Staff Paper

U.S. Fresh and Pickling Cucumber Markets

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As part of an effort to estimate the potential impact of downy mildew to U.S. growers of cucumbers, this report reviews historical trends in production and markets for cucumbers including slicing and pickling cucumbers.

First, cucumber can be grown in all regions of the US and many regions outside the US. Climate variation in the US allows for US cucumber production to take place nearly year-round. However, cucumber production is limited by several factors. Cucumbers can be grown in a variety of soils as long as the soils are well drained, high in moisture content, and provides sufficient access to plant nutrients.

In the US, the most common cucumber cultivars share common parentage. This uniformity represents a significant challenge to pest management for new and adapting virulence. To avoid the buildup of soil pathogens, careful crop rotations should be considered. It is generally preferable to avoid planting cucumbers on soils planted to cucurbits (muskmelon, cucumber, watermelon, squash, pumpkin or gourd) within the prior two to three years. Corn, small grains and sod make excellent rotation crops in the absence of triazine herbicide.

Cucumbers are warm-season crop and are sensitive to cold and excessive heat. Hence, planting takes place during periods where soil has sufficiently warmed, there exist no danger of frost over and there is minimal threat of excessive heat. Many growers choose to install irrigation systems for fresh market cucumbers, though processing cucumbers are generally rain-fed. Climate influences variety choices for planting. Varieties planted should be consistent with climate, soil conditions as well as marketing consideration. For many regions, pickling cucumbers fit within a double cropping system, because of their quick rate of maturation. Yields are generally lower for processing cucumbers than for fresh-market cucumbers, which generally command a relatively higher price. Processing cucumbers are usually grown on bare ground and planted under contract with processors. Fresh market cucumber growers generally employ plastic mulch to expedite soil warming and reduce weed pressures.

International Cucumber Production

Table 1 shows the top 14 cucumber and gherkin[1] producing countries and their rankings from largest producer to smallest. Production is measured in metric tonnes.[2] As evident, China stands out as the world's largest producer of cucumbers. Since 2000, the top three producers have retained their ranking. The U.S. has gradually decreased production since 2000, reducing output by about 20 percent from 2000 level of just under 1.11 million tonnes. Japan, is also reducing production while Spain shows steady increases since 2000.

[1] Gherkin is a small cucumber.

[2] A metric tonne is approximately equal to 1.102 short tons

Table 1. 2010 Top 15 Cucumber and Gherkin Producing Countries

	2000		2005		2010	
	Tonnes	Rank	Tonnes	Rank	Tonnes	Rank
China	19,869,181	1	30,053,118	1	45,711,326	1
Iran	1,342,000	3	1,720,690	3	1,811,630	2
Turkey	1,825,000	2	1,745,000	2	1,739,190	3
Russian Federation	1,192,000	4	1,414,010	4	1,161,870	4
United States of America	1,106,350	5	960,333	5	880,530	5
Ukraine	709,000	7	687,900	6	860,100	6
Spain	425,000	11	485,170	11	682,900	7
Egypt	566,980	8	600,000	8	631,408	8
Japan	766,500	6	674,700	7	587,800	9
Indonesia	423,282	12	552,891	9	547,141	10
Mexico	459,261	9	475,443	12	477,366	11
Poland	356,000	15	468,467	13	462,245	12
Netherlands	410,000	13	440,000	14	435,000	13
Iraq	390,000	14	526,000	10	432,500	14

Source: FAOSTAT Data, 2011

Figure 1 shows U.S. annual trade in cucumbers and gherkins from 1998 to 2010 in tonnes. Evident is that imports have steadily increased while exports have remained relatively constant over this span, though 2006 showed a significant decline.

