

**U.S. Fresh Mushroom Market Update  
with a Focus on Canadian Supplies**

**A Report Prepared for the Mushroom Council**

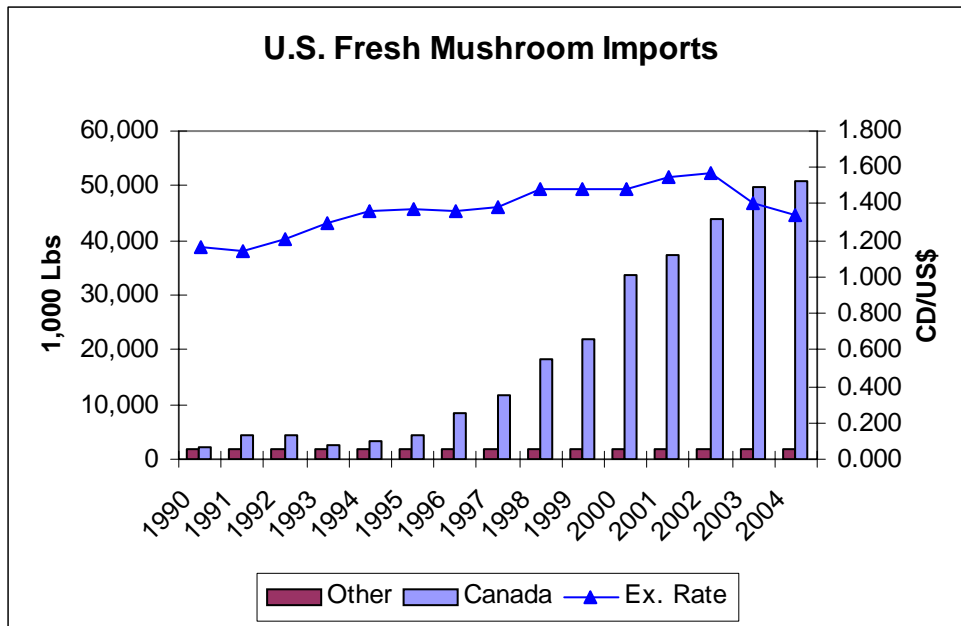
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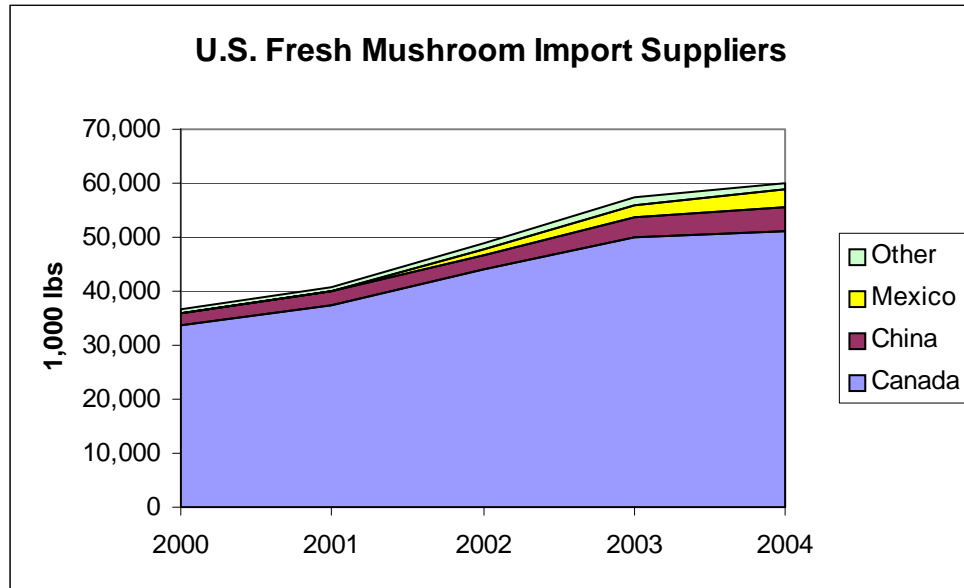
## U.S. Mushroom Fresh Market Update with a Focus on Canadian Supplies

The U.S. fresh mushroom market has seen an increased flow of imports in recent years. In 1990, imports accounted for less than one percent of domestic consumption. However, by 2003, imports had grown to account for approximately 7.4 percent of domestic consumption. Canada has been a leading supplier of the United States, accounting for between 78 to 96 percent of U.S. imports since 1990. The growth in imports has been attributed to steady growth in U.S. consumption and a strong U.S. dollar. Since 1990, the U.S.-Canadian exchange rate, measured in Canadian dollars per U.S. dollar, grew from an average 1.167 to a high of 1.569 in 2002 (please see figure 1). As the U.S. dollar strengthened, the U.S. dollar cost of Canadian mushrooms fell, thereby encouraging imports. Canada also benefited from its strategic location, which enhances trade opportunities for this highly perishable product.



**Figure 1. U.S. Fresh Mushroom Imports and Exchange Rate**

Although figure 1 suggests that other country suppliers play a fairly small role in the U.S. fresh mushroom market, there are some that appear to be of rising importance. In particular, China and Mexico are beginning to make inroads in the U.S. fresh mushroom market. Since 2000, Canada has seen its share of the U.S. fresh mushroom market fall from 92 percent to 85 percent in 2004. Meanwhile, China and Mexico's shares have grown to approximately 8 and 5 percent, respectively (see figure 2). Currently, Chinese farmers are being encouraged by their government to move agricultural production out of traditional commodities and into value added products, such as mushrooms.



**Figure 2. Leading U.S. Mushroom Import Suppliers**

The primary objective of this study is to develop forecasts on the Canadian fresh mushroom market. A model of the Canadian mushroom market is developed, which will be used in developing forecasts on area, production, consumption, exports, and imports of fresh mushrooms. The model is integrated with the U.S. mushroom market model to develop better forecasts for the U.S. market. A secondary objective of this study is to develop a series of simulations under alternative market assumptions for the U.S. mushroom market. In particular, changes in U.S. production levels and U.S. import levels are explored. The paper begins with a brief overview of the Canadian and U.S. market models. Then the outlook for the Canadian market is reviewed, followed by an updated analysis on the U.S. market outlook. Finally, the U.S. market simulations results are discussed.

### **Model Overview**

Both the U.S. and Canadian market models are based on market equilibrium models, where the grower price is allowed to vary to bring supply and demand conditions into balance. The models incorporate econometrically estimated functions representing producer decisions on area, trends in yield, producer decisions on allocating mushroom production to either fresh or processed markets, imports and exports of mushrooms, and domestic consumption of mushrooms. The two countries are linked through the U.S. grower price for fresh mushrooms. The form of these econometric functions is described in appendix table 1.

## Canadian Market Outlook

As shown in table 1, total Canadian mushroom production reached 189.6 million pounds in 2003 (the most current year for available statistics), an amount equal to about 22 percent of U.S. production in the same year. During the ten-year period 1994 through 2003, harvested area increased by 18 percent, growing an annual rate of about 2 percent per year. By comparison, area harvested in the U.S. grew by about 1 percent per year. Total mushroom production grew by approximately 4 percent per year. Meanwhile, U.S. output grew by 1.3 percent per year. Approximately 85 percent of Canadian mushroom production is now allocated to the fresh market, which is comparable to the allocation in the United States.

