Demand for Wild Blueberries at Farm and Processor Levels

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The wild blueberry crop harvested in Maine and eastern Canada has increased considerably in recent years. The purpose of this study is to understand the recent trends in demand for wild blueberries with particular attention to the effects of production and the marketing of wild and cultivated blueberries. A price response model was developed to analyze farm-gate price and the processor price, using annual data from 1978 through 1997. Key explanatory variables in the model include quantity of wild blueberries, real per capita disposable income, the quantity of processed cultivated blueberries, and carry-over stocks of frozen blueberries.

Background

The world's wild, or lowbush, blueberry production is confined to the northeastern United States and eastern Canada. It has increased considerably in recent years, from about 42 million pounds in 1978 to a record high of 138 million pounds in 1997 (Figure 1). The state of Maine produces about one-half of the wild blueberry crop, and Nova Scotia and Quebec are the leading producers among the eastern Canadian provinces, accounting for 81 percent of Canadian wild blueberry production in 1997 (Agriculture & Agri-Food Canada, 1999).

The fluctuation of price paid to wild blueberry growers in Maine, Nova Scotia, and Quebec is depicted in Figure 2. The combined production of these areas comprised more than 90 percent of the total crop during 1995 through 1997. These prices overall are at a similar level and move together. During the 20-year period from 1978 through 1997, the correlation coefficients between grower prices in Maine and Nova Scotia were 0.95, 0.81 between Maine and Quebec, and 0.85 between Nova Scotia and Quebec.

Average prices received by Maine growers (farm-gate level prices) between 1978 and 1997 were deflated to 1982–84 dollars to give a picture of real price trends for wild blueberries (Figure 3). The result shows that there was a great deal of variation in real price throughout the period, but between 1978 and 1994, the general trend is downward. However, real prices began climbing during the 1995–97 period.

Figure 1. Annual North American Wild Blueberry Production, 1978–97.
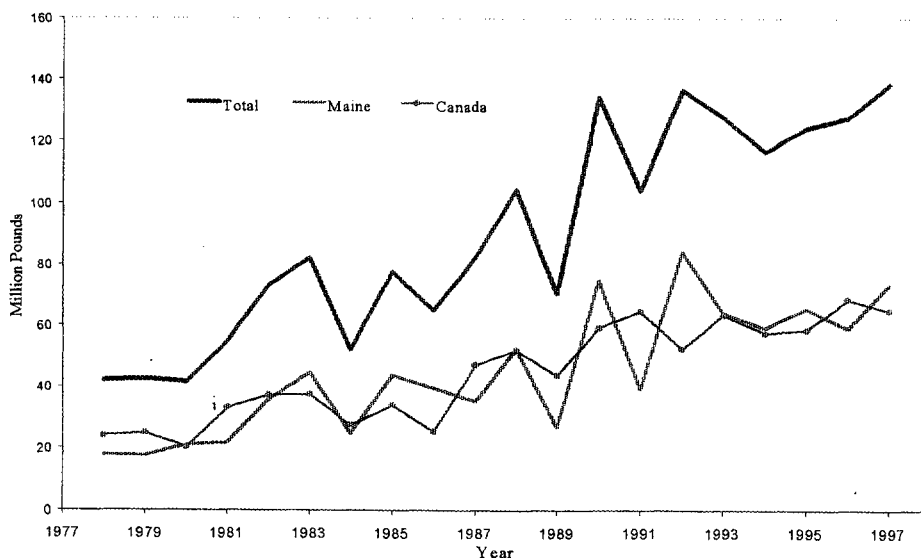
Source: U.S. Department of Agriculture–National Agricultural Statistics Service and *Fruit & Vegetable Production*, Statistics Canada.

