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Forecasting Idaho Potato Acreage

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Prices of agricultural commodities depend on both supply and demand, but with potatoes supply is the most important factor. Since the U.S. potato market does not have government price supports, large crops can mean money-losing prices. High prices occur when potatoes are scarce. If growers could reliably forecast potato supply, they could make sound business decisions on potato production, contracting, storage, and timing of sales.

The U.S. Department of Agriculture (USDA), together with the Idaho Agricultural Statistics Service (IASS), provides acreage estimates for most of the major crops grown in Idaho. For some crops, IASS not only estimates acreage after planting but also provides an estimate of planting intentions before the crop is planted. Prospective plantings are published in March for Idaho corn, barley, oats, wheat, dry beans, and hay but not for Idaho potatoes.

The first Idaho potato acreage estimate is provided in July, well after the crop has been planted. Estimates are revised in November and December, after harvest. Although there is much discussion and speculation about what Idaho potato acreage will be each year, forecasting models generally have not been available to the public. This publication presents two models that can easily be used by growers and others to make acreage predictions.

Both models are based on information from a survey of Idaho potato growers, funded by the Idaho Potato Commission. The survey was sent to half the growers on a list provided by Potato Growers of Idaho. The response rate was 57 percent.

Growers were asked, "What factors do you consider important in your decision regarding the acreage of potatoes you plant each year?" Their responses resulted in the following ranking:

1. contract price and availability,
2. crop rotation,
3. U.S. acreage projections,
4. price outlook,
5. price of the previous potato crop,
6. other crop prices,
7. cost of production, and
8. lender advice.

Some of these factors can easily be measured and used for forecasting, but others cannot. Model 1 uses only factors for which numbers are available from IASS. Model 2 includes factors for which there are no readily available numbers. Instead, the person doing the forecasting estimates a rating number.

Model 1 — Forecasting Equations

Because IASS reports Idaho potato acreage in two parts of the state, Model 1 consists of two equations: Model 1-B for the southwestern counties of Idaho and Model 1-A for the rest of the state.

The Model 1 equations include information required to predict changes in potato acreage planted. Specifically, data about three variables are needed: (1) acres planted last year, (2) price of the previous potato crop, and (3) prices of alternative crops in the previous crop year. These variables allow potato acreage forecasts to be made as soon as their values can be estimated.

The "acreage" variable represents grower investment in specialized equipment such as potato planters and potato harvesters and in buildings such as potato

storages. Once growers invest in these factors of production they are likely to continue to grow potatoes.

The "price of the previous potato crop" was rated fifth in the Idaho grower survey. Apparently some growers develop their price expectations for the next crop based on the price of the previous crop. They respond to higher prices by planting more potatoes next year.

Idaho growers rated "other crop prices" as the sixth most important factor in their planting decisions. Alternative crop opportunities vary across Idaho. Potato growers in high-elevation, short-growing-season eastern Idaho can grow small grains and hay as alternatives, but growers in southwestern Idaho can grow dozens of other crops.

Model 1-A, which excludes southwestern Idaho, follows:

$$\begin{aligned}\text{Acres planted} = {} & 88.2 \times 0.83\ (\textit{potato acres, last year}) \\ & + 24.5\ (\textit{potato price, last year's crop}) \\ & - 36.7\ (\textit{barley price, last year's crop}) \\ & - 13.4\ (\textit{wheat price, last year's crop})\end{aligned}$$

It can be used for forecasting by putting numbers into the equation and doing simple multiplication and addition. For example, 1989 crop information can be used to forecast 1990 acreage. In 1989, Model 1-A Idaho potato acreage was 338,000 acres, the average price of Idaho potatoes was $6.15 per hundredweight (cwt), the average price of Idaho barley was $2.70 per bushel, and the average price of Idaho wheat was $3.75 per bushel. Plugging these numbers into the equation we get:

$$\begin{aligned}\text{Acres planted} = {} & 88.2 \\ & + 0.83 \times 338 \\ & + 24.5 \times 6.15 \\ & - 36.7 \times 2.70 \\ & - 13.4 \times 3.75 \\ = {} & 88.2 + 280.5 + 150.7 - 99.1 - 50.2 \\ = {} & 370.1\end{aligned}$$

The calculations provide a 1990 estimate of 370,100 acres. (Notice that the equation uses acres expressed in thousands.) Actual acreage planted in 1990 was 375,000 so the equation's prediction was too low by 4,900 acres or about 1 percent. In most years the equation provided a reasonably good estimate of potato acreage (Fig. 1).

