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Research
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The role of potatoes in Idaho's economy

Idaho is famous for its potatoes for good reasons. The state's potato industry is an outstanding example of how natural resources, production technology, and marketing expertise can be combined to develop a thriving industry. Forty years ago Maine was the number one potato state, and Idaho produced only 16 percent of the U.S. crop. Idaho's share has steadily increased since then (fig. 1) and continues to grow. In the 1990s Idaho is clearly the number one producer, growing nearly 30 percent of the nation's crop.

In addition to being the production leader, Idaho is also the price leader. Despite higher transportation costs, Idaho shippers receive the highest prices in the U.S. This is largely the result of 60 years of successful advertising, promotion, and quality control by the Idaho Potato Commission. The Idaho industry has created such a strong demand for Idaho potatoes that consumers are willing to pay a price premium for "Idahos" (fig. 2).

Idaho's potatoes are grown primarily in the Snake River Plain, where rich volcanic soil, long sunny days, and plentiful irrigation water produce the high quality potatoes on which the Idaho industry has built its reputation. Eastern Idaho is where much of the state's fresh potatoes are grown. Dehydrated potato processors are also found in eastern Idaho where they make use of potatoes that do not pass the strict quality standards for the fresh market. Potato growers in the southwestern region of Idaho grow primarily for the frozen potato processing market. Southcentral Idaho, also known as the Magic Valley, produces potatoes for both fresh and processed markets.

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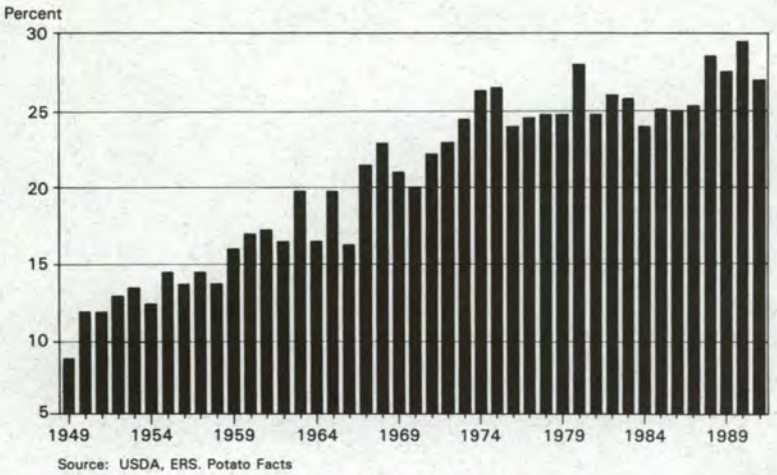

Fig. 1. Idaho share of U.S. potato crop, 1949-91.

The Idaho potato industry is vertically integrated (i.e., Idaho provides many links in the production chain). It begins with the inputs commercial potato growers buy. Most of the seed potatoes they plant are grown in the high-elevation areas of eastern Idaho. Much of the specialized potato equipment, such as planters and harvesters, is manufactured in Idaho. Even some of the fertilizer used on Idaho potatoes is mined in Idaho. After the potatoes are grown, value is added within the state by the fresh shippers and processors.

The potato industry is an important part of Idaho's economy. This publication chronicles research aimed at determining the role of potatoes in Idaho's economy.

Report highlights

Measuring the economic role of potatoes 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

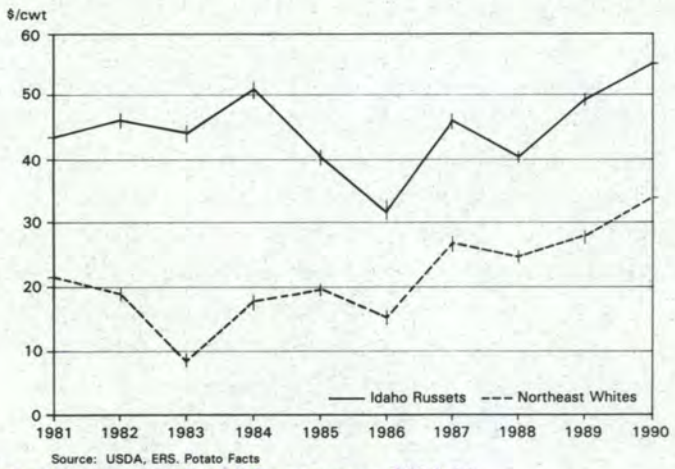

Fig. 2. Retail prices for Idaho potatoes, 1981-90.

