used in wheat production rather than by field operation. Substantial detail regarding the type, amount, and per unit prices of most inputs is also presented. Producers who cannot or do not wish to estimate per acre costs for individual field operations may find that Table 2 offers a more convenient format for summarizing their costs.

Tables 3A, 3B, and 3C: Break-Even Selling Prices

These tables show the break-even selling price for different levels of wheat production costs. The first break-even price is the price needed to cover total variable costs--those costs that occur only if the crop is produced. If the price received does not equal or exceed variable costs, the crop is uneconomical to produce even in the short run, since the added costs of production are greater than the added returns.

The second break-even price is required to cover total cash costs except interest on land and/or machinery debt. If other cash costs exist on an individual's farm, these costs should be identified and included in the cash cost break-even calculation. Note that a cash cost has been attributed to all labor, including both hired and operator/family labor.

The third break-even price is the price needed to cover total cash cost plus depreciation on machinery and irrigation equipment. This price must be realized to stay in business over the long run.

The fourth break-even price is the price the producer must receive to recover total costs including cash costs, depreciation, and the opportunity costs for producer management, labor, and investment in land, equipment, and buildings. Failure to receive this break-even price means that the owner-operator will not realize a return on his or her management, labor, and capital contributions equivalent to what could be earned in an alternative use. Realization of a price above the break-even level means that in addition to covering all costs, the operator will earn a return for the risk assumed in producing the crop.

Tables 4A, 4B, and 4C: Summary of Revenues, Costs, and Returns Per Acre

Revenues, costs, and various measures of net return for each of three wheat enterprises are summarized in these tables. The first measure is returns over variable costs, calculated by subtracting total variable costs from total revenues. An important use of returns over variable costs is selecting the most profitable crop. By selecting the crop(s) with the greatest return over variable costs, farm profits are maximized (or losses minimized). A second return measure, gross returns to land and management, is calculated by subtracting machinery fixed costs from returns over variable cost. The return realized on capital invested in land is another return measure. To calculate the return to land, all crop costs (including a management charge and real estate taxes) except the land rent are subtracted from total revenues. The rate of return on the land investment is calculated by dividing the return to land by the land's estimated current market value.

Table 5: Machinery Complement

Table 5 identifies the machinery complement used for estimating costs. It includes current purchase prices, annual hours of use, and per-hour fixed and variable costs. Fixed costs include depreciation, interest on investment, property taxes, housing, and insurance. These costs do not vary with the number of acres farmed. Variable costs include repair, fuel, and lubrication--costs that vary with the number of acres farmed. Additional detail on procedures for computing machinery costs is available in "The Cost of Owning and Operating Farm Machinery in the Pacific Northwest," PNW 346, Cooperative Extension, Washington State University, Pullman, WA.

Table 6: Prices for Selected Inputs

The 1997 prices used for fuel, chemicals, fertilizers, and other inputs are presented in Table 6.

Table 1A: Schedule of operations and costs per acre for soft white winter wheat following alfalfa seed, Walla Walla County, Washington, 1997.