The equation for Model 1-B (southwestern Idaho) follows:

$$\begin{aligned}\text{Acres planted} = {} & 28.3 + 0.3\ (\textit{potato acres, last year}) \\ & + 4.1\ (\textit{potato price, last year's crop}) \\ & - 0.3\ (\textit{sugarbeet price, last year's crop}) \\ & - 0.2\ (\textit{hay price, last year's crop}) \\ & - 0.5\ (\textit{onion price, last year's crop}) \\ & - 6.8\ (\textit{for years after 1985})\end{aligned}$$

It is used the same way as the equation for Model 1-A. For example, 1989 southwestern Idaho potato acreage was 17,000 acres, the price of Idaho potatoes was $6.15 per cwt, the price of Idaho sugarbeets was $44.30 per ton, the price of Idaho hay was $80.00 per ton, and the price of Idaho onions was $11.70 per cwt. Putting these numbers into the southwestern Idaho equation we get:

$$\begin{aligned}\text{Acres planted} = {} & 28.3 \\ & + 0.3 \times 17 \\ & + 4.1 \times 6.15 \\ & - 0.3 \times 44.30 \\ & - 0.2 \times 80.00 \\ & - 0.5 \times 11.70 \\ & - 6.8 \\ = {} & 28.3 + 5.1 + 25.2 - 13.3 - 16 - 5.8 - 6.8 \\ = {} & 16.7\end{aligned}$$

The equation predicted 1990 southwestern Idaho potato acreage to be 16,700 acres. Actual acreage was 20,000 acres so the estimate was too low by 3,300 acres. Figure 2 shows how the equation performed for other years. (Subtracting 6.8 for years after 1985 accounts for processors moving contracts out of the area because of potato sugar end problems.)

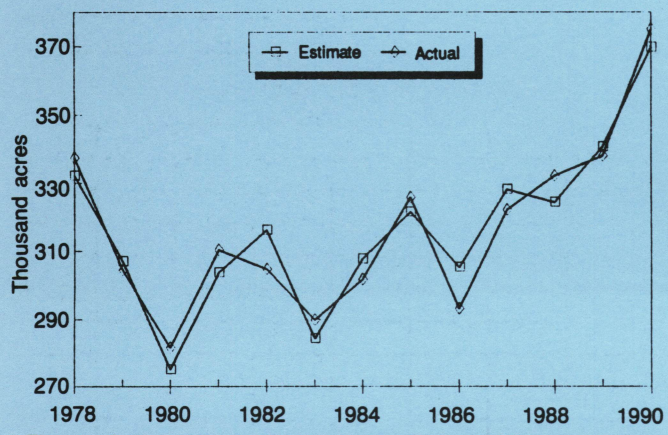

Fig. 1. A comparison of estimated and actual Idaho potato acreages, excluding southwestern counties.

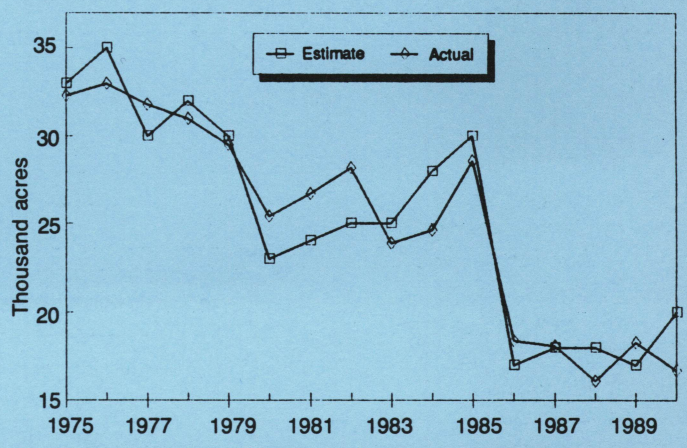

Fig. 2. A comparison of estimated and actual potato acreages in southwestern Idaho.