IDAEMP

Idaho Economic Modeling Project

IDAEMP uses "value added" as the key measure of an industry's economic output. 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, or 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 1989. Idaho had a gross income (or gross state product) of $16.4 billion in 1989 (U.S. Department of Commerce 1992).

IDAEMP takes into account the many interconnections that characterize the Idaho economy. It identifies the value added of a particular industry, such as agriculture, and links to it 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. In turn, agricultural suppliers buy inputs, and their suppliers buy inputs, etc. 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. Ag wage earners spend their incomes on consumer goods, generating more value added. Ag producers, wage earners, and suppliers also pay state and local taxes to fund government payrolls, which are part of the state's value added. The model thus also tracks agriculturally related value added in consumer industries and government and links it to agriculture.

Fig. 3. Gross state product linked to the potato industry in Idaho's four regions, 1989.

the state, capturing interindustry trade, and shows how income creation in one industry is related to income creation in other industries. The research reported here refers to Idaho's economy in 1989. We wanted our analysis to be current, so we chose 1989 because this was the latest year for which the data we needed were fully available.

At $7.10 per hundredweight (cwt) (Idaho Agricultural Statistics 1992), 1989 was a good year for Idaho potato growers. In contrast, in the 5-year period 1987-91, average price of potatoes was only $4.93 per cwt, nearly a third less than the 1989 price. It might be supposed, therefore, that our 1989 analysis is not representative — this is not the case, however. The greatest economic impact of potato production occurs as a result of farmers purchasing needed inputs: irrigation supplies, fertilizers, pest control, fuel, and most important, labor. The price of potatoes harvested in the fall cannot be known before spring planting, and once incurred, planting costs are sunk, making harvest costs all but unavoidable regardless of fall potato prices. The implication of this for our analysis is that potato prices vary far more than the potato industry's income-generating role in the economy, and the analysis presented here is applicable with only minor variation between high and low potato-price years.

Idaho had a gross income (or gross state product) of $16.4 billion in 1989 (U.S. Department of Commerce 1992). When all supply and income effects are considered, potato production, packaging, and processing generated $2.5 billion, or 15.3 percent, of Idaho's gross income in 1989. Income tied to potatoes in particular regions is much greater, however (fig. 3). In eastern Idaho, potatoes account for nearly 33 percent of all income, and in Magic Valley, potatoes account for over 27 percent. In southwestern Idaho nearly 7 percent of all income is potato-related. Only in northern Idaho is the role of potatoes small, with seed potato production providing just over $1 million in income, or less than .05 percent of all northern Idaho income.

While our aim in this report is to inform, we expect our analytic framework to prove useful in making future resource management decisions. Potatoes are a significant part of Idaho's economy, and policy actions that impact the potato 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.

For the analysis reported here, we break Idaho's potato industry into three parts: growing, frozen and dehydrated processing, and fresh packaging. In addition, we include as part of Idaho's potato economy, Idaho's notable potato machinery manufacturing industry, arguing that without potatoes this industry would have located elsewhere. We begin our analysis with the economic role of potato growing.

Direct impacts of potato production

Table 1 shows sales and expenditures for Idaho potato growers in 1989. We constructed table 1 from price and production information for 1989, and with the help of representative enterprise budgets for potato growers.

In 1989, Idaho potato growers had combined sales of $728 million. These revenues are used to meet operating and ownership costs and to provide income for potato growers and their employees. For the purposes of our analysis, all income, including wage, proprietary, and property income, is counted in our "direct income" category.