In 2003, approximately 31 percent of Canada's fresh production was sold in export markets. This marked a high point after growing from only 4 percent in 1994. The United States is the leading market for Canadian fresh exports accounting for approximately 85 percent of all exports in recent years (please see figure 3). However, in 2004, the share of exports destined for the U.S. market fell to 78 percent. Other leading export destinations include Japan, France, the Netherlands, and Switzerland. Canada's strong growth in mushroom exports during the 1990's was due in a large part to the strong value of the U.S. dollar, which made these imports more affordable, as Canadian mushrooms have generally been slightly more costly than U.S. mushrooms. For instance, between 1983 and 1992, Canadian fresh mushrooms were on average 8.6 cents per pound higher than U.S. fresh mushrooms, once converted to U.S. dollars. However, beginning in 1993, as the U.S. dollar strengthened, the U.S. dollar price of Canadian mushrooms dropped below the average U.S. fresh mushroom price (please see figure 4). Between 1993 and 2003, Canadian exports grew at an annual rate of 31 percent per year, growing from 4.6 million pounds in 1993 to 49.6 million pounds in 2003.

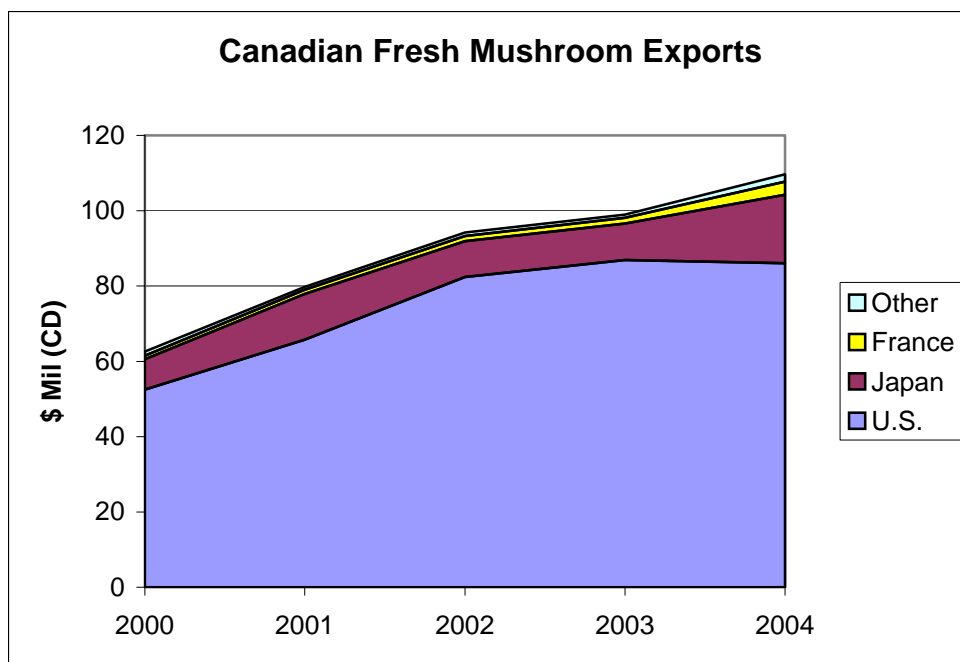
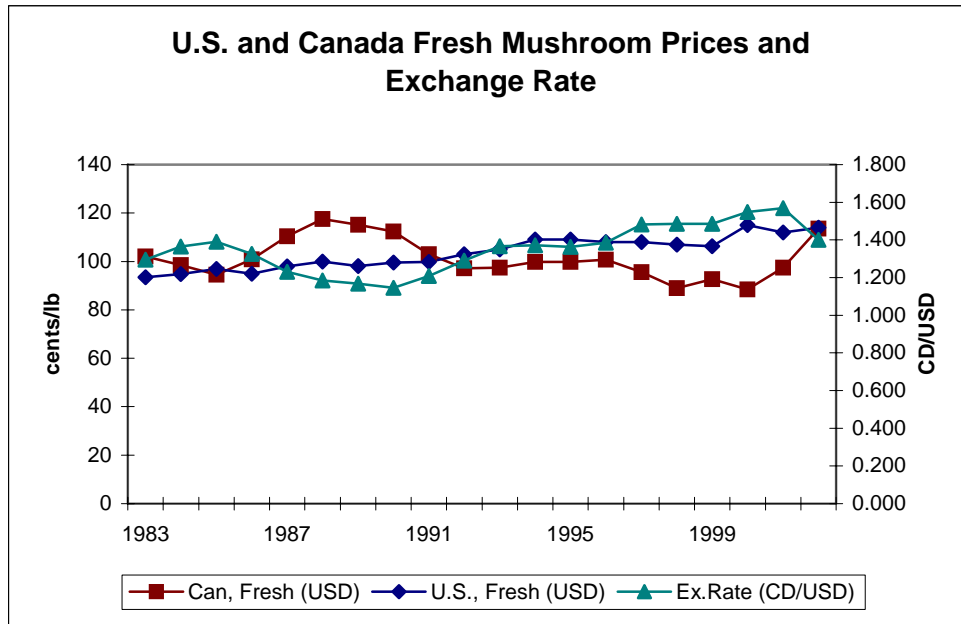


Figure 3. Canadian Fresh Mushroom Exports



**Figure 4. U.S. and Canada Fresh Mushroom Prices**

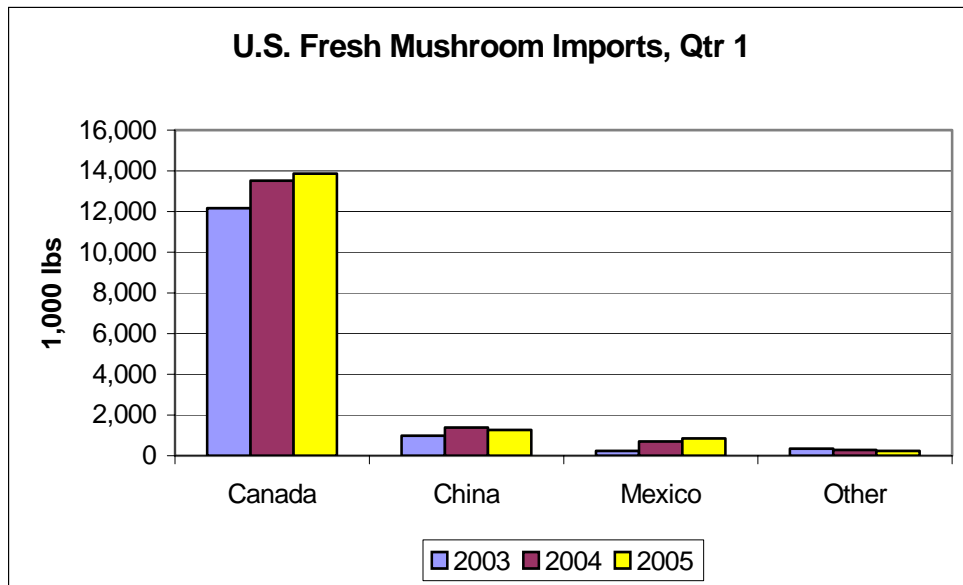
However, Canadian growth in exports is forecast to slow beginning in 2004, due partly to a depreciation of the U.S. dollar and slow forecasted growth in Canadian production (see table 2). Between 2005 and 2014, the exchange rate will trend downward from \$1.32 Canadian dollar per U.S. dollar to \$1.17. During this time, Canadian export growth will slow to about 4 percent per year. Meanwhile, production growth will slow to 1.7 percent per year. Growth in Canadian consumption of fresh mushrooms is expected to hold at about 4 percent per year. With continued steady, albeit slower growth in exports, steady growth in consumption, but slower production growth, domestic fresh mushroom prices in Canada are expected to increase, further eroding the competitiveness of Canadian mushrooms in the U.S. market.