Together the two equations predicted total Idaho 1990 acreage at 386,800. The actual acreage provided by IASS was 395,000 acres. Neither equation exactly predicted acres for 1990, but they provided fairly close estimates.

Models 1-A and 1-B can be used in late January when IASS provides preliminary estimates of Idaho crop prices in the annual crop summary issue of its newsletter *Agriculture in Idaho.* IASS estimates of potato acreage for the previous crop are available in November and December.

Sugarbeet prices present a special challenge. Estimates are not available from government sources until more than a year after harvest. Sugarbeet growers and processors, however, can often provide reasonably accurate estimates much sooner.

Model 2 — Forecasting Chart

Model 2 is a rating chart using planting decision factors from the Idaho grower survey (Table 1). For each of the 10 factors, the user enters a number ranging from −5 to +5. A zero means that the user thinks the factor will have no effect on Idaho potato acreage. A negative number means that the factor is expected to reduce acreage, and a positive number suggests the factor will tend to increase acreage. The overall rating is calculated by adding all the numbers.

The 10 factors in Model 2 capture the influence of six of the eight factors rated by Idaho growers in the survey. Crop rotation and U.S. acreage projections were left out because they are difficult to evaluate. The number one rated factor "contract price and availability," was separated into two categories. There are also two categories for alternative crops: "profitability" and "contract availability."

Model 2 was tested with potato growers who attended two potato marketing workshops at the Twenty-third Annual Idaho Potato School in January 1991. The workshop instructor led the discussion of each factor until the group reached agreement on the rating for the 1991 crop. The overall rating from the first group of about 100 growers was +2. The second group, which was smaller, provided a rating of +2.5. Although the ratings of +2 and +2.5 cannot be directly translated to a specific acreage forecast, they do suggest that in January 1991 growers expected Idaho potato acreage to increase.

The numbers from the two groups follow:

	Group 1	Group 2
1. Potato price	−2	−2
2. Potato demand	+1	+1.5
3. Grower feelings	0	−0.5
4. Contract availability	0	0
5. Contract price	0	0
6. Production costs	−2	−1
7. Seed availability	+2	+1
8. Financing	0	+1
9. Profitability, other crops	+3	+2
10. Contract availability, other crops	0	−0.5
TOTAL	+2	+2.5

Remember, the numbers came from a group of Idaho potato growers who attended the Idaho Potato School in January 1991. Since contract negotiations with potato processors had not yet been settled, the entries for numbers 4 and 5 were zero. Had the group rated the factors at a different time, the ratings may have been different.

Conclusions

Two models that can be used to forecast Idaho potato acreage were developed based on information from a survey of Idaho potato growers. Most of the factors identified by Idaho growers as important to their planting decisions were included in one or both models. Model 1 forecasts potato acres planted, while Model

Table 1. Factors that affect potato plantings.

	<---------- Negative ----------					0	---------- Positive ---------->				
	−5	−4	−3	−2	−1	0	+1	+2	+3	+4	+5
1. Potato price											
2. Potato demand											
3. Grower feelings											
4. Contract availability											
5. Contract price											
6. Production costs											
7. Seed availability											
8. Financing											
9. Profitability, other crops											
10. Contract availability, other crops											

2 uses personal opinions to indicate whether acreage is expected to increase or decrease.

Although neither model can be relied on to give perfectly accurate forecasts, they can be used to make reasonably good estimates. They can help growers make decisions by providing information about an uncertain future.

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