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Economics of Increasing the Minimum Size for Fresh Potatoes

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Executive Summary

The Idaho Potato Commission funded a project to help answer the question: What would be the economic impact if the potato industry increased the minimum size for fresh potatoes? We estimate that increasing the minimum size from 4 to 5 ounces would have diverted an average of 5 million cwt to dehydrators during 2000-2010. Idaho fresh potato revenue would have increased $73 million each year. Idaho dehydrated potato revenue would have increased $18 million. The total impact would have been increased revenue of $91 million. A sensitivity analysis showed that revenue increases would be larger when more potatoes are diverted. Had a five ounce minimum been in place for the 2000-2010 crops the average Idaho Grower Return Index (GRI) price would have increased 24% from $5.63 to $6.97 per cwt.

Size Data

The Idaho Agricultural Statistics Service (IASS) conducts annual field digs to document russet potato size and grade. We used these data to estimate the amount of potatoes that would be diverted from the fresh market to dehydration processing if the minimum size standard increased. IASS provides data for five Idaho regions: Eastern Counties, Eastern Seed Counties, South-central Counties, Southwest Counties and Other Counties. We chose the Eastern Counties as the best indicator for the potato size profile of the fresh potato industry.

The average size distribution for the 2000 to 2010 crops is in Figure 1. The largest size category, at 27% of the total, is '2" or 4-6 ounces'. On average more than one-fourth (26%) of the Eastern Idaho crop is in this size range. The range was from 22% in 2002 to 33% in 2010. The IASS data do not specify a 4-5 ounce category. We assumed that half the 4-6 ounce category is made up of 4-5 ounce potatoes. That puts 13% of the potato crop in the 4-5 ounce category.

Ignoring the small amount of 'baby potatoes' marketed from Idaho, we estimate that the share of fresh potatoes in the 4-5 ounce category is 15.4% of total shipments. Using the 2000-10 average for Idaho fresh shipments of 33 million cwt, the 4-5 ounce quantity is 5 million cwt. That is the amount of potatoes that would be diverted from fresh to dehy. Total fresh shipments would drop from 33 to 28 million cwt (Table 1).

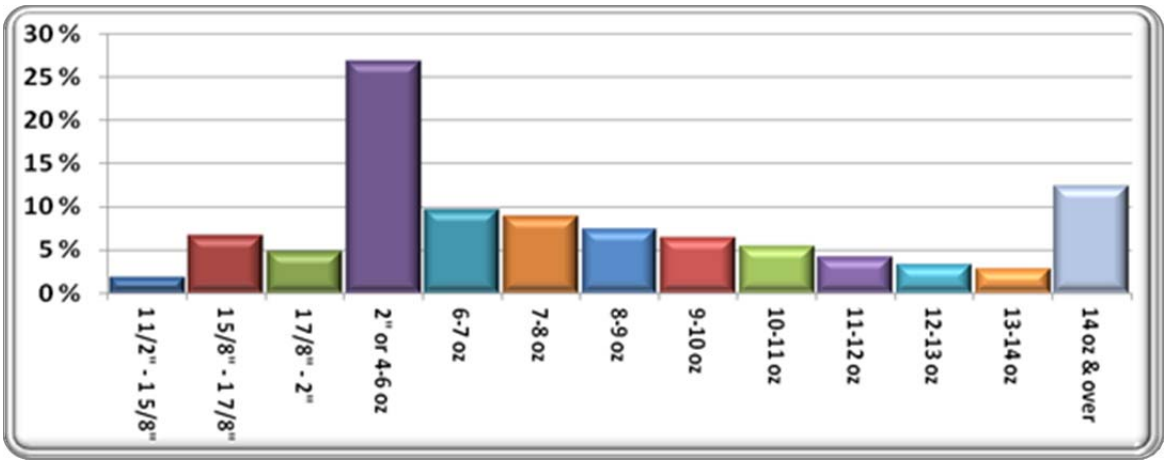

Figure 1. Eastern Idaho Potato Size Profile, 2000-2010 Average

Impact on the Fresh Potato Industry

Diverting small potatoes from the fresh market would: (1) reduce quantity sold in the fresh market and (2) increase fresh potato prices. Prices could also change due to demand for more uniform sizing. Idaho shippers marketing non-size A packs with a 5 ounce minimum get a premium price. In late July 2010 the suggested premium was $1.50 for 5-9 ounce packs and $0.75 for size A packs, according to the United Potato Growers of Idaho (UPGI) website.

We built an econometric model to estimate the impact of reduced supply going into the fresh market. The model explains 73% of the changes in annual Fresh Weighted Average (FWA) prices, a shipper-level price that accounts for various fresh pack sizes and containers. The explanatory variables in the model are:

Q_{ID} = Quantity of Idaho fresh potatoes shipped (million cwt)

Q_{US} = Change in quantity of all U.S. potatoes produced (%)

We used the model to calculate price flexibility (F), a measure of price sensitivity. F for this model is -2.5, which means that for each one percent change in the quantity of Idaho potatoes shipped, the FWA price moves 2.5% in the opposite direction. For the 15.4% reduction in fresh shipments we would expect the price to have increased 38%.

We used the price flexibility to estimate an average $73 million increase in fresh potato shipper revenue if the minimum size standard had been raised to 5 ounces in 2000-2010 (Table 1). In spite of a drop of 5 million cwt in the amount of potatoes sold, revenue would increase by 17% due to the jump in FWA prices.

