The role of the wheat industry in Idaho's economy

W heat fields are a familiar scene in Idaho, in the rolling prairie country of the north and the plains and lush valleys of the south and east. Whether green or golden, Idaho's wheat fields are charismatic scenery. Wheat is also an important rotation crop that breaks the pest cycle, recharges the soil, and increases the yield and return of other Idaho crops. In addition, wheat is an important Idaho cash crop in its own right. In this report, we examine the economic role of wheat in Idaho's economy.

In 1991, Idaho ranked eighth among all states in the U.S. in total wheat production. In a supporting role, two firms in Idaho rank in the top 100 U.S. grain companies as measured by their total grain storage capacity (1994 North American Grain and Milling Annual).

Decisions affecting Idaho's wheat industry are routinely made in Boise and Washington, D.C. Wise decision-making demands a rather specific understanding of wheat's contribution to the state's economy and of the economic impact of policies affecting the wheat industry. The purposes of this research are to quantify the economic role of the wheat industry in Idaho and to show how the economic impact of policy affecting the wheat industry can be evaluated.

Report highlights

Measuring the economic role of the wheat industry requires a model of the state's economy. In 1991 a team of economists in the University of Idaho's College of Agriculture completed the Idaho Economic Modeling Project (IDAEMP). IDAEMP tracks economic activity in the state, capturing interindustry trade and showing how income creation in one industry is related to income creation in other industries.[1] (See the sidebar on page 4 for more information about IDAEMP.)

[1] For specific details on IDAEMP, see "The Role of Natural Resource-Based Industry in Idaho's Economy," University of Idaho Cooperative Extension System, EXT 731.

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A summary of our findings are as follows. When all supply and income multiplier effects are considered, wheat farming generated $513 million, or almost 3 percent, of Idaho's gross income in 1991. With the exception of southwestern Idaho, the percent of income tied to wheat farming in the other subregions of Idaho is greater than 3 percent (fig. 1).

While our aim in this report is to inform, our analytic framework can prove useful in future resource management decisions. Wheat farming plays an important role in Idaho's agricultural economy, and policy actions that impact the wheat industry can significantly affect the rest of the economy. An important spinoff of our research is to provide a method for addressing future economic issues of statewide importance.
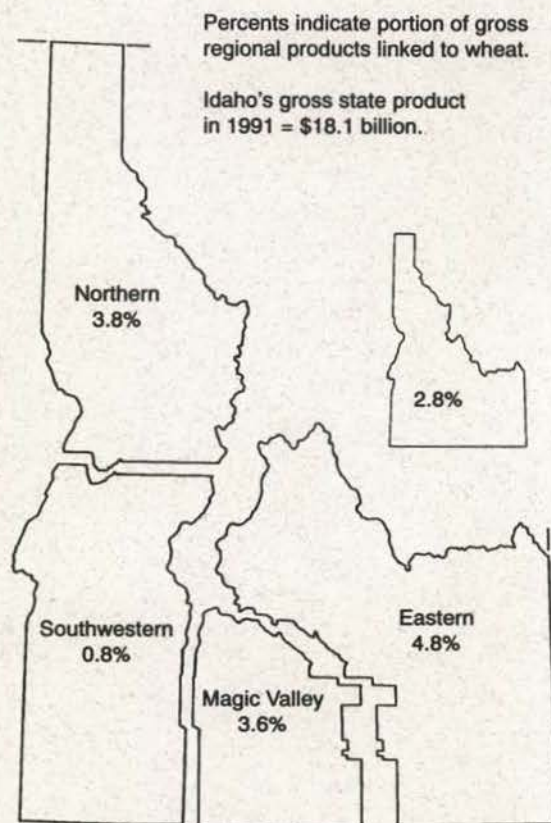
Direct impacts of wheat farming

In this section we estimate wheat farming's direct contribution to income creation in Idaho. Later, we use the IDAEMP economic model to estimate wheat's indirect income creation effects. Wheat farming's contribution to direct income is simply the sum of all wages and salaries (paid to wheat farmers or to their employees), proprietors' income, and property income received by wheat producers.

Direct expenditures cover everything else, including the dispersal of wheat farming revenues to purchase fertilizers, fuels, specialized services, and the other inputs needed to produce wheat. Wheat farming input expenditures have important indirect income-generating effects for input-producing industries, which are tracked with IDAEMP as well.