### U.S. Market Outlook

Projections for the U.S. mushroom market are given in table 4. (Table 3 provides historical values on these supply and use statistics). Current projections for the U.S. fresh mushroom market are driven by a fairly aggressive assumption on domestic per capita consumption, which is forecast to grow by an average of 3.2 percent per year between 2005 and 2014. As shown in table 4, per capita consumption is forecast to grow from 2.67 pounds per capita in 2005 to 3.55 pounds per capita in 2014. With U.S. population forecast to grow at about 1 percent per year, total consumption will grow by about 4 percent per year, about the same as in Canada. Meanwhile, total fresh market mushroom production is forecast to grow at about 2.24 percent per year from 724 million pounds in 2005 to 882 million pounds in 2014. Although fairly modest in magnitude, exports are projected to grow by over 6 percent per year from 12.1 million pounds in 2005 to 21.1 million pounds in 2014. Canada is also the leading export destination for U.S. mushrooms. The expected depreciation in the value of the dollar is also expected to promote exports of U.S. mushroom. With moderate growth in domestic mushroom production and faster

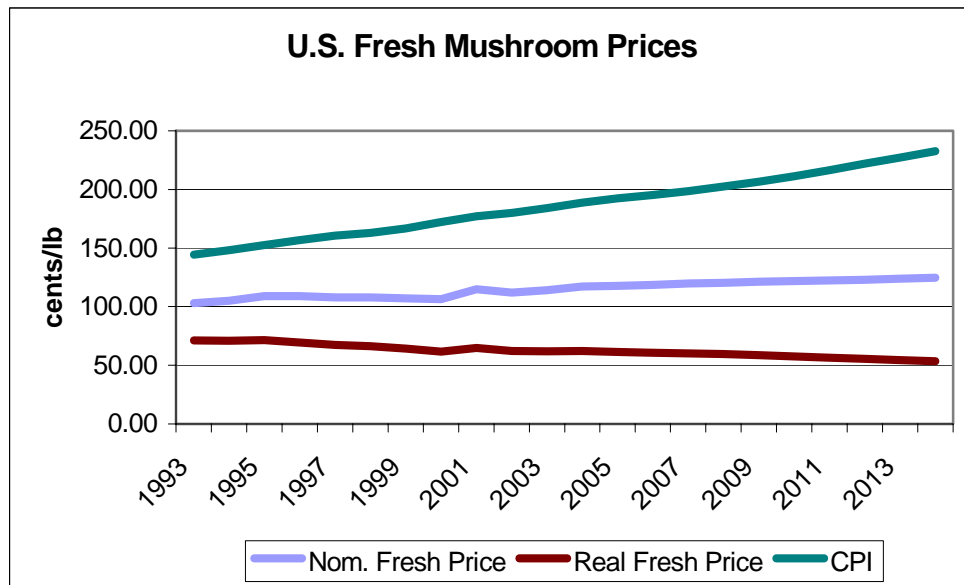
growth in consumption and exports, increasing import supplies will be required. Indeed, fresh mushroom imports are projected to grow from 79.3 million pounds in 2005 to 278.8 million pounds in 2014. As a share of domestic consumption, imports will grow from 10 percent in 2005 to 24 percent in 2014. This growth is anticipated even after accounting for the depreciation in the value of the dollar.

The next important question, however, is from where will these imports come? The projected U.S. import growth rates will outstrip anticipated production growth rates for Canada, the primary U.S. supplier. Even if Canada shipped all of its exports to the U.S., its share of this market would fall from 76 to 30 between 2005 and 2014. This suggests a substantial change in importer shares over time. Future production in Canada, though, is modeled on past production activities. The model cannot capture producer decisions to bring on large amounts of new production, such as through investment in new facilities. One must question whether Canadian producers would be content to see their share of the U.S. market erode. There are, however, some indicators to suggest a shift in importer shares is possible. As discussed earlier, Canada saw its share of the U.S. fresh mushroom import market fall from 92 percent in 2001 to 85 percent in 2004 once the dollar began depreciating. During the first quarter of 2005, Canada has held onto its 85 percent market share. China's shipments to the U.S. during the first quarter of 2005 are slightly lower than they were a year ago, yielding it a share of about 8 percent. However, Mexico has seen increased shipments during this time period, compared to a year ago and holds a 5.3 percent market share. These trends suggest that China and Mexico may be suppliers to watch in the future. The massive entrance China has made into other sectors of agriculture, such as the apple market, makes this a particular concern.



**Figure 5. First Quarter U.S. Fresh Mushroom Imports, 2003 – 2005**

Under these supply and demand conditions projected for the United States, the average fresh market grower price is expected to grow from about \$1.17 per pound to \$1.24 between. While it is perhaps encouraging to see growth in the U.S. grower price, this slow rate of growth is a potential concern, particularly since it follows a historic pattern of slow growth. Indeed, once the fresh grower price is adjusted for inflation using the consumer price index (CPI, 1982-84=100), we see that the real price of mushroom has been in decline at least since 1993 (please see figure 6). Over the period 1994 through 2004, the real price of fresh mushrooms declined by 1.21 cent per pound per year. During the forecast period 2005 through 2014, the real price continues to decline by 1.45 cents per pound per year. Declining real prices for agricultural product is not unusual, as technological advancements have reduced production costs and increased yields. These advances have allowed producers in some sectors to maintain profitable margins for their product. Nevertheless, concerns over excess supplies and the potential that product buyers, through the market power they may hold, may offer prices below competitive levels. The pattern exhibited in figure 6, though, raises questions on the pattern of prices that could emerge under alternative supply and demand conditions, which is explored in the next section.



**Figure 6. U.S. Fresh Mushroom Prices**

### Market Simulations

The value of the market equilibrium forecasting models is that it allows one to evaluate how the market would adjust to changes in market conditions. We use these models here to explore eight different scenarios. For each scenario we present the impacts of the change in market conditions on production, imports, consumption, exports, and, importantly, the equilibrium price in the U.S. fresh mushroom market. The resulting changes in these market variables are then compared to the base case. The eight scenarios evaluated include:

1. Area harvested (all mushrooms – fresh and processed) decreased by 10% each year below what market conditions would normally dictate;
2. Area harvested decreased by 10% each year and yield held constant at 2003 level – production reduced by 10% per year;
3. Area harvested and yield held to 2003 level;
4. Boost in demand by 2% per year;
5. One time boost in demand by 12% which is sustained;
6. One time, sustained boost in demand by 12%, while holding domestic production at 2003 levels;
7. One time, sustained boost in demand by 12%, while holding domestic production and imports at their 2003 levels;
8. Constant per capita consumption from 2004 onward at 2.60 pounds—a do nothing at all strategy.

### 1. Area Harvested Reduced by 10% Each Year

Under this scenario, the area harvested is reduced by 10 percent from the desired level of area under prevailing economic conditions. This reduction in area translates into an 82.5 million pound decrease in fresh mushroom in production in 2005, when compared to the base case solution. Production is down by 156 million pounds in 2014. With the decline in production, market price rises by 15 to 16 cents per pound. Over the forecast period, an increasing amount of area is set aside, as the desired area harvested rises with price. Domestic consumption declines in response to the increased price. An increase in imports only partially offsets the decrease in production. In spite of the rise in price, grower revenues fall, as the price increase is proportional less than the decrease in production. A \$21 million decline in revenues is experienced in 2005, when compared to the base forecast; revenue losses grow to \$84 million in 2014.

### 2. Area Harvested Reduced by 10% Each Year, Yield Held to 2003 Level

Growth in production attributable to increasing yields over the forecast period is muted in this scenario by holding yields to their 2003 level. The impact of these assumptions is consistent with expectations and the magnitude of changes is larger than those in the first simulation scenario. Price increases by between 19 to 28 cents per pound. Still, grower revenue falls between \$47 million to \$171 million.