Table 1. Impact on 5-ounce minimum on Idaho potato shipper revenue

	Min = 4 oz	**Min = 5 oz**	**Difference**
Quantity (million cwt)	33	28	-5
Price ($/cwt FWA)	$12.84	$17.78	$4.94
Revenue ($ million)	$428	$501	$73
	Average 2000-2010	*Estimated*	

The revenue increase does not include adjustments for price premiums that shippers currently get for 5-ounce minimum packs. Since quantities are not reported for those packs it could not be included in the model. Other research sponsored by the Idaho Potato Commission found that minimum sizing is not an important quality issue among consumers.

If the Idaho potato industry increased the minimum size standard, growers might respond to higher prices by planting more potatoes. Supply response is beyond the scope of this project and is influenced by the supply management programs of United Potato Growers of Idaho.

Impact on the Dehydrated Potato Industry

Diverting small potatoes into the dehydrated market would: (1) increase quantity sold in the dehydrated market and (2) decrease prices for dehydrated potatoes. We built an econometric model to estimate the impact of increased supply in the U.S. dehydrated market. Due to a lack of data we could not build an Idaho model. Since a large part of the industry is in Idaho we used the U.S. model to analyze Idaho impacts. The model explains 91% of the changes in U.S. dehydrated potato product prices for the 2000-2010 crops. The explanatory variables in the model are:

Q_{US} = Quantity of U.S. dehydrated potatoes (million lbs.)

Time = Accounts for an upward trend in dehydrated potato prices

From the model we calculated the price flexibility (F) for U.S. dehydrated potatoes. F for this model is -0.54, which means that for each one percent change in dehydrated potato quantity, the price moves 0.54% in the opposite direction. Diverting 5 million cwt from Idaho fresh to dehy, at an 8:1 raw to finished product conversion rate, would increase U.S. dehydrated potato supply by 12%. This would cause finished product price to decline by 6%. U.S. dehy revenue would increase $25 million (Table 2).

We asked several industry experts to estimate the share of the U.S. dehydrated potato industry that is in Idaho. The average estimate was 70%. We used this figure to calculate that $18 million of the estimated $25 million increase in dehy revenue would be in Idaho.

Table 2. Impact of 5-ounce minimum on dehydrated potato revenue

	Min = 4 oz	**Min = 5 oz**	**Difference**
U.S. Quantity (million lbs.)	550	614	64
U.S. Price ($/lb.)	$0.99	$0.93	-$0.06
U.S. Revenue ($ million)	$545	$570	$25
ID Revenue ($ million)	$381	$399	$18
	Average 2000-2010	*Estimated*	

Sensitivity Analysis

The impact estimates are based on averages for the quantity of Idaho fresh potatoes shipped and the portion of potatoes in the 4-5 ounce range. We also conducted a sensitivity analysis to estimate the impacts when those two variables were at their highest and lowest values from 2000 to 2010 (Table 3).

Table 3. Sensitivity analysis for Idaho potato industry revenue

	Fresh	**Dehy**	**Total**	**Change**
Actual 2000-10 average	$428	$381	$809	-
Min = 5 oz	$501	$399	$900	$92
ID Quantity shipped:				
Largest (37.3 mcwt)	$561	$401	$961	$152
Smallest (30.7 mcwt)	$462	$398	$859	$50
Size profile:				
Highest 4-5 oz (19.7%)	$518	$396	$914	$105
Lowest 4-5 oz (12.3%)	$489	$399	$888	$78
Note: revenue is $million				

We found that the largest impact would have been when Idaho fresh shipments were at the largest -- 37.3 million cwt for the 2000 crop. With that quantity and a 5-ounce minimum, revenue would have increased $152 million in the fresh industry and $20 million in the dehy industry. The next largest increase in revenue ($105 million) would have been when the largest share of fresh potatoes was in the 4-5 ounce category – 19.7% in 2010. The biggest benefits occur when large quantities of potatoes are diverted from fresh to dehy.

Grower Impact

Although the analysis was conducted at the shipper and dehydration processor links of the marketing chain, the results can be extended to growers. The four impacts on Idaho fresh potato growers would be:

1. Lower packout rate
2. Higher price for fresh potatoes
3. Lower price for dehydration potatoes
4. Higher GRI price

The average price Grower Return Index (GRI) price for the 2000-2010 crops was $5.63 per cwt. We estimate that had a five ounce minimum requirement been implemented the average price would have been $6.97 per cwt. That is an increase of $1.34 or 24%.

Previous IPC-sponsored Potato Demand Research

The Idaho Potato Commission funded another potato demand research project more than 20 years ago. The researchers estimated price flexibilities in the retail market at -7.1 for fresh potatoes and -1.3 for dehydrated potatoes (Guenthner *et al.* 1991). In the current study we estimate the flexibilities at -3.7 and -0.54, respectively. The smaller numbers suggest that prices are less sensitive to changes in supply. Flexibilities in the older study differ from the ones in this study for three reasons.

1. *Product*. The older study was on U.S. fresh potatoes and the current one focused on Idaho fresh potatoes. Since there are more substitutes for Idaho potatoes (e.g. Washington potatoes) than there are for U.S. potatoes, we expect the price flexibility to be smaller.
2. *Market.* The older study analyzed the retail link of the market chain and used prices that consumers pay. This study used price data from the fresh shipper and dehydration processor.
3. *Time.* In this study we used data from 2000 to 2010 to model current market behavior. The older study used data from 1975-1988.

References:

Guenthner, Joseph F., Annette E. Levi, and Biing-Hwan Lin. 1991. Factors that affect the demand for potatoes in the US, *American Potato Journal*, 68(9): 569-579.

Regional Potato Research Website

As you can probably tell from the *Potato Progress* header, the potato commissions of Washington, Idaho, and Oregon are working toward joining forces in the funding and management of their research grants and distribution of research results. Toward that end, the following website has been created. Please have a look! All feedback and suggestions are welcome to Andy Jensen, ajensen@potatoes.com.

http://www.nwpotatoresearch.com/