						Variable Costs							
Operation	Tooling	Month	Machine Time	Labor Time	Total Fixed Costs[1]	Fuel, Lubr., & Repairs	Mach. Labor @$10/Hr.	Service	Materials	Interest @ 10%	Total Variable Costs	Total Costs	Comments
			Hrs./A	Hrs./A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	
Chop Stubble	120 HP-WT, Flail Chopper	Sept.	0.17	0.186	11.88	2.10	1.86	0.00	0.00	0.36	4.32	16.20	
Irrigate	Handline System	Sept.	0.00	0.313	10.02	7.98	3.13	0.00	0.00	1.02	12.13	22.15	6 Acre-Inches Water
Plow	120 HP-WT, 5 Btm. MB Plow	Oct.	0.32	0.354	4.68	1.86	3.54	7.36	0.00	1.06	13.82	18.50	Rented WT
Cultipack	120 HP-WT, Cultipacker 12'	Oct.	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.41	5.32	14.88	
Cultipack	120 HP-WT, Cultipacker 12'	Oct.	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.41	5.32	14.88	
Seed	120 HP-WT, 12' Disc Drill	Oct.	0.25	0.275	1.90	3.47	2.75	5.75	15.50	2.29	29.76	31.66	Rented WT, 100 lbs. Seed
Weed Control	120 HP-WT, 100' Sprayer	April	0.02	0.022	1.30	0.26	0.22	0.00	13.96	0.48	14.92	16.22	1½ Pint Bronate, 0.3 oz . Harmony Extra
Fertilize	120 HP-WT, 40' Spreader	April	0.06	0.065	3.01	1.10	0.65	1.50	25.80	1.94	30.99	34.00	60 Lbs. N from 40-0-0-6
Irrigate	Handline System	April	0.00	0.313	10.02	7.98	3.13	17.00	0.00	0.94	29.05	39.07	6 Acre-Inches Water
Irrigate	Handline System	May	0.00	0.313	10.02	7.98	3.13	0.00	0.00	0.28	11.39	21.41	6 Acre-Inches Water
Harvest	HS Combine, 20'	July	0.24	0.264	10.54	8.84	2.64	0.00	0.00	0.00	11.48	22.02	
Haul Grain	Truck, 16'	July	0.26	0.315	4.23	2.26	3.15	0.00	0.00	0.00	5.41	9.64	
Pickup	¾ Ton	Annual	0.25	0.275	3.48	1.91	2.75	0.00	0.00	0.23	4.89	8.37	
Miscellaneous	Util., Legal, Accnt. Dues, Insur., etc.	Annual	0.00	0.000	0.00	0.00	0.00	13.00	0.00	0.00	13.00	13.00	
Real Estate Taxes		Annual	0.00	0.000	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	
Land Rent	Net Rent[2]	Annual	0.00	0.000	72.94	0.00	0.00	0.00	0.00	0.00	0.00	72.94	
Management[3]		Annual	0.00	0.000	28.10	0.00	0.00	0.00	0.00	0.00	0.00	28.10	
TOTAL PER ACRE				3.167	206.24	50.84	31.67	44.61	55.26	9.42	191.80	398.04	

Table 2A. Summary of costs per acre for soft white winter wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Unit	Price or Cost Per Unit	Quantity	Cost	Your Farm
Variable Costs:					
Seed	Lb.	$0.155	100	$ 15.50	
Herbicides: Bronate	Pt.	6.27	1½	9.40	_____
Harmony Extra	Oz	15.20	0.3	4.56	_____
Fertilizer, Nitrogen	Lb.	0.43	60	25.80	_____
Repairs	Ac.	—	—	19.66	_____
Fuel, Lubr., and Power	Ac.	—	—	31.18	_____
Labor	Hr.	10.00	3.167	31.67	
Machine Rent	Ac.	—	—	14.61	_____
Irrigation District Fee	Ac.	—	—	17.00	_____
Miscellaneous (util., accnt. legal, insur., etc.)	Ac.	—	—	13.00	_____
Interest on Operating Capital	Ac.	10%	—	9.42	_____
TOTAL VARIABLE COSTS				$191.80	_____
Fixed Costs					
Machinery (depreciation, interest at 9½%, property taxes, housing and insurance)	Ac.	—	—	90.20	_____
Real Estate taxes	Ac.	—	—	15.00	_____
Land (net rent)[1]	Ac.	—	—	72.94	_____
Management[2]	Ac.	—	—	28.10	_____
TOTAL FIXED COSTS				206.24	_____
TOTAL COSTS				$398.04	_____

[1]Equals $135 cash rent - $15.00 real estate taxes -$17.00 irrigation district fee - $30.07 irrigation system ownership (fixed) costs.
[2]Equals 7% x value of production (110 bu. x $3.65).

Table 3A. Break-even selling price per bushel for soft white winter wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Cost Per Acre	Your Farm	Break-Even Price ($/bu.)[1]	Your Farm
1. Total Variable Costs	$191.80	_____	$ 1.74	_____
Plus: Machinery Taxes & Insurance	9.86	_____		_____
Real Estate Taxes	15.00	_____		_____
2. Total Cash Costs	216.66	_____	1.97	_____
Plus: Machinery Depreciation	40.46	_____		_____
3. Total Cash Costs and Depreciation	257.12	_____	2.34	_____
Plus: Machinery Interest (9½%)	37.23	_____		_____
Machinery Housing	2.65	_____		_____
Land (net rent)	72.94	_____		_____
Management	28.10	_____		_____
4. Total Cost and Break-Even Price	$398.04	_____	$ 3.62	_____

[1]Assumes yield of 110 bushels per acre.