Indirect impacts of potato production

Table 1 shows potato grower income of $355 million. This is part of Idaho's $16.4 billion in overall income, or gross state product. However, the economic impact of potato growing does not stop here — table 1's other expense items generate income as well. Preharvest operating expenditures on seed, fertilizers, soil preparations, equipment fuels, harvest and storage expenditures, machinery purchases, interest payments, and other "fixed costs" included in the ownership cost category create income in the industries that provide these inputs for potato production. This income is indirectly linked to potato growing.

Of course, input suppliers purchase inputs, and these lead to still more income (indirect income). And the recipients of potato-linked income purchase consumer goods, and, thus, still more income is generated. This is what is commonly known as a "multiplier effect" — increased activity/income in one industry positively affects other sectors of the economy. IDAEMP tracks these many indirect income effects of potato growing.

Tables 2 through 5 show the results of our IDAEMP analysis. The tables refer to Idaho's four principal trade regions: eastern, southcentral (Magic Valley), southwestern, and northern Idaho.

Total potato production income by region

Total income attributable to potato growing is shown with two components: "direct income" is the same as in table 1, except here it is distributed by region; "indirect income" is defined above and is the result of our IDAEMP analysis. Total income is simply direct plus indirect income. Potato growing in eastern Idaho contributes most to overall Idaho income, $642 million (table 2). The "multiplier" for eastern Idaho, 2.99, is simply the total income divided by the direct income. The total of direct and indirect income equals the multiplier of 2.99. Thus, associated with every dollar of income generated by eastern Idaho potato growers is nearly $3.00 in total regional income.

Table 1. Consolidated revenue-expenditure account for Idaho potato growers in 1989.

Revenue		Expenditures	
	($1,000s)		($1,000s)
Sales	727,573	Operating costs	279,029
		Ownership costs	93,356
		Direct income	355,188
TOTAL	727,573	TOTAL	727,573

Table 2. Eastern Idaho: Role of potatoes in 1989 economy.

	$1,000s	% GRP
Potato growers		
Direct income	214,759	
Indirect income	426,844	
TOTAL	641,603	15.0
(Multiplier: 2.99)		
From Magic Valley	40,416	1.0
Fresh packaging		
Direct income	123,884	
Indirect income	121,182	
TOTAL	245,066	5.7
(Multiplier: 1.98)		
From Magic Valley	7,002	0.2
Potato processing: Frozen		
Direct income	31,567	
Indirect income	70,833	
TOTAL	102,400	2.4
(Multiplier: 3.24)		
From Magic Valley	51,721	1.2
Potato processing: Dehydrated		
Direct income	82,184	
Indirect income	184,413	
TOTAL	266,597	6.2
(Multiplier: 3.24)		
From Magic Valley	3,103	0.1
Potato machinery manufacturing		
Direct income	19,310	
Indirect income	23,096	
TOTAL	42,406	1.0
(Multiplier: 2.20)		
From Magic Valley	1,315	<.05
Total potato related	1,401,629	32.8
Gross regional product	4,268,400	100.0

Table 3. Magic Valley: Role of potatoes in 1989 economy.

	$1,000s	% GRP
Potato growers		
Direct income	116,807	
Indirect income	207,277	
TOTAL	324,085	13.4
(Multiplier: 2.77)		
Fresh packaging		
Direct income	32,511	
Indirect income	31,052	
TOTAL	63,563	2.6
(Multiplier: 1.96)		
Potato processing: Frozen		
Direct income	98,125	
Indirect income	152,703	
TOTAL	250,828	10.4
(Multiplier: 2.56)		
Potato processing: Dehydrated		
Direct income	5,887	
Indirect income	9,161	
TOTAL	15,048	0.6
(Multiplier: 2.56)		
Potato machinery manufacturing		
Direct income	4,790	
Indirect income	5,370	
TOTAL	10,160	0.4
(Multiplier: 2.12)		
Total potato related	663,684	27.4
Gross regional product	2,422,800	100.0

Table 2 shows another element under potato growing: 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 eastern Idaho trade center exerts trade dominance over Magic Valley[1]. Reflecting this trade dominance, income formation in Magic Valley has a spillover effect on eastern Idaho income. Table 2's $40 million "from Magic Valley" indicates the potato growing portion of this spillover income. Altogether then, potato growing explained 16 percent of all eastern Idaho income in 1989, 15 percent attributable to potato growing in eastern Idaho itself, and another 1 percent attributable to potato growing in Magic Valley.