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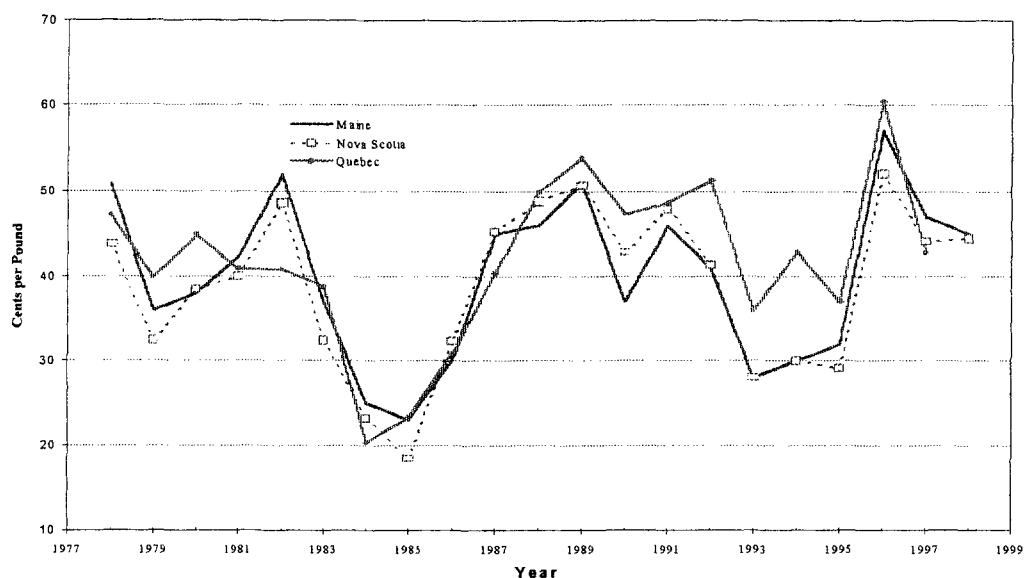
Figure 2. Prices Paid to Growers in Maine, Nova Scotia and Quebec, 1978-1998.[a]

[a] Maine grower prices are from the USDA, National Agricultural Statistics Service. Prices paid to growers in Nova Scotia are from *Wild Blueberry Production and Marketing in Nova Scotia: A Situation Report—1998.* Quebec prices are derived from value and production data obtained from *Fruit & Vegetable Production,* Statistics Canada. Canadian prices are converted to U.S. dollars using annual currency exchange rates.
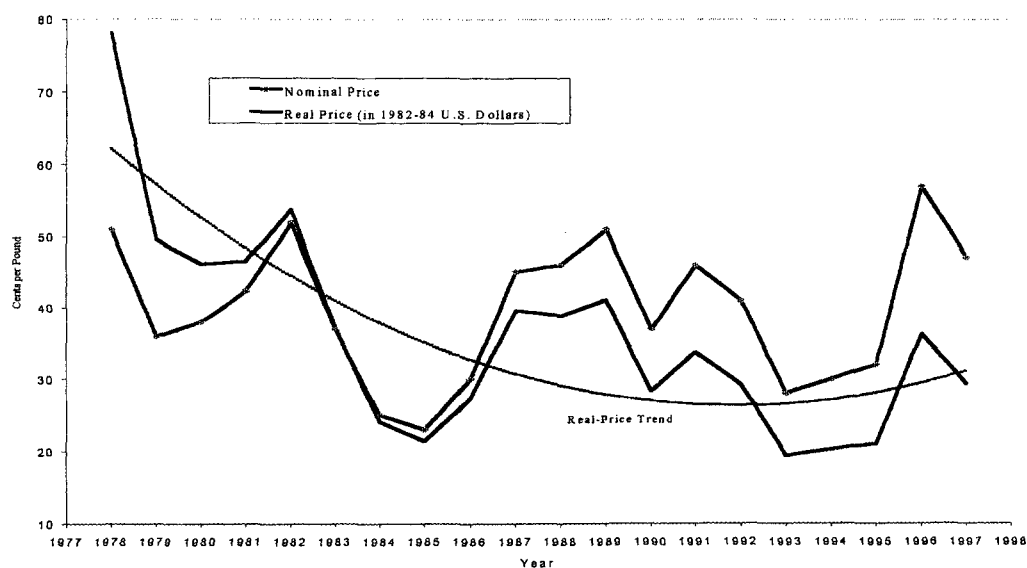

Figure 3. Nominal and Real Prices of Wild Blueberries Paid to Growers in Maine, 1978-97.[a]

[a] Nominal (current) prices are deflated by consumer price index for all items (1982 to 1984 =100).