Table 4A. Summary of revenue, costs, and returns per acre for soft white winter wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Amount	Your Farm
Gross Revenue (110 bu. x $3.65[1])	$401.50	_____
Less Total Variable Costs	191.80	_____
1. Returns Over Variable Costs	209.70	_____
Less Machinery Fixed Costs	90.20	_____
2. Gross Returns to Land and Management	119.50	_____
Less Management	28.10	_____
3. Gross Returns to Land	91.40	_____
Less Real Estate Taxes	15.00	_____
4. Net Returns to Land	76.40	_____
5. Rate of Return on Market Value of Land ($76.40 ÷ $1,200 market value x 100)	6.4%	_____%

[1]Assumes Portland price of $4.10 per bushel and $0.45 transportation costs from Walla Walla to Portland.

Table 1B: Schedule of operations and costs per acre for dark northern spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

						Variable Costs							
Operation	Tooling	Month	Machine Time	Labor Time	Total Fixed Costs[1]	Fuel, Lubr., & Repairs	Mach. Labor @$10/Hr.	Service	Materials	Interest @ 10%	Total Variable Costs	Total Costs	Comments
			Hrs./A	Hrs./A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	
Chop Stubble	120 HP-WT, Flail Chopper	Sept.	0.17	0.186	11.88	2.10	1.86	0.00	0.00	0.36	4.32	16.20	
Irrigate	Handline System	Oct.	0.00	0.313	10.02	7.98	3.13	0.00	0.00	0.93	12.04	22.06	6 Acre-Inches Water
Plow	120 HP-WT, 5 Btm. MB Plow	Nov.	0.32	0.354	4.68	1.86	3.54	7.36	0.00	0.96	13.72	18.40	Rented WT
Cultipack	120 HP-WT, Cultipacker 12'	Nov.	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.37	5.28	14.84	
Cultipack	120 HP-WT, Cultipacker 12'	March	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.20	5.11	14.67	
Seed	120 HP-WT, 12' Disc Drill	March	0.25	0.275	1.90	3.47	2.75	5.75	19.92	1.18	33.07	34.97	Rented WT, 100 lbs. Seed
Weed Control	120 HP-WT, 100' Sprayer	April	0.02	0.022	1.30	0.26	0.22	0.00	13.96	0.48	14.92	16.22	1½ Pint Bronate, 0.3 oz. Harmony Extra
Fertilize	120 HP-WT, 40' Spreader	April	0.06	0.065	3.01	1.10	0.65	1.50	30.10	1.11	34.46	37.47	70 Lbs. N from 40-0-0-6
Irrigate	Handline System	April	0.00	0.313	10.02	7.98	3.13	17.00	0.00	0.94	29.05	39.07	6 Acre-Inches Water
Irrigate	Handline System	June	0.00	0.313	10.02	7.98	3.13	0.00	0.00	0.18	11.29	21.31	6 Acre-Inches Water
Harvest	HS Combine, 20'	July	0.24	0.264	10.54	8.84	2.64	0.00	0.00	0.00	11.48	22.02	
Haul Grain	Truck, 16'	July	0.26	0.315	4.23	2.26	3.15	0.00	0.00	0.00	5.41	9.64	
Pickup	¾ Ton	Annual	0.25	0.275	3.48	1.91	2.75	0.00	0.00	0.23	4.89	8.37	
Miscellaneous	Util., Legal, Accnt. Dues, Insur., etc.	Annual	0.00	0.000	0.00	0.00	0.00	13.00	0.00	0.00	13.00	13.00	
Real Estate Taxes		Annual	0.00	0.000	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	
Land Rent	Net Rent[2]	Annual	0.00	0.000	72.94	0.00	0.00	0.00	0.00	0.00	0.00	72.94	
Management[3]		Annual	0.00	0.000	30.59	0.00	0.00	0.00	0.00	0.00	0.00	30.59	
TOTAL PER ACRE				3.167	208.73	50.84	31.67	44.61	63.98	6.94	198.04	406.77	