Table 3 reports on Magic Valley itself. Potato growing created $117 million in direct income in Magic Valley, and another $207 million in indirect income. Potato growing thereby accounts for roughly 13 percent of all income in Magic Valley[2].

Table 4 presents the potato growing picture for southwestern Idaho — $86 million in total income, consisting of $23 million in direct and $63 million in indirect income. Despite the fact that the size of the figures in the region are not as large as in the areas previously discussed, multiplier effects are greatest here. This largely reflects the deeper interindustry linkages of Boise, Idaho's largest urban center. Southwestern Idaho also experiences income effects that result from Magic Valley potato growing. Boise's economic dominance extends to Magic Valley similarly to that of the eastern Idaho urban complex. Table 5 indicates only a modest role for potatoes in northern Idaho.

Income impacts of potato fresh packaging

A large portion of Idaho potatoes are consumed fresh, and a substantial industry is involved in transporting, sorting, packaging, and marketing Idaho fresh potatoes. Tables 2 through 4 show direct and indirect income in Idaho's fresh packaging industry. We found no fresh packaging in northern Idaho.

Sales (revenues) for Idaho's fresh packaging industry were arrived at in much the same manner as potato growing: 1989 fresh-

[1]The U.S. Department of Commerce (1975) has mapped the "trade structure of the U.S. economy." In its analysis, the Commerce Department included Magic Valley entirely within the eastern Idaho market area. In contrast, our research suggests a shared dominance between eastern and southwestern Idaho. For a further discussion of market dominance and its impact on the 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.

[2]The smaller multiplier for Magic Valley as compared to eastern Idaho, 2.77 vs. 2.99, reflects Magic Valley's somewhat less commercially linked economy. With less development there are fewer industries, and fewer industries means fewer interindustry linkages. The size of the multiplier depends on the depth of interindustry linkages.

packaged prices times the quantity of fresh-packaged potatoes sold. Direct income and business expenditures in the fresh-packaging industry were obtained with the aid of fresh-packaged enterprise budgets. Business expenditures in the fresh packaging industry feed the IDAEMP model to yield indirect income estimates.

The second panels in tables 2 through 4 show the results of our analysis of the fresh packaging industry. Fresh packaging activities are greatest in eastern Idaho, providing some $124 million in direct income and another $121 million in indirect income. Note that another $7 million in eastern Idaho income is generated by fresh packaging activity in the Magic Valley. Altogether, nearly 6 percent (5.7 percent + 0.2 percent) of all eastern Idaho income is linked to the activities of the fresh potato industry.

The second panels in tables 3 and 4 show the role of fresh packaging in Magic Valley and southwestern Idaho. Fresh packaging directly and indirectly accounts for just under 3 percent of all income in Magic Valley, and somewhat less than 1 percent of all income in southwestern Idaho. As with the potato growing calculations, our analysis provides multipliers for fresh packaging by region. These range from 1.96 in the Magic Valley area to 2.52 in eastern Idaho.

Income impacts of potato processing

Idaho is a leading source of frozen and dehydrated potatoes. We gathered employment data on frozen and dehydrated potato processing for 1989 from County Business Patterns (U.S. Department of Commerce, Bureau of the Census) and Idaho Job Service. Direct potato processing income was then estimated using national income-employment ratios (U.S. Department of Commerce 1979). Indirect income was estimated using food processing income multipliers from IDAEMP.

The third and fourth panels in tables 2 through 4 show the income impacts of frozen and dehydrated potato processing in southern Idaho. There is no potato processing in northern Idaho. Frozen processing is prominent in Magic Valley and southwestern Idaho, while dehydrated processing is prominent in eastern Idaho.