### 3. Area Harvested and Yield held to their 2003 Level

Holding harvested area and yield to the 2003 level results in constant total mushroom production over the forecast period. However, growers still make decisions on the allocation of mushrooms to the fresh and processed market. Thus, fresh production is not necessarily fixed under this simulation. Again, the reduction in production results in a rising fresh mushroom market price, inducing growers to allocate more to this market. Prices rise by 5 to 69 cents per pound over the forecast period, compared to the base forecast. Decreases in production are actually lower under this scenario, as compared to simulations 1 and 2. Still, grower revenue falls by \$5 million to \$69 million.

#### 4. Boost Demand by 2% per Year

Domestic consumption is expanded by an additional 2 percent per year above the expected forecast trend. Under this simulation, production and imports rise with an increase in price. Price increases by about 2 cents per pound. The increase in price and increase in production results in an increase in grower revenue by \$17 million to \$21 million.

#### 5. Boost Demand 12% and Hold

In a simulation reminiscent of the demand expansion experienced in 1997 domestic consumption is increased by about 12% and held at this new level for the entire sample period. Price increases by approximately 7 cents per pound in the early years of the forecast period, but declines to about 5 cents per pound in later years, as increases in production push price back down. Still, grower revenue increases by \$73 million in the early years and by about 63 million in later years.

#### 6. Boost Demand 12% and Hold, Hold Total Mushroom Production to 2003 Level

Supply control policies are used in an effort to bolster the positive effects of the increase in demand. Coupled with the 12% increase in demand, domestic area and yield for total mushroom production are held to their 2003 levels. Price rises over the entire period, causing imports to rise. Domestic consumption actually falls in response to the higher prices. Grower revenue actually increases compared to the base case in the early years of the forecast, but later declines, as the decrease in production more than offsets the increase in price.

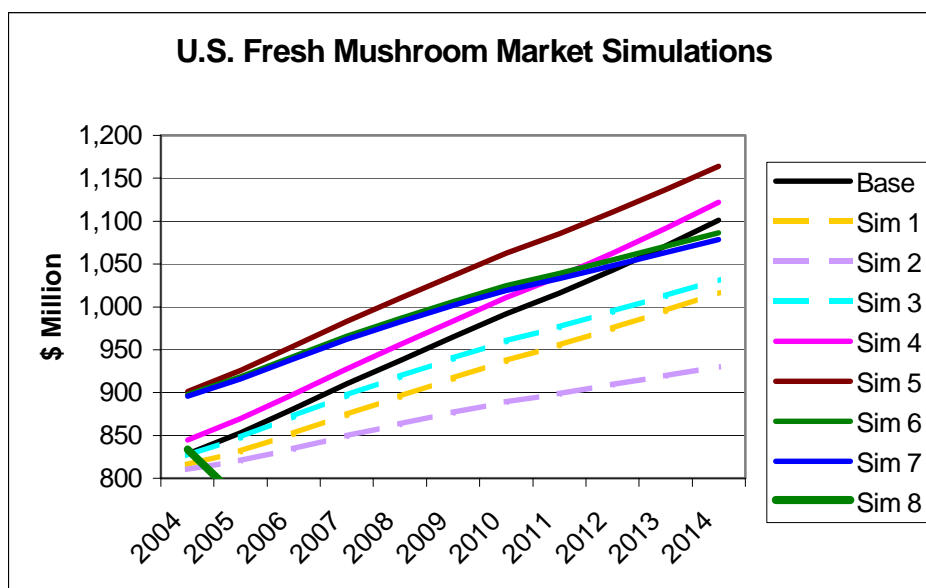
#### 7. Boost Demand 12% and Hold, Hold Total Mushroom Production and Imports to 2003 Level

The additional restriction on imports further accentuates the effects experienced in the prior simulation. Again, grower revenue initially rises, but then declines, when compared to the base simulation.

#### 8. Constant 2004 per Capita Consumption (2.60 pounds)—Do Nothing At All

The final simulation holds per capita consumption at its 2004 level of 2.60 pounds per capita. Some growth in total consumption is realized due to growth in the U.S. population. With such slow growth in domestic consumption, domestic production also slows and eventually declines. Imports grow slightly, but at a much slower rate compared to the base forecast. Under this soft demand conditions, grower price and revenue falls through the forecast period.

Figure 7 summarizes the impacts of the eight simulations on grower revenue. In summary, the simulations showed that both supply controls and increases in demand can increase price, as expected, but only the simulations with increases in demand resulted in an increase in grower revenue. The decrease in grower revenue resulting from a decrease in supply would be consistent with demand conditions described as price elastic. In these cases, consumption levels fall by an amount proportionally larger than the increase in price.



**Figure 7. U.S. Fresh Market Simulations**

Note: Base = Base forecast; Sim 1 = Area harvested reduced by 10% per year; Sim 2 = Area harvested reduced by 10% per year, yield held to 2003 level; Sim 3 = Area harvested and yield held to their 2003 levels; Sim 4 = Boost demand 2% per year; Sim 5 = Boost demand 12% and hold; Sim 6 = Boost demand 12% and hold, hold total mushroom production to 2003 level; Sim 7 = Boost demand 12% and hold; hold total mushroom production and imports to 2003 level; Sim 8 = Hold per capita consumption at 2004 level of 2.60 pounds (revenue falls below 800 million by 2006—off the chart).

**Table 1. Canada Fresh Mushroom Market and Macroeconomic Indicators (1993 – 2003)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<b>Domestic Production</b>											
Area (1,000 sq ft)	32,908	33,148	34,270	34,858	34,010	35,909	34,683	38,406	42,869	38,912	39,047
Yield (lbs per sq ft)	4.06	4.15	4.45	4.55	4.86	4.93	4.85	5.08	4.90	4.69	4.86
Production (1,000 lbs)	133,581	137,558	152,353	158,716	165,296	177,111	168,361	194,997	209,860	182,444	189,598
Fresh Allocation (1,000 lbs)	107,027	113,259	123,821	129,134	133,306	128,797	143,700	175,398	187,801	157,294	161,950
Proc. Alloc. (1,000 lbs)	26,554	24,301	28,532	29,581	31,993	48,316	24,663	19,599	22,061	25,150	27,648
<b>Fresh Market</b>											
Domestic Production (1,000 lbs)	107,027	113,259	123,821	129,134	133,306	128,797	143,700	175,398	187,801	157,294	161,950
Imports (1,000 lbs)	14,109	8,091	9,678	9,965	12,412	11,949	19,797	18,056	13,029	8,973	7,959
Total Supply (1,000 lbs)	121,136	121,350	133,500	139,099	145,717	140,746	163,498	193,454	200,830	166,267	169,909
Exports (1,000 lbs)	3,571	4,652	5,489	9,700	13,426	19,092	22,994	34,326	38,492	43,894	49,581
Domestic Consumption (1,000 lbs)	117,565	116,698	128,010	129,399	132,291	121,654	140,504	159,128	162,338	122,373	120,327
Fresh Grower Price (cents/lb)	125.38	133.14	136.94	136.07	139.46	141.76	132.25	137.62	136.94	152.84	159.03
Average Grower Price (Fresh and Processed)	113.97	122.67	126.16	125.18	126.27	127.62	126.22	131.82	130.65	141.29	145.50
<b>Macroeconomic Variables</b>											
Canada, Nominal National Income (\$ Billion)	727	771	810	837	883	915	982	1,076	1,107	1,155	1,215
Canada, GDP Deflator (1999=100)	89	91	94	95	97	98	100	102	103	102	104
Canada, 'Real National Income (\$ Billion)	752	788	810	824	858	894	943	993	1,012	1,045	1,063
Exchange Rate (CD/USD)	1.29	1.37	1.37	1.36	1.39	1.48	1.49	1.49	1.55	1.57	1.40
United States Per Capita Ann. Food Expend.	2,654	2,731	2,775	2,846	2,913	3,000	3,121	3,271	3,388	3,485	3,653
United States, CPI (1982-84 = 100)	144	148	152	157	161	163	167	172	177	180	184
Unites States, Real Disp. Inc. (Base = 2000)	5,594	5,746	5,906	6,081	6,296	6,664	6,862	7,194	7,333	7,560	7,734