Direct income and expenditures would be easy to obtain if we had access to the records of every wheat farmer in Idaho. We could then collect statements of income and retained earnings, and on the basis of these form a consolidated income and retained earnings account (i.e., an account for the whole state). Such an approach would be extremely expensive, if not impossible. However, we can approximate what is essentially the same thing, a consolidated revenue and expenditure account. Our approximation is derived from secondary data on production, prices, and deficiency payments, and on the basis of wheat farming enterprise budgets (which include both fixed and variable costs) developed by the College of Agriculture at the University of Idaho.

Table 1 shows our estimated statewide 1991 wheat farming revenue and expenditure account. When all marketing receipts and deficiency payments are taken into account, Idaho wheat producers showed gross revenues of $336 million. Revenues are paid out in the purchase of produced inputs and as payments for labor. What remains is the income of wheat farm proprietors, land rent, and other profit income. The expenditure side of table 1 shows wheat's non-labor production input expenditures in 1991 to be $185 million, and income items to total $151 million.

Percents indicate portion of gross regional products linked to wheat.

Idaho's gross state product in 1991 = $18.1 billion.

Northern 3.8%

2.8%

Southwestern 0.8%

Eastern 4.8%

Magic Valley 3.6%

Fig. 1. Gross state product linked to the wheat industry in Idaho's four regions, 1991.

Table 1 also shows statewide revenues and expenditures disaggregated by Idaho's four principal economic subregions. In relative terms, revenue from wheat is greatest in eastern Idaho, also large in northern Idaho, and smallest in southwestern Idaho.

Income as a portion of gross revenues varies across regions. The income variations reflect regional differences in deficiency payments and in wheat's role as a rotation crop. In southern Idaho for example, farmers settle for modest returns on wheat, or even losses, to obtain rotation-increased yields on other crops in subsequent years. Wheat increases the yield of other crops because it breaks up pest cycles that occur in monocultured crops. This is a role not represented in wheat revenue and income figures alone.

Indirect impacts of wheat farming

Table 1 shows almost $151 million of direct income creation from wheat farming in 1991. However, the economic impact of wheat farming does not stop here. Purchases of other items generate income as well. Expenditures for inputs by wheat producers create income in the industries that supply these inputs. And input suppliers purchase inputs of their own, and this leads to still more income (indirect income). Moreover, the various recipients of wheat-related income (direct and indirect) purchase consumer goods, and further income is generated. Overall, the income-creating process produces what economists call the "multiplier effect"—activity in one industry generates income through a ripple process in other parts of the economy. IDAEMP tracks the many indirect income effects of wheat farming.

Table 2 shows the result of our IDAEMP analysis. This table shows the value of all Idaho income in 1991—Idaho's gross state product—at $18.1 billion. Of this, nearly $513 million, or 2.8 percent, is linked to wheat production. Table 2 also shows the statewide values disaggregated by economic subregion within the state.

Table 1. Wheat farming's consolidated revenue and expenditure account in 1991.

Revenue	$1,000s	Expenditures	$1,000s	%
Statewide				
Marketing receipts + Deficiency payments	336,259	Non-labor production inputs	185,381	55.1
		Labor, proprietors', and property income	150,878	44.9
TOTAL	336,259	TOTAL	336,259	100.0
Northern Idaho				
Marketing receipts + Deficiency payments	86,558	Non-labor production inputs	35,656	41.2
		Labor, proprietors', and property income	50,901	58.8
TOTAL	86,558	TOTAL	86,558	100.0
Southwestern Idaho				
Marketing receipts + Deficiency payments	33,475	Non-labor production inputs	18,788	56.1
		Labor, proprietors', and property income	14,688	43.9
TOTAL	33,475	TOTAL	33,475	100.0
Magic Valley				
Marketing receipts + Deficiency payments	66,301	Non-labor production inputs	36,786	55.5
		Labor, proprietors', and property income	29,514	44.5
TOTAL	66,301	TOTAL	66,301	100.0
Eastern Idaho				
Marketing receipts + Deficiency payments	149,926	Non-labor production inputs	94,151	62.8
		Labor, proprietors', and property income	55,775	37.2
TOTAL	149,926	TOTAL	149,926	100.0

Total wheat farming income by region

Total income attributable to wheat farming is shown in table 2 with two components: "direct income" is the same as in table 1, except that here it is distributed by region; "indirect income" is defined on page 3 and is the result of our IDAEMP analysis. Total income is simply direct income plus indirect income.