Potato processing is a substantial part of Idaho's potato economy. Dehydrated potato processing in eastern Idaho accounts for more income than fresh packaging — 6.3 percent compared to 5.9 percent. And frozen potato processing in Magic Valley generates nearly as much income as potato growing. Frozen potato processing in southwestern Idaho is the most significant source of potato-related income.

The multipliers for processing are larger than those for growing or packaging. Food processing industries, including frozen and dehydrated potato processing, are capital intensive. These industries require a large investment in plants and equipment and have a large

Table 4. Southwestern Idaho: Role of potatoes in 1989 economy.

	$1,000s	% GRP
Potato growers		
Direct income	23,275	
Indirect income	62,742	
TOTAL	86,017	1.3
(Multiplier: 3.70)		
From Magic Valley	15,175	0.2
Fresh packaging		
Direct income	14,716	
Indirect income	22,322	
TOTAL	37,038	0.6
(Multiplier: 2.51)		
From Magic Valley	2,781	<.05
Potato processing: Frozen		
Direct income	73,532	
Indirect income	206,368	
TOTAL	279,900	4.3
(Multiplier: 3.81)		
From Magic Valley	12,240	0.2
Potato processing: Dehydrated		
From Magic Valley	734	<.05
Potato machinery manufacturing		
Direct income	1,720	
Indirect income	2,820	
TOTAL	4,540	0.1
(Multiplier: 2.64)		
From Magic Valley	440	<.05
Total potato related	438,865	6.8
Gross regional product	6,462,000	100.0

Table 5. Northern Idaho: Role of potatoes in 1989 economy.

	$1,000s	% GRP
Potato growers		
Direct income	347	
Indirect income	792	
TOTAL	1,138	<.05
(Multiplier: 3.28)		
Total potato related	1,138	<.05
Gross regional product	3,228,000	100.0

No significant fresh packaging, processing, or potato equipment manufacturing was identified for northern Idaho.

For further reading

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dollar output relative to labor requirement. Industries such as these generally have the largest income multipliers.

Potato machinery manufacturing

Before concluding our analysis we consider one last activity: potato farm machinery manufacturing. Idaho is a significant national supplier of potato farm machinery; clearly, this role stems from Idaho's dominance in potato production. Therefore, we include potato machinery manufacturing as a part of Idaho's potato economy.

A list was assembled of Idaho potato machinery manufacturers and their employees[3]. We then estimated direct income in the potato machinery manufacturing sector using national income-employment ratios and indirect income using the "farm machinery and equipment" income multiplier of IDAEMP.

The bottom panels in tables 2 through 4 show the results of our analysis. We found no potato equipment manufacturing in northern Idaho. Potato machinery manufacturing is most significant in eastern Idaho, where it accounts for approximately 1 percent of all income. Income linked to this industry is less important in other regions, though it still provides a noteworthy element of Idaho's potato economy.

Conclusions

Economists recognize sales to nonresidents, or outside income, as the source of regional wealth. Idaho is the nation's leading potato producer and its annual potato harvest is one of the state's leading outside income sources. There is more to it than this, however. The income-generating effect of potato production is magnified by the integration of Idaho's potato industry. Potato sales feed a diverse industry of local potato input suppliers, and on leaving the farm a large share of Idaho potatoes undergo additional processing in the state, thereby adding further value to the potato crop.

Statewide, potato production and processing accounted for over 15 percent of all Idaho income in 1989. In some regions, potato-dependent income is much higher, accounting for 33 percent of all income in eastern Idaho and 27 percent in Magic Valley. Idaho's economy is clearly sensitive to policy actions that affect the potato industry. Irrigation policy, salmon recovery, and plans to transfer water from Idaho to California all have great potential to impact Idaho's economy. Through economic analysis provided by the IDAEMP model, a vehicle exists to address potato policy issues.

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[3]We initially assembled a list of all Idaho manufacturers categorized as "farm machinery and equipment." Our source was the Idaho Manufacturing Directory, 1992 (Center for Business Development and Research, University of Idaho). The directory also provides the location of manufacturers and the number of employees. We then narrowed this list to those who produce potato machinery, either in part or entirely.

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