**Table 2. Canada Fresh Mushroom Market and Macroeconomic Outlook (2004-2014)**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Domestic Production</b>											
Area (1,000 sq ft)	40,351	41,348	41,865	42,495	43,142	43,853	44,562	45,277	46,260	47,069	47,830
Yield (lbs per sq ft)	4.98	5.08	5.12	5.18	5.24	5.31	5.38	5.44	5.54	5.61	5.69
Production (1,000 lbs)	201,117	210,028	214,536	220,206	226,147	232,797	239,537	246,428	256,178	264,267	271,959
Fresh Allocation (1,000 lbs)	177,451	183,853	185,128	191,538	197,798	205,396	212,785	220,496	226,719	234,563	241,750
Proc. Alloc. (1,000 lbs)	23,666	26,175	29,409	28,668	28,349	27,400	26,753	25,932	29,459	29,704	30,209
<b>Fresh Market</b>											
Domestic Production (1,000 lbs)	177,451	183,853	185,128	191,538	197,798	205,396	212,785	220,496	226,719	234,563	241,750
Imports (1,000 lbs)	3,914	10,798	12,416	15,325	17,439	19,625	21,751	23,915	26,531	28,129	29,903
Total Supply (1,000 lbs)	181,365	194,651	197,544	206,863	215,237	225,021	234,535	244,411	253,251	262,692	271,654
Exports (1,000 lbs)	55,392	60,580	65,206	69,258	72,664	75,400	77,420	79,629	81,594	83,332	84,862
Domestic Consumption (1,000 lbs)	125,973	134,071	132,338	137,605	142,573	149,621	157,116	164,782	171,656	179,359	186,792
Fresh Grower Price (cents/lb)	166.30	165.96	161.20	165.33	168.21	171.97	174.82	177.78	185.55	186.36	188.74
Average Grower Price (Fresh and Processed)	150.46	150.14	145.76	149.57	152.22	155.68	158.31	161.03	168.18	168.93	171.12
<b>Macroeconomic Assumptions</b>											
Canada, Nominal National Income (\$ Billion)	1,281	1,341	1,405	1,472	1,543	1,622	1,705	1,788	1,870	1,951	2,033
Canada, GDP Deflator (1999=100)	108	109	111	114	117	118	120	122	124	126	129
Canada, Real National Income (\$ Billion)	1,095	1,133	1,171	1,208	1,246	1,284	1,324	1,364	1,402	1,438	1,473
Exchange Rate (CD/USD)	1.34	1.32	1.28	1.23	1.21	1.20	1.19	1.19	1.18	1.18	1.17
United States Per Capita Ann. Food Expend.	3,888	3,956	4,018	4,095	4,177	4,270	4,380	4,506	4,641	4,778	4,931
United States, CPI (1982-84 = 100)	189	192	195	199	202	207	211	217	222	227	233
United States, Real Disp. Inc. (Base = 2000)	7,987	8,192	8,434	8,692	8,946	9,213	9,489	9,760	10,068	10,405	10,775

**Table 3. U.S. Mushroom Market (1993 – 2003)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
<b>Domestic Production</b>											
CA Area (1,000sq ft)	21,822	21,889	22,401	23,028	24,513	23,858	23,387	22,898	22,846	22,666	21,282
CA Yield (lbs per sq ft)	5.68	6.16	5.85	5.65	5.46	5.54	5.53	5.64	5.64	5.63	5.75
CA Production (1,000 lbs)	124,019	134,897	130,963	130,152	133,848	132,166	129,254	129,168	128,910	127,713	122,477
CA Fresh Alloc. (1,000 lbs)	15,391	20,190	14,698	14,859	15,121	13,140	12,498	118,052	119,428	119,175	117,832
CA Proc. Alloc. (1,000 lbs)	108,628	114,707	116,265	115,293	118,727	119,026	116,756	11,116	9,482	8,538	4,645
PA Area (1,000sq ft)	62,081	65,100	60,350	61,543	67,010	72,082	75,674	73,398	73,722	75,006	78,970
PA Yield (lbs per sq ft)	5.72	5.45	5.85	5.86	5.66	5.91	5.85	6.17	6.14	6.15	5.88
PA Production (1,000 lbs)	354,793	354,500	353,115	360,905	379,295	426,108	442,615	453,006	452,504	461,404	464,627
PA Fresh Alloc. (1,000 lbs)	184,913	182,250	186,818	206,384	256,881	296,756	310,590	343,450	348,210	357,293	363,305
PA Proc. Alloc. (1,000 lbs)	169,880	172,250	166,297	154,521	122,414	129,352	132,025	109,556	104,294	104,111	101,322
Other U.S. Area (1,000sq ft)	51,800	52,628	52,569	51,659	53,571	54,077	52,426	47,577	44,254	43,192	46,090
Other U.S. Yield (lbs per sq ft)	5.25	5.57	5.59	5.53	5.52	5.35	5.39	5.55	5.64	5.60	5.57
Other U.S. Production (1,000 lbs)	271,987	292,943	293,792	285,620	295,535	289,486	282,525	264,035	249,693	247,281	256,855
Other U.S. Fresh Alloc. (1,000 lbs)	223,295	235,275	234,041	232,103	245,929	242,051	241,195	231,128	222,330	220,780	219,723
Other U.S. Proc. Alloc. (1,000 lbs)	48,692	57,668	59,751	53,517	49,606	47,435	41,330	32,907	27,363	26,501	37,132
U.S. Area (1,000sq ft)	135,703	139,617	135,320	136,230	145,094	150,017	151,487	143,873	140,822	140,864	146,342
U.S. Yield (lbs per sq ft)	5.53	5.60	5.75	5.70	5.57	5.65	5.64	5.88	5.90	5.94	5.77
U.S. Production (1,000 lbs)	750,799	782,340	777,870	776,677	808,678	847,760	854,394	846,209	831,107	836,398	843,959
U.S. Fresh Alloc. (1,000 lbs)	516,836	532,232	537,124	553,780	621,537	657,833	668,541	692,630	689,968	697,248	700,860
U.S. Proc. Alloc. (1,000 lbs)	233,963	250,108	240,746	222,897	187,141	189,927	185,853	153,579	141,139	139,150	143,099
<b>Fresh Market</b>											
Domestic Production (1,000 lbs)	516,836	532,232	537,124	553,780	621,537	657,833	668,541	692,630	689,968	697,248	700,860
Imports (1,000 lbs)	3,246	4,960	7,032	11,324	18,756	23,182	29,797	36,683	40,719	48,737	57,285
Total Supply (1,000 lbs)	520,082	537,192	544,156	565,104	640,293	681,015	698,338	729,313	730,687	745,985	758,145
Exports (1,000 lbs)	11,644	9,879	10,347	11,669	14,521	13,801	15,172	13,025	11,257	7,069	6,807
Domestic Consumption (1,000 lbs)	512,773	532,983	539,299	561,840	628,747	677,555	693,733	729,612	737,160	747,472	778,006
Per Capita Fresh Demand (lbs)	1.97	2.02	2.02	2.08	2.30	2.45	2.48	2.58	2.58	2.59	2.67
CA Fresh Grower Price (cents/lb)	110.00	110.00	116.00	128.00	126.00	129.00	132.00	132.00	139.00	138.00	144.00