Table 2B. Summary of costs per acre for dark northern spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Unit	Price or Cost Per Unit	Quantity	Cost	Your Farm
Variable Costs:					
Seed	Lb.	$0.1992	100	$ 19.92	
Herbicides: Bronate	Pt.	6.27	1½	9.40	_____
Harmony Extra	Oz	15.20	0.3	4.56	_____
Fertilizer, Nitrogen	Lb.	0.43	70	30.10	_____
Repairs	Ac.	—	—	19.66	_____
Fuel, Lubr., and Power	Ac.	—	—	31.18	_____
Labor	Hr.	10.00	3.167	31.67	
Machine Rent	Ac.	—	—	14.61	_____
Irrigation District Fee	Ac.	—	—	17.00	_____
Miscellaneous (util., accnt. legal, insur., etc.)	Ac.	—	—	13.00	_____
Interest on Operating Capital	Ac.	10%	—	6.94	_____
TOTAL VARIABLE COSTS				$198.04	_____
Fixed Costs					
Machinery (depreciation, interest at 9½%, property taxes, housing and insurance)	Ac.	—	—	90.20	_____
Real Estate taxes	Ac.	—	—	15.00	_____
Land (net rent)[1]	Ac.	—	—	72.94	_____
Management[2]	Ac.	—	—	30.59	_____
TOTAL FIXED COSTS				208.73	_____
TOTAL COSTS				$406.77	_____

[1]Equals $135 cash rent - $15.00 real estate taxes -$17.00 irrigation district fee - $30.07 irrigation system ownership (fixed) costs.
[2]Equals 7% x value of production (100 bu. x $4.37).

Table 3B. Break-even selling price per bushel for dark northern spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Cost Per Acre	Your Farm	Break-Even Price ($/bu.)[1]	Your Farm
1. Total Variable Costs	$198.04	_____	$ 1.98	_____
Plus: Machinery Taxes & Insurance	9.86	_____		_____
Real Estate Taxes	15.00	_____		_____
2. Total Cash Costs	222.90	_____	2.23	_____
Plus: Machinery Depreciation	40.46	_____		_____
3. Total Cash Costs and Depreciation	263.36	_____	2.63	_____
Plus: Machinery Interest (9½%)	37.23	_____		_____
Machinery Housing	2.65	_____		_____
Land (net rent)	72.94	_____		_____
Management	30.59	_____		_____
4. Total Cost and Break-Even Price	$406.77	_____	$ 4.07	_____

[1]Assumes yield of 100 bushels per acre.

Table 4B. Summary of revenue, costs, and returns per acre for dark northern spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Amount	Your Farm
Gross Revenue (100 bu. x $4.37[1])	$437.00	_____
Less Total Variable Costs	198.04	_____
1. Returns Over Variable Costs	238.96	_____
Less Machinery Fixed Costs	90.20	_____
2. Gross Returns to Land and Management	148.76	_____
Less Management	30.59	_____
3. Gross Returns to Land	118.17	_____
Less Real Estate Taxes	15.00	_____
4. Net Returns to Land	103.17	_____
5. Rate of Return on Market Value of Land ($103.17 ÷ $1,200 market value x 100)	8.6%	_____

[1]Assumes wheat is 13¼% protein, Portland price of $5.00 per bushel at 14% protein, $0.06 discount for each ¼% decrease in protein, and $0.45 transportation cost from Walla Walla to Portland.

Table 1C: Schedule of operations and costs per acre for soft white spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