Of Idaho's four regions, wheat production in eastern Idaho contributes most to overall Idaho income formation, at $205 million (table 2). Wheat farming accounts for almost 5 percent of all income in eastern Idaho. The "multiplier" for this region's wheat farming, 3.67, is simply the total income divided by the direct income. Thus, $3.67 in total regional income is produced by every dollar of income generated by eastern Idaho wheat farmers. This multiplier, along with the others calculated in this study, may be higher than one might expect. However, this is due to the large proportion of contributions to wheat production enterprises that come from within the state of Idaho.

The eastern Idaho portion of table 2 also shows another element under wheat farming—income "from Magic Valley." Income formation in eastern Idaho is magnified by the presence of a significant regional trade center, an emerging urban-suburban complex consisting of Rexburg, Rigby, Idaho Falls, Blackfoot, and Pocatello. The market reach of the eastern Idaho trade center extends to Magic Valley.[2] Reflecting this market reach, income formation in Magic Valley has a spillover effect on eastern Idaho income. Table 2's $11 million "from Magic Valley" under eastern Idaho indicates the wheat farming portion of this spillover income. Altogether, wheat farming explained 5.1 percent of all eastern Idaho income in 1991, with 4.8 percent attributable to wheat farming in eastern Idaho itself and another 0.3 percent ascribed to wheat farming in Magic Valley.

The wheat farming impact for Magic Valley is also shown in table 2. This amounts to total income of $99.4 million, consisting of $29.5 million in direct income and $69.9 million in indirect income.

Table 2 indicates a more modest role for wheat farming in southwestern Idaho, accounting for a total income of $58.3 million or approximately 0.8 percent of all income generated. This figure is lower than in the other regions. However, the multiplier effect is largest in southwestern Idaho. This reflects the deeper interindustry linkages of Boise, Idaho's largest trade center. Southwestern Idaho also experiences income effects as a result of Magic Valley wheat production. Boise's economic

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[2] The U.S. Department of Commerce has mapped the "trade structure of the U.S. economy." In its analysis, the Commerce Department included the Magic Valley area entirely within the eastern Idaho market area. In contrast, our research suggests a shared dominance between eastern Idaho and southwestern Idaho. For a further discussion of market dominance and its impact on diffusion of income in Idaho see "The Role of Rural Industry in Idaho's Urban Places," CIS 971, a 1992 publication by the University of Idaho College of Agriculture.

IDAEMP
Idaho Economic Modeling Project

IDAEMP is a part survey, part non-survey-based multiregional input-output model of Idaho. IDAEMP uses "value added" as the key measure of an industry's contribution to economic well-being. Value added is defined as the sum of all before-tax profits and proprietary income, allowances for depreciation, and wages paid to labor, including contributions for social insurance. Value added is roughly equivalent to the business person's notion of revenues less cost of goods sold (net cash flow), plus wages paid to labor.

The sum of all value added in Idaho equals the gross state product: the value of all goods and services produced in the state during a given year or roughly the state equivalent of gross domestic product. The research reported here refers to Idaho's economy in 1991. Idaho had a gross income (or gross state product) of $18.1 billion in 1991.

IDAEMP considers the many interconnections that characterize the Idaho economy. It identifies the value added of a particular industry such as agriculture, and links it to the value added of all the industries and activities it supports. For example, agricultural production generates value added in the agricultural sector. In the process of production, agricultural producers purchase inputs, and value added is generated in these agriculturally linked industries. Agricultural suppliers buy inputs, in turn, and their suppliers buy inputs, and so on. At each step, value added is generated. The model tracks this chain of value added and links it to agriculture.

However, the chain of value-added generation goes even further than supply linkages. Agricultural wage earners spend their incomes on consumer goods, generating more value added. Agricultural producers, wage earners, and suppliers also pay state and local taxes to fund government payrolls, which are part of the state's value

added. Thus, the model also tracks agriculturally related value added in consumer industries and government and links it to agriculture.