**Table 3. U.S. Mushroom Market (1993 – 2003)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
PA Fresh Grower Price (cents/lb)	87.90	87.40	87.10	86.00	84.90	85.90	84.50	85.90	95.20	86.40	90.30
Other U.S. Fresh Grower Price (cents/lb)	107.22	110.53	120.82	117.48	119.32	125.40	124.12	123.61	134.49	139.33	138.64
U.S. Fresh Grower Price (cents/lb)	103.00	105.00	109.00	109.00	108.00	108.00	107.00	106.34	115.00	112.00	114.00
<b>Processed Market</b>											
Domestic Production (1,000 lbs)	233,963	250,108	240,746	222,897	187,141	189,927	185,853	153,579	141,139	139,150	143,099
Imports (1,000 lbs)	233,800	293,100	234,200	279,800	276,200	210,700	271,400	280,100	256,900	260,000	265,070
Total Supply (1,000 lbs)	467,763	543,208	474,946	502,697	463,341	400,627	457,253	433,679	398,039	399,150	408,169
Exports (1,000 lbs)	23,700	30,800	9,500	7,600	11,400	8,500	14,200	13,000	12,400	12,200	14,030
Domestic Consumption (1,000 lbs)	448,383	511,875	464,545	494,311	451,058	389,940	441,975	418,537	385,723	404,039	437,082
Per Capita Proc Disappearance (lbs)	1.72	1.94	1.74	1.83	1.65	1.41	1.58	1.48	1.35	1.40	1.50
CA Proc Grower Price (cents/lb)	74.20	72.40	52.90	53.70	59.80	61.40	65.30	64.40	65.00	67.60	64.70
PA Proc Grower Price (cents/lb)	64.00	66.40	55.30	52.60	50.50	57.50	57.10	56.80	50.80	49.90	50.30
Other U.S. Proc Grower Price (cents/lb)	94.65	98.27	79.48	80.89	83.89	70.95	70.31	59.47	54.48	56.61	64.07
U.S. Proc Grower Price (cents/lb)	66.20	68.40	57.90	55.90	55.30	61.10	60.60	57.92	52.50	55.80	54.60
<b>Average Grower Prices (Fresh and Processed)</b>											
California (cents/lb)	106.00	104.00	109.00	120.00	119.00	122.00	126.00	126.18	133.56	133.29	141.00
Pennsylvania (cents/lb)	76.50	77.20	72.10	71.70	73.80	77.30	76.30	78.86	84.97	116.00	90.40
Other U.S. (cents/lb)	104.91	108.11	112.44	110.63	113.37	116.48	116.25	115.61	125.73	130.38	127.86
U.S. (cents/lb)	91.60	93.50	93.50	94.00	95.70	97.70	97.00	97.55	105.00	102.00	104.00

**Table 4. U.S. Mushroom Market Outlook (2004 – 2014)**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Domestic Production</b>											
CA Area (1,000sq ft)	21,291	21,299	21,311	21,324	21,335	21,345	21,354	21,360	21,369	21,379	21,391
CA Yield (lbs per sq ft)	5.67	5.76	5.84	5.92	6.00	6.08	6.16	6.24	6.32	6.40	6.48
CA Production (1,000 lbs)	120,814	122,581	124,380	126,185	127,973	129,763	131,550	133,315	135,101	136,898	138,708
CA Fresh Alloc. (1,000 lbs)	114,347	116,054	117,927	119,828	121,638	123,456	125,247	126,917	128,700	130,534	132,425
CA Proc. Alloc. (1,000 lbs)	6,468	6,527	6,452	6,357	6,335	6,307	6,303	6,398	6,401	6,364	6,283
PA Area (1,000sq ft)	79,229	79,443	79,649	79,853	80,027	80,177	80,306	80,406	80,491	80,568	80,643
PA Yield (lbs per sq ft)	6.01	6.14	6.27	6.40	6.53	6.66	6.78	6.91	7.04	7.17	7.30
PA Production (1,000 lbs)	476,165	487,703	499,240	510,820	522,257	533,581	544,795	555,845	566,818	577,755	588,691
PA Fresh Alloc. (1,000 lbs)	360,213	371,001	381,788	392,615	403,308	413,897	424,382	434,714	444,973	455,199	465,424
PA Proc. Alloc. (1,000 lbs)	115,952	116,702	117,452	118,205	118,948	119,684	120,413	121,131	121,845	122,556	123,266
Other U.S. Area (1,000sq ft)	44,231	44,253	44,297	44,346	44,363	44,378	44,389	44,389	44,392	44,396	44,402
Other U.S. Yield (lbs per sq ft)	6.07	6.20	6.33	6.46	6.59	6.72	6.84	6.97	7.10	7.23	7.36
Other U.S. Production (1,000 lbs)	268,484	274,327	280,312	286,339	292,175	297,999	303,795	309,522	315,271	321,028	326,797
Other U.S. Fresh Alloc. (1,000 lbs)	232,166	237,156	242,678	248,299	253,542	258,795	263,955	268,749	273,849	279,082	284,467
Other U.S. Proc. Alloc. (1,000 lbs)	36,318	37,171	37,633	38,040	38,633	39,204	39,840	40,773	41,422	41,945	42,330
U.S. Area (1,000sq ft)	144,751	144,995	145,257	145,523	145,725	145,900	146,048	146,154	146,251	146,343	146,435
U.S. Yield (lbs per sq ft)	5.98	6.10	6.22	6.35	6.47	6.59	6.71	6.83	6.96	7.08	7.20
U.S. Production (1,000 lbs)	865,463	884,611	903,932	923,344	942,405	961,343	980,140	998,682	1,017,190	1,035,680	1,054,196
U.S. Fresh Alloc. (1,000 lbs)	706,726	724,211	742,394	760,742	778,489	796,148	813,584	830,380	847,522	864,815	882,317
U.S. Proc. Alloc. (1,000 lbs)	158,738	160,400	161,538	162,602	163,916	165,196	166,556	168,302	169,668	170,865	171,879
<b>Fresh Market</b>											
Domestic Production (1,000 lbs)	706,726	724,211	742,394	760,742	778,489	796,148	813,584	830,380	847,522	864,815	882,317
Imports (1,000 lbs)	67,644	79,313	92,509	107,422	124,220	143,128	164,384	188,221	214,984	245,037	278,791
Total Supply (1,000 lbs)	774,370	803,524	834,903	868,165	902,709	939,275	977,968	1,018,601	1,062,506	1,109,853	1,161,108
Exports (1,000 lbs)	11,032	12,102	13,075	14,000	15,011	16,017	17,104	18,262	19,291	20,226	21,098
Domestic Consumption (1,000 lbs)	763,338	791,422	821,829	854,165	887,698	923,258	960,865	1,000,339	1,043,216	1,089,626	1,140,010
Per Capita Fresh Demand (lbs)	2.60	2.67	2.74	2.83	2.91	3.00	3.10	3.20	3.31	3.42	3.55
CA Fresh Grower Price (cents/lb)	151.08	152.10	153.83	155.68	157.13	158.61	159.98	160.80	162.12	163.66	165.44