As wild blueberry production increases, its impacts on price—along with other factors—warrant attention. In addition, the wild blueberry industry in Maine and eastern Canada has made joint efforts to promote wild blueberries. The Wild Blueberry Association of North America (WBNA), for example, has developed and imple-

mented market strategies in the last few years to build "wild blueberry" as a brand identity and to promote the health and nutritional benefits of the fruit. Moreover, the Wild Blueberry Association in Maine has promoted the sales of individually-quick-frozen (IQF) blueberries (Bertelsen, Harwood, and Zepp, 1995).

The purpose of this report is to assess factors affecting the demand for wild blueberries and to test a hypothesis of a structural change in demand that might have occurred in recent years. Our focus is on the derived demand for wild blueberries at the farm and the processor level. Demand for wild blueberries at the retail level is difficult to ascertain because wild blueberries are primarily frozen by the primary processors and sold to the secondary processors, such as bakeries, breakfast cereal, and cake mix sectors.

The Demand Models

Most wild blueberries are processed (frozen) and compete directly with frozen cultivated blueberries in the market. Cultivated, or highbush, blueberries are commercially grown mainly in Michigan, New Jersey, Oregon, and Canada's British Columbia. Most Michigan and Oregon blueberries (70 percent and 64 percent) were used frozen in 1995–97, while 31 percent of New Jersey's and less than 45 percent (1997) of British Columbia's blueberries were processed. Overall, cultivated blueberry production totaled 190 million pounds in 1997; about one-half of the crop was used for processing, and the rest was sold fresh (North American Blueberry Council, 1990).

A price response model was developed and used to analyze the demand for wild blueberries at the farm and the primary processor levels. While wild blueberry production has trended upward in the last two decades, there has been substantial fluctuation in crop size from year to year, primarily due to natural causes. The annual demand model used for the estimation of demand at the farm and the primary processor level is specified in equation (1).

$$(1) \qquad P_t = f\left(Q_t^w, Q_t^s, Q_t^c, I_t\right).$$

In each given year t, the price of wild blueberries P_t is hypothesized to be affected by the size of wild blueberry production (Q_t^w), the stock of frozen blueberries as of July 1 (Q_t^S), and the consumer income (I_t). Since frozen wild blueberries compete directly with the cultivated blueberries in the secondary food processor market, the quantity of cultivated blueberries used in processing (Q_t^c) is included in the model.

To test whether there were significant changes in the demand structure over time and the likely impact of the increasing marketing effort since 1995, additional variables are included in the statistical model. A double-log model, as specified in Equation (2), is used to estimate demand for wild blueberries at the farm and the processor levels.

$$\ln P_t = \beta_0 + \beta_1 \ln Q_t^w + \beta_2 \ln Q_t^S + \beta_3 \ln Q_t^C +$$
$$(2) \qquad \beta_4 \ln I_t + \beta_5 T_t + \beta_6 D_t + \beta_7 (T_t \times \ln Q_t^w)$$
$$+ \beta_8 (D \times \ln Q_t^w) + \varepsilon_t.$$

In Equation (2), the addition variables are a time trend T_t ($T=1, 2,..., 20$; for t from 1978 to 1997) and a dummy variable D_t ($=1$, if t is after 1994; $=0$ otherwise). The interaction terms between T and $\ln Q_t^w$ and D_t and $\ln Q_t^w$ are specified in the model to test for changes in the impact of wild blueberry production on prices. The βs denote the unknown parameters to be estimated, and ε_t represents the error term in the model.

Data

Data covering annual time periods from 1978 through 1997 were compiled from various sources, primarily the USDA Economic Research Service, Statistics Canada, and the Food Institute.