						Variable Costs							
Operation	Tooling	Month	Machine Time	Labor Time	Total Fixed Costs[1]	Fuel, Lubr., & Repairs	Mach. Labor @$10/Hr.	Service	Materials	Interest @ 10%	Total Variable Costs	Total Costs	Comments
			Hrs./A	Hrs./A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	$/A	
Chop Stubble	120 HP-WT, Flail Chopper	Sept.	0.17	0.186	11.88	2.10	1.86	0.00	0.00	0.36	4.32	16.20	
Irrigate	Handline System	Oct.	0.00	0.313	10.02	7.98	3.13	0.00	0.00	0.93	12.04	22.06	6 Acre-Inches Water
Plow	120 HP-WT, 5 Btm. MB Plow	Nov.	0.32	0.354	4.68	1.86	3.54	7.36	0.00	0 .96	13.72	18.40	Rented WT
Cultipack	120 HP-WT, Cultipacker 12'	Nov.	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.37	5.28	14.84	
Cultipack	120 HP-WT, Cultipacker 12'	March	0.21	0.236	9.56	2.55	2.36	0.00	0.00	0.20	5.11	14.67	
Seed	120 HP-WT, 12' Disc Drill	March	0.25	0.275	1.90	3.47	2.75	5.75	14.50	1.10	27.57	29.47	Rented WT, 100 lbs. Seed
Weed Control	120 HP-WT, 100' Sprayer	April	0.02	0.022	1.30	0.26	0.22	0.00	13.96	0.48	14.92	16.22	1½ Pint Bronate, 0.3 oz. Harmony Extra
Fertilize	120 HP-WT, 40' Spreader	April	0.06	0.065	3.01	1.10	0.65	1.50	17.20	0.68	21.13	24.14	40 Lbs. N from 40-0-0-6
Irrigate	Handline System	April	0.00	0.313	10.02	7.98	3.13	17.00	0.00	0.94	29.05	39.07	6 Acre-Inches Water
Irrigate	Handline System	June	0.00	0.313	10.02	7.98	3.13	0.00	0.00	0.18	11.29	21.31	6 Acre-Inches Water
Harvest	HS Combine, 20'	July	0.24	0.264	10.54	8.84	2.64	0.00	0.00	0.00	11.48	22.02	
Haul Grain	Truck, 16'	July	0.26	0.315	4.23	2.26	3.15	0.00	0.00	0.00	5.41	9.64	
Pickup	¾ Ton	Annual	0.25	0.275	3.48	1.91	2.75	0.00	0.00	0.23	4.89	8.37	
Miscellaneous	Util., Legal, Accnt. Dues, Insur., etc.	Annual	0.00	0.000	0.00	0.00	0.00	13.00	0.00	0.00	13.00	13.00	
Real Estate Taxes		Annual	0.00	0.000	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	
Land Rent	Net Rent[2]	Annual	0.00	0.000	72.94	0.00	0.00	0.00	0.00	0.00	0.00	72.94	
Management[3]		Annual	0.00	0.000	25.55	0.00	0.00	0.00	0.00	0.00	0.00	25.55	
TOTAL PER ACRE				3.167	203.69	50.84	31.67	44.61	45.66	6.43	179.21	382.90	

Table 2C Summary of costs per acre for soft white spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Unit	Price or Cost Per Unit	Quantity	Cost	Your Farm
Variable Costs:					
Seed	Lb.	$0.145	100	$ 14.50	
Herbicides: Bronate	Pt.	6.27	1½	9.40	_____
Harmony Extra	Oz	15.20	0.3	4.56	_____
Fertilizer, Nitrogen	Lb.	0.43	40	17.20	_____
Repairs	Ac.	—	—	19.66	_____
Fuel, Lubr., and Power	Ac.	—	—	31.18	_____
Labor	Hr.	10.00	3.167	31.67	
Machine Rent	Ac.	—	—	14.61	_____
Irrigation District Fee	Ac.	—	—	17.00	_____
Miscellaneous (util., accnt. legal, insur., etc.)	Ac.	—	—	13.00	_____
Interest on Operating Capital	Ac.	10%	—	6.63	_____
TOTAL VARIABLE COSTS				$179.21	_____
Fixed Costs					
Machinery (depreciation, interest at 9½%, property taxes, housing and insurance)	Ac.	—	—	90.20	_____
Real Estate taxes	Ac.	—	—	15.00	_____
Land (net rent)[1]	Ac.	—	—	72.94	_____
Management[2]	Ac.	—	—	25.55	_____
TOTAL FIXED COSTS				203.69	_____
TOTAL COSTS				$382.90	_____

[1]Equals $135 cash rent - $15.00 real estate taxes -$17.00 irrigation district fee - $30.06 irrigation system ownership (fixed) costs.
[2]Equals 7% x value of production (100 bu. x $3.65).

Table 3C. Break-even selling price per bushel for soft white spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Cost Per Acre	Your Farm	Break-Even Price ($/bu.)[1]	Your Farm
1. Total Variable Costs	$179.21	_____	$ 1.79	_____
Plus: Machinery Taxes & Insurance	9.86	_____		_____
Real Estate Taxes	15.00	_____		_____
2. Total Cash Costs	204.07	_____	2.04	_____
Plus: Machinery Depreciation	40.46	_____		_____
3. Total Cash Costs and Depreciation	244.53	_____	2.45	_____
Plus: Machinery Interest (9½%)	37.23	_____		_____
Machinery Housing	2.65	_____		_____
Land (net rent)	72.94	_____		_____
Management	25.55	_____		_____
4. Total Cost and Break-Even Price	$382.90	_____	$ 3.83	_____

[1]Assumes yield of 100 bushels per acre.

Table 4C. Summary of revenue, costs, and returns per acre for soft white spring wheat following alfalfa seed, Walla Walla County, Washington, 1997.