**Table 4. U.S. Mushroom Market Outlook (2004 – 2014)**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
PA Fresh Grower Price (cents/lb)	93.74	94.07	94.63	95.23	95.70	96.18	96.63	96.90	97.32	97.82	98.40
Other U.S. Fresh Grower Price (cents/lb)	131.31	131.98	133.13	134.35	135.30	136.28	137.18	137.72	138.59	139.61	140.78
U.S. Fresh Grower Price (cents/lb)	117.23	117.76	118.67	119.65	120.41	121.19	121.91	122.34	123.04	123.85	124.78
<b>Processed Market</b>											
Domestic Production (1,000 lbs)	158,738	160,400	161,538	162,602	163,916	165,196	166,556	168,302	169,668	170,865	171,879
Imports (1,000 lbs)	284,413	278,849	266,890	252,379	249,359	247,062	245,468	244,510	244,390	244,086	243,285
Total Supply (1,000 lbs)	443,151	439,250	428,428	414,981	413,275	412,258	412,024	412,812	414,058	414,951	415,164
Exports (1,000 lbs)	14,809	15,110	15,222	15,263	15,278	15,283	15,284	15,284	15,284	15,284	15,283
Domestic Consumption (1,000 lbs)	428,341	424,139	413,206	399,717	397,997	396,975	396,740	397,528	398,774	399,667	399,881
Per Capita Proc Disappearance (lbs)	1.46	1.43	1.38	1.32	1.31	1.29	1.28	1.27	1.26	1.26	1.25
CA Proc Grower Price (cents/lb)	62.67	63.20	64.03	64.97	65.12	65.18	65.15	65.07	64.84	64.53	64.15
PA Proc Grower Price (cents/lb)	48.60	49.40	51.51	54.02	53.29	52.16	50.68	48.97	46.62	43.95	40.99
Other U.S. Proc Grower Price (cents/lb)	58.33	59.68	63.21	67.42	66.19	64.31	61.82	58.95	55.02	50.54	45.58
U.S. Proc Grower Price (cents/lb)	49.30	50.11	52.22	54.73	54.00	52.87	51.39	49.67	47.32	44.65	41.69
<b>Average Grower Prices (Fresh and Processed)</b>											
California (cents/lb)	145.09	146.14	147.93	149.85	151.30	152.77	154.11	154.92	156.20	157.68	159.40
Pennsylvania (cents/lb)	81.16	81.54	82.27	83.07	83.44	83.79	84.07	84.16	84.35	84.57	84.84
Other U.S. (cents/lb)	120.94	121.82	123.55	125.48	126.17	126.77	127.18	127.19	127.32	127.48	127.71
U.S. (cents/lb)	104.29	105.23	106.74	108.38	109.15	109.85	110.42	110.74	111.10	111.49	111.90

**Table 5. U.S. Fresh Mushroom Market Simulations**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Base Scenario</b>											
Domestic Production (1,000 lbs)	706,726	724,211	742,394	760,742	778,489	796,148	813,584	830,380	847,522	864,815	882,317
Imports (1,000 lbs)	67,644	79,313	92,509	107,422	124,220	143,128	164,384	188,221	214,984	245,037	278,791
Consumption (1,000 lbs)	763,338	791,422	821,829	854,165	887,698	923,258	960,865	1,000,339	1,043,216	1,089,626	1,140,010
Exports (1,000 lbs)	11,032	12,102	13,075	14,000	15,011	16,017	17,104	18,262	19,291	20,226	21,098
Grower Price, Fresh (cents/lb)	117.23	117.76	118.67	119.65	120.41	121.19	121.91	122.34	123.04	123.85	124.78
Grower Revenue (\$ Million)	828	853	881	910	937	965	992	1,016	1,043	1,071	1,101
<b>1. Area Harvested Reduced by 10% each Year</b>											
Domestic Production (1,000 lbs)	648,212	641,724	642,937	648,865	657,153	667,244	678,312	689,486	701,436	713,759	726,366
Imports (1,000 lbs)	69,062	82,841	98,728	116,852	137,358	160,469	186,443	215,539	248,146	284,677	325,599
Consumption (1,000 lbs)	708,456	715,499	732,144	755,588	783,554	815,842	851,823	890,915	934,385	982,215	1,034,760
Exports (1,000 lbs)	8,818	9,067	9,521	10,128	10,956	11,871	12,931	14,111	15,197	16,220	17,205
Grower Price, Fresh (cents/lb)	125.87	129.6	132.54	134.75	136.23	137.37	138.19	138.54	139.01	139.48	139.97
Grower Revenue (\$ Million)	816	832	852	874	895	917	937	955	975	996	1,017
<b>2. Area Harvested Reduced by 10% each Year, Yield held</b>											
Domestic Production (1,000 lbs)	630,731	614,314	605,890	602,208	600,814	601,079	602,157	603,187	604,821	606,654	608,595
Imports (1,000 lbs)	69,489	83,965	100,832	120,243	142,368	167,461	195,815	227,726	263,624	303,970	349,279
Consumption (1,000 lbs)	692,069	690,222	698,526	713,945	734,129	758,842	787,470	819,473	856,145	897,509	943,966
Exports (1,000 lbs)	8,150	8,056	8,196	8,507	9,052	9,698	10,502	11,440	12,301	13,114	13,907
Grower Price, Fresh (cents/lb)	128.47	133.55	137.71	141.08	143.66	145.85	147.66	148.96	150.31	151.59	152.84
Grower Revenue (\$ Million)	810	820	834	850	863	877	889	899	909	920	930

**Table 5. U.S. Fresh Mushroom Market Simulations**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>3. Area Harvested and Yield held to 2003 Levels</b>											
Domestic Production (1,000 lbs)	691,524	695,168	699,288	703,395	707,022	710,530	713,793	716,468	719,382	722,316	725,287
Imports (1,000 lbs)	68,016	80,417	94,736	111,198	130,004	151,418	175,718	203,182	234,209	269,221	308,693
Consumption (1,000 lbs)	749,089	764,556	782,500	802,605	824,457	848,778	875,635	904,967	938,204	975,513	1,017,358
Exports (1,000 lbs)	10,451	11,028	11,523	11,989	12,569	13,170	13,876	14,684	15,387	16,024	16,622
Grower Price, Fresh (cents/lb)	119.5	121.95	124.73	127.49	129.94	132.3	134.5	136.3	138.27	140.24	142.25
Grower Revenue (\$ Million)	826	848	872	897	919	940	960	977	995	1,013	1,032
<b>4. Boost Demand by 2% per Year</b>											
Domestic Production (1,000 lbs)	710,070	727,835	746,242	764,772	782,665	800,444	817,981	834,860	852,075	869,431	886,989
Imports (1,000 lbs)	67,928	79,911	93,456	108,758	125,991	145,386	167,187	191,633	219,076	249,891	284,496
Consumption (1,000 lbs)	767,408	796,081	827,059	859,965	894,079	930,248	968,500	1,008,665	1,052,295	1,099,531	1,150,821
Exports (1,000 lbs)	10,589	11,664	12,639	13,566	14,577	15,583	16,669	17,828	18,856	19,792	20,663
Grower Price, Fresh (cents/lb)	118.96	119.47	120.37	121.34	122.11	122.89	123.6	124.04	124.73	125.54	126.48
Grower Revenue (\$ Million)	845	870	898	928	956	984	1,011	1,036	1,063	1,091	1,122
<b>5. Boost Demand by 12% and Hold</b>											
Domestic Production (1,000 lbs)	721,580	739,890	758,587	777,210	795,043	812,638	829,883	846,378	863,118	879,913	896,822
Imports (1,000 lbs)	68,903	81,930	96,601	113,121	131,676	152,510	175,881	202,039	231,354	264,214	301,056
Consumption (1,000 lbs)	781,418	811,608	843,934	878,088	913,404	950,766	990,233	1,031,663	1,076,621	1,125,268	1,178,069
Exports (1,000 lbs)	9,065	10,213	11,254	12,243	13,315	14,382	15,531	16,754	17,851	18,859	19,809
Grower Price, Fresh (cents/lb)	124.9	125.13	125.78	126.5	127.03	127.57	128.04	128.23	128.66	129.18	129.81
Grower Revenue (\$ Million)	901	926	954	983	1,010	1,037	1,063	1,085	1,110	1,137	1,164