About one-half of the wild blueberry crop is produced in Maine, and industry sources indicate that prices paid to the growers and processors in Maine are representative of the industry. For the processor market, average price from October through December, weighted by volume, was used. Both the farm and the processor prices are measured in cents per pound. To make adjustments for inflation, price and income are deflated by the implicit price deflator for personal consumption (1992=100).

Data on quantity of processed (frozen) wild blueberries are not available. Since almost all of the wild blueberries were used for processing, the quantity of wild blueberries harvested was used in the processor model.

Empirical Results

The estimated demand for wild blueberries at the farm and the processor levels are presented in Table 1. In general, quantities of wild blueberries,

frozen blueberries in storage, and quantity of cultivated blueberries used for processing were found to have significant negative impact on wild blueberry prices, while the increase in per capita disposable income had significant positive impact on prices during 1978 through 1997.

Table 1. Estimation Results of the Demand for Wild Blueberries at the Farm and Processor Levels.

	Estimated Coefficients	
Variables	Farm Level	Processor Level
Intercept	-31.679*	-34.848*
	(18.921)	(17.890)
$\ln Q_t^w$	-1.608*	-1.090*
	(0.344)	(0.325)
$\ln Q_t^S$	-0.945*	-0.602*
	(0.145)	(0.137)
$\ln Q_t^c$	-0.685*	-0.391
	(0.247)	(0.234)
$\ln I_t$	4.854*	4.858*
	(2.000)	(1.892)
T	-0.318*	-0.193
	(0.122)	(0.115)
D	16.221	13.761
	(10.326)	(9.763)
$T*\ln(Q_t^w)$	0.082*	0.044*
	(0.024)	(0.022)
$D*\ln(Q_t^w)$	-3.450	-2.908
	(2.134)	(2.018)

The effect of the production of wild blueberries on price has changed over time. At the farm level, the demand had shifted downward, signified by the significant negative coefficient associated with the time trend variable (T). Furthermore, farm price has become less responsive to changes in quantity harvested, which is captured by the interaction term between time trend (T) and wild blueberry production (ln(Q)), and the parameter estimates are statistically significant. A similar change in demand has occurred at the processor level as well, except that the coefficient of the time trend variable is negative but not statistically significant.

The two variables, D and $D*\ln(Q_{wild})$, are included in the models to test for potential intercept and slope changes, respectively, in demand for wild blueberries after 1994. In both models, the coefficients associated with variable D are positive, indicating an upward shift in demand

after 1994, and the negative sign of the interaction terms between D and $\ln(Q_{wild})$ indicate that the demand functions have become steeper. Although in both models these estimates are not statistically significantly different from zero individually, the result of a joint test of intercept and slope changes indicates that the demand structure at the farm level after 1994 is significantly different from that in the previous periods. With only three observations for the recent periods, the model was not able to capture precisely the change in intercept and slope of the model separately. As for the demand for frozen blueberries at the processor level, there is no statistical evidence to conclude a significant change in demand after 1994.

Summary

The study attempts to assess the direction and magnitude of the impact of factors on demand for wild blueberries at the farm and the processor level. In general, the demand for wild blueberries at both farm and the primary processor level had changed in the last two decades. Other factors being equal, the real prices paid to the farmers and processors had generally decreased from 1978 through 1994. The effect of increasing production on price, however, had decreased over this period.

Between 1995 and 1997, the demand pattern for wild blueberries at the farm level is found to be significantly different from previous years. There appeared to be an increase in demand and a greater price response to production changes. Because of the small number of observations for the period, we were unable to estimate precisely the magnitude of these two changes separately. In terms of the demand pattern for wild blueberries at the processor level, we did not find any statistically significant evidence that it had changed since 1995.

These data provide preliminary results and should continue to be collected in order to verify these findings. In addition, further improvement in the model is needed. This study essentially focuses on the demand for wild blueberries at the harvest. The processors, however, sell frozen blueberries throughout the year. In a future attempt to analyze demand at the processor level, factors— such as the supply of processed wild blueberries and market margins—will be incorporated in the modeling.

References

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