Item	Amount	Your Farm
Gross Revenue (100 bu. x $3.65[1])	$365.00	_____
Less Total Variable Costs	179.21	_____
1. Returns Over Variable Costs	185.79	_____
Less Machinery Fixed Costs	90.20	_____
2. Gross Returns to Land and Management	95.59	_____
Less Management	25.55	_____
3. Gross Returns to Land	70.04	_____
Less Real Estate Taxes	15.00	_____
4. Net Returns to Land	55.04	_____
5. Rate of Return on Market Value of Land ($55.04 ÷ $1,200 market value x 100)	4.6%	_____

[1]Assumes Portland price of $4.10 per bushel and $0.45 transportation cost from Walla Walla to Portland.

Table 5. Machinery complement, purchase price, annual use, and hourly costs, wheat enterprises, Walla Walla County, Washington, 1997.

Item	Purchase Price	Years to Trade	Annual Hours	Fixed Costs: Depreciation	Fixed Costs: Interest at 9 ½%	Fixed Costs: Taxes, Housing, and Insurance	Fixed Costs: Total Fixed Cost	Variable Costs: Repair	Variable Costs: Fuel and Lubricants	Variable Costs: Total Variable Costs	Total Costs Per Hour
	$					- $ Per Hour -					
120 HP Wheel Tractor	85,000	15	325	14.04	14.84	4.06	32.94	4.97	5.81	10.11	43.05
120 HP Wheel Tractor, Rented	--	--	200			Rental Fee Per Hour =	23.00	0.00	5.81	5.81	28.81
100' Sprayer, PTO	14,000	15	54	15.62	13.50	2.84	31.96	2.00	0.00	2.00	33.96
15' Flail Chopper, Used	10,000	15	35	17.86	14.41	5.01	37.28	2.23	0.00	2.23	39.51
5 Btm. MB Plow	10,000	15	85	7.09	6.13	1.29	14.51	5.22	0.00	5.22	19.73
12' Cultipacker	8,000	15	85	5.67	4.90	1.03	11.60	1.38	0.00	1.38	12.98
12' Disk Drill	5,000	15	90	3.35	2.89	1.34	7.58	3.76	0.00	3.76	11.34
40' Fert. Spreader, Used	7,000	15	50	8.71	7.10	1.49	17.30	6.98	0.00	6.98	24.28
20' HS Combine, Used	50,000	15	150	21.25	16.52	6.96	44.73	29.77	7.72	36.61	81.34
Truck, 16', Used	20,000	10	175	6.41	4.55	5.32	16.28	5.00	3.68	8.26	24.54
Pickup, ¾ Ton	17,000	5	250	5.11	4.85	3.98	13.94	4.69	2.96	7.31	21.25
								- $ Per Acre-Inch -			
Irrigation System	210,000	20	Buried Mainline/Pipe/ Pump/Motor	0.78	0.74	0.15	1.67	0.28	1.06	1.33	3.00

[1]Assumes 1,050 acre-feet of irrigation water are pumped seasonally through the system for use on alfalfa seed (450 acres) and wheat (150 acres) enterprises.

Sources: The machinery costs appearing in this table were generated by a microcomputer program, MACHCOST, developed by L. Stodick and R. Smathers, Department of Agricultural Economics and Rural Sociology, University of Idaho, Moscow, ID. The same cost calculation procedures also appear in G. Willett's, R. Smathers', "The Costs of Owning and Operating Farm Machinery in the Pacific Northwest," PNW 346, Cooperative Extension, Washington State University, Pullman, WA.

Table 6. Prices of selected inputs for wheat production, Walla Walla County, Washington, 1997.

Item		Unit	Price
Fuel:	Diesel	Gal.	$ 0.96
Fertilizer:	Nitrogen (40-0-0-6)	Lb.	0.43
Chemicals:	Bronate	Gal.	50.16
	Harmony Extra	Oz.	15.20
Seeds:	Soft White Winter Wheat (Stephens/Madsen)	60 Lb. Bag	9.30
	Soft White Spring Wheat (Penawawa)	60 Lb. Bag	8.70
	Dark Northern Spring Wheat (Nomad)	60 Lb. Bag	11.95
Labor		Hr.	10.00
Interest:	Operating Capital	%	10.0
	Machinery Investment	%	9.5
Dry Fertilizer Application		Ac.	1.50

Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is violation of law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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