**Table 5. U.S. Fresh Mushroom Market Simulations**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>6. Boost Demand by 12% and Hold, Hold Domestic Production to 2003 Level</b>											
Domestic Production (1,000 lbs)	703,882	707,318	711,209	715,061	718,405	721,600	724,519	726,814	729,308	731,780	734,244
Imports (1,000 lbs)	69,332	83,180	99,093	117,309	138,044	161,579	188,215	218,246	252,097	290,216	333,105
Consumption (1,000 lbs)	764,819	781,490	800,759	822,317	845,767	871,844	900,631	932,084	967,654	1,007,529	1,052,196
Exports (1,000 lbs)	8,395	9,008	9,543	10,053	10,682	11,336	12,102	12,976	13,752	14,468	15,154
Grower Price, Fresh (cents/lb)	127.52	129.83	132.45	135.05	137.3	139.45	141.42	142.97	144.65	146.31	147.97
Grower Revenue (\$ Million)	898	918	942	966	986	1,006	1,025	1,039	1,055	1,071	1,086
<b>7. Boost Demand 12% and Hold, Hold Domestic Production and Imports to 2003 Levels</b>											
Domestic Production (1,000 lbs)	703,588	706,920	710,725	714,500	717,751	720,854	723,665	725,840	728,240	730,635	733,035
Imports (1,000 lbs)	69,299	83,100	98,949	117,087	137,723	161,138	187,627	217,481	251,124	289,002	331,614
Consumption (1,000 lbs)	766,081	783,213	802,868	824,781	848,668	875,185	904,485	936,515	972,558	1,012,831	1,057,842
Exports (1,000 lbs)	6,807	6,807	6,807	6,807	6,807	6,807	6,807	6,807	6,807	6,807	6,807
Grower Price, Fresh (cents/lb)	127.32	129.56	132.13	134.67	136.86	138.95	140.85	142.31	143.93	145.54	147.16
Grower Revenue (\$ Million)	896	916	939	962	982	1,002	1,019	1,033	1,048	1,063	1,079
<b>8. Hold Per Capita Consumption at 2004 Level of 2.60 Pounds</b>											
Domestic Production (1,000 lbs)	707,808	707,897	707,781	707,409	706,753	705,887	704,785	703,375	701,587	699,383	696,745
Imports (1,000 lbs)	67,736	78,031	88,290	98,594	109,024	119,647	130,517	141,681	153,180	165,055	177,349
Consumption (1,000 lbs)	764,655	771,663	778,643	785,580	792,447	799,373	806,300	813,237	820,208	827,204	834,214
Exports (1,000 lbs)	10,889	14,266	17,428	20,423	23,331	26,161	29,002	31,819	34,559	37,234	39,880
Grower Price, Fresh (cents/lb)	117.79	109.32	101.69	94.59	87.95	81.62	75.49	69.45	63.47	57.50	51.51
Grower Revenue (\$ Million)	834	774	720	669	622	576	532	489	445	402	359

## Appendix Table 1: Canadian Fresh Mushroom Market Model: Estimated Equations

<b>Equations</b>	
<b>Dependent Variables</b>	<b>Independent Variables</b>
Area Harvested (National)	Lagged Area Harvested Average Grower Price (fresh and processed)
Yield (National)	Lagged Yield Average Grower Price (fresh and processed)
Share Allocated to Fresh Market	Grower Price, Fresh Total Production
Average Grower Price	Grower Price, Fresh
Domestic Consumption, Fresh	Real Grower Price Nominal National Income (GDP)
Imports, Fresh	Grower Price (Canada), Fresh Grower Price (U.S.), Fresh Exchange Rate (CD/USD) Real National Income (Real GDP)
Exports, Fresh	Lagged Exports Grower Price (U.S.), Fresh

### Identities (Defined Relationships)

$$\text{Production} = \text{Area Harvested} \times \text{Yield}$$

$$\text{Allocation to Fresh Market} = (\text{Share Allocated to Fresh Market}) \times \text{Production}$$

$$\text{Allocation to Processed Markets} = \text{Production} - (\text{Allocation to Fresh Market})$$

Canadian simulation model solves for fresh mushroom grower price; U.S. price enters Canadian model while U.S. simulation model is solving for U.S. fresh and processed grower prices.

The Canadian fresh mushroom market equilibrium is achieved when the fresh grower price is adjusted so that the following balance is achieved:  $\text{Production} + \text{Imports} = (\text{Domestic Consumption}) + \text{Exports}$

Data Sources: All data used in estimating the market equilibrium model for Canada were obtained from Statistics Canada.

**Appendix Table 2: U.S. Mushroom Market Model: Estimated Equations**

<b>Equations</b>	
<b>Dependent Variables</b>	<b>Independent Variables</b>
Harvested Area (California, Pennsylvania, Other U.S.)	Lagged Area (Regional) Average Grower Price (Regional)
Yield (Regional) (California, Pennsylvania, Other U.S.)	Time Trend
Fresh Allocation (California, Pennsylvania, Other U.S.)	Grower Price, Fresh (Regional) Production (Regional)
Imports, Fresh	Grower Price, Fresh (National) Lagged Imports
Exports, Fresh	Grower Price, Fresh (National) Real GDP (Canada)
Imports, Processed	Exchange Rate (CD/USD) Real National Income
Exports, Processed	Log(Lagged Exports, Processed) Log(Real GDP (Canada))
Per Capita Consumption, Fresh (National)	Grower Price, Fresh (National) Real National Income
Per Capita Consumption, Processed (National)	Grower Price, Processed (National) Real National Income
Average Grower Price (National)	Grower Price, Fresh (National) Grower Price, Processed (National) Time Trend
Fresh Grower Price (Regional) (California, Pennsylvania, Other U.S.)	Grower Price, Fresh (National)
Processed Grower Price (Regional) (California, Pennsylvania, Other U.S.)	Grower Price, Processed (National)
Average Grower Price (Regional) (California, Pennsylvania, Other U.S.)	Fresh Grower Price (Regional) Processed Grower Price (Regional)

**Identities (Defined Relationships)**

$$\text{Regional Production} = \text{Area Harvested} \times \text{Yield}$$

$$\text{Regional Processed Allocation} = (\text{Regional Production}) - (\text{Fresh Allocation})$$

$$\text{Domestic Fresh Consumption} = (\text{Per Capita Fresh Consumption}) \times (\text{U.S. Population})$$

$$\text{Domestic Processed Consumption} = (\text{Per Capita Processed Consumption}) \times (\text{U.S. Population})$$

U.S. simulation model solves for national fresh mushroom grower price and national processed grower price.

The U.S. fresh and processed mushroom market equilibriums are achieved when the respective fresh grower price and processed grower price are adjusted so that the following balance is achieved in each market:

$$\text{Production} + \text{Imports} = (\text{Domestic Consumption}) + \text{Exports}$$

Data Sources: Data on production, production area, and grower prices obtained for the USDA's National Agricultural Statistical Service; data on consumption obtained from the USDA's Economic Research Service; data on imports and exports obtained for the U.S. Commerce Department.