Technically IDAEMP is a member of the "input-output" family of economic models. However, IDAEMP is an input-output model with a number of important differences. For one thing, IDAEMP conveys a degree of interarea detail. IDAEMP shows the spatial spread of economic impacts from one geographic part of the state to others, particularly the impact of rural industry on Idaho's urban places.[3]

Moreover, IDAEMP can be termed an "export-base/input-output model." While regional input-output models normally include consumer spending effects from the household sector (i.e., are "closed" with regard to the household sector), export base models (like IDAEMP) extend model closure to local investment, and state and local government as well.

The practical effect of export-base model closure is an increase in the size of the input-output model multipliers. Generally speaking, input-output multipliers summarize the string of supply and income interconnections that characterize the modern economy. With the input-output model closed in the export-base model fashion, the interconnection string includes state and local government effects, and income stimulated by induced business investment. Export-base/input-output multipliers are thereby the largest in the family of input-output multipliers. We discuss multipliers more fully in the main body of this paper.

[3] For additional details on this facet of the IDAEMP model see "The Role of Rural Industry in Idaho's Urban Places," CIS 971.

dominance extends to Magic Valley as does eastern Idaho's urban area.

Table 2 also shows income generated by wheat farming in northern Idaho, with direct income totalling almost $51 million and indirect income reaching nearly $84 million. Total income linked to wheat production in northern Idaho is approximately $135 million, or 3.8 percent of all income in that region.

The multiplier for northern Idaho, 2.65, is the smallest. This is due in large part to the fact that the majority of wheat raised in northern Idaho is dryland—no irrigation costs are incurred. In the other regions of the state, irrigation expenses add to local input costs, thus raising the multiplier.

Table 2. The role of wheat in Idaho's 1991 economy.

	$1,000s	% GSP
Statewide		
Direct income	150,878	
Indirect income	61,949	
TOTAL	512,827	2.8
(Multiplier: 3.40)		
Gross state product	18,141,500	100.0
Northern Idaho		
Direct income	50,901	
Indirect income	83,994	
TOTAL	134,896	3.8
(Multiplier: 2.65)		
Gross regional product	3,515,280	100.0
Southwestern Idaho		
Direct income	14,688	
Indirect income	43,627	
TOTAL	58,315	0.8
(Multiplier: 3.97)		
From Magic Valley	4,177	0.1
Gross regional product	7,579,640	100.0
Magic Valley		
Direct income	29,514	
Indirect income	69,923	
TOTAL	99,437	3.6
(Multiplier: 3.37)		
Gross regional product	2,761,320	100.0
Eastern Idaho		
Direct income	55,775	
Indirect income	149,160	
TOTAL	204,935	4.8
(Multiplier: 3.67)		
From Magic Valley	11,068	0.3
Gross regional product	4,285,260	100.0

Derivation of wheat farming direct income and expenditures

The University of Idaho Cooperative Extension System publishes Crop Enterprise Budgets, which are updated every several years. These budgets report the operating expenses and revenues for typical crop operations. For purposes of this study, we used a variety of wheat budgets reflecting different regions, all modeling the 1990-91 crop year.

To develop the figures used in our analysis, acreage and yield by crop type (hard red wheat, soft white, spring or winter, irrigated or dryland) was combined with prices for each type to arrive at a value for these crops. Then a weighted average price was calculated to arrive at a price for the region. This price was subsequently multiplied by the number of bushels of wheat produced to determine total operation revenues for the region.

University budget figures are developed on a per-acre basis. Thus, to develop a regional budget, total regional acres were multiplied by the per-acre budgets, generating total regional costs. When this figure was subtracted from total operation revenues for the region, this produced net regional return.

Conclusion

Economists recognize sales to nonresidents, or outside income, as the source of regional wealth. Idaho is one of the top 10 wheat producing states in the United States, and wheat makes an important contribution to the state's economy. Decisions affecting Idaho's wheat industry have ripple effects that touch many other parts of the economy. Through economic analysis provided by the IDAEMP model, decision makers can be aware of these impacts. The continued growth and vigor of Idaho's economy depends on informed decisions.

The IDAEMP model can be used to estimate the cost or benefit to producers and other sectors of the Idaho economy that result from policy changes in trade, environmental rules, water management, or commodity programs.

For further reading

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