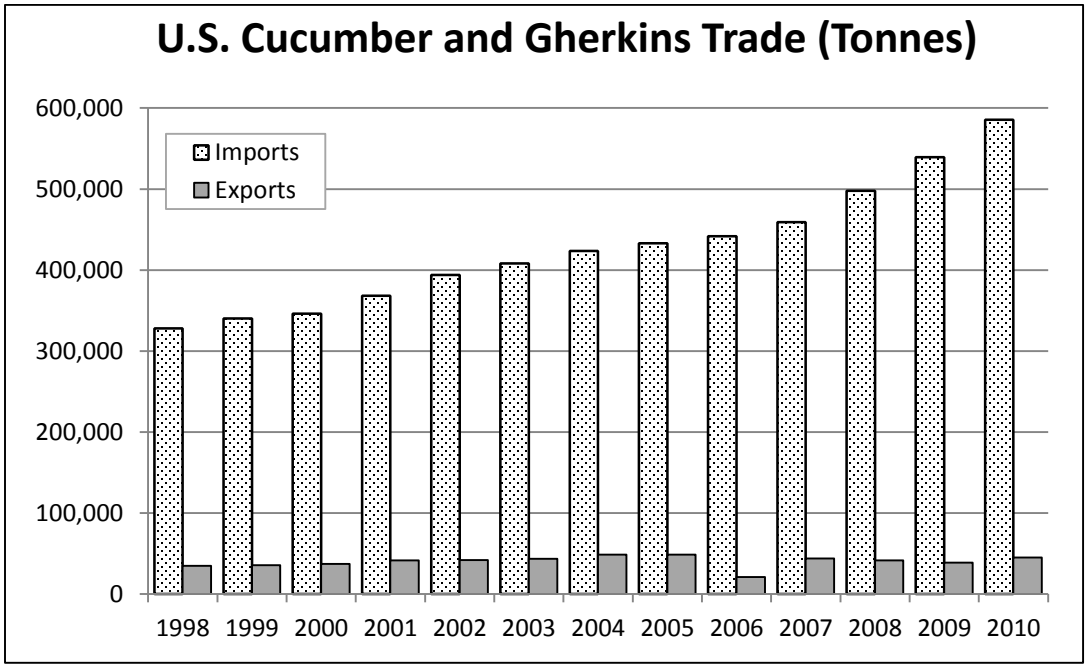

Figure 1. Trends in U.S. Cucumber and Gherkins Trade 1998-2010
Source: *FAOSTAT Data, 2011*

Table 2 shows the top U.S. trading countries for cucumbers and gherkins. For the U.S. Mexico and Canada are the top suppliers of imported cucumbers and gherkins. Honduras and the Dominican Republic are also important suppliers. Canada and Mexico are top destinations for U.S. produced

cucumbers and gherkins, but Canada is, by far, the dominate destination. Other export destinations of varies from year to year.

Table 2. Top US Import and Export Markets for Cucumber and Gherkin

Imports (Tonnes)					Exports (Tonnes)			
	2000	2005	2010			2000	2005	2010
Mexico	312,307	342,521	497,366		Canada	36,917	48,523	43,761
Canada	22,542	48,781	64,550		Mexico	290	48	890
Honduras	6,020	39,241	18,090		China, Hong Kong SAR	24	-	272
Dominican Republic	1,025	794	3,704		Republic of Korea	88	16	23
Spain	1,481	1,278	529		China	-	105	-
Guatemala	1,883	-	-		Belize	-	5	81
Netherlands	468	447	534		Honduras	-	50	-
All Others	334	65	803		All Others	10	27	36

Source: FAOSTAT Data, 2011

By adding net imports (**Table 2**) to U.S. domestic production (Table 1), in 2010, the U.S. net supply of cucumbers and gherkins was approximately 1.42 million tonnes in 2010. Just over 5 percent of U.S. production was exported, and imports accounted for 41 percent of net tonnage. Since 1998, net imports (imports-exports) have grown while U.S. domestic production had declined.

Domestic Cucumber Production and Sales

In 2011, the top seven fresh cucumber-producing states make up approximately 92 percent of total U.S. production, while the top seven process cucumber-producing states made of 76 percent. Top fresh market cucumber production states (See **Table 3**) include Florida (33.5%) Georgia (18.0%), North Carolina (10.5%) and Michigan (9.9%). New Jersey, California and New York are also important states, where each state had approximately seven percent of the U.S. production. Michigan (36.7%) dominated the U.S. processed cucumber market in production followed by, Florida (17.5%) and North Carolina (7.2%) as the largest producing states, with North Carolina and Wisconsin making large contributions of around seven percent each.

Table 3. State Shares of Fresh and Processed Cucumber Production: 2011

Fresh			Processed	
Florida	33.5%		Michigan	36.7%
Georgia	18.0%		Florida	17.5%
North Carolina	10.5%		North Carolina	7.2%
Michigan	9.9%		Wisconsin	6.4%
New Jersey	7.0%		Ohio	3.7%
California	6.6%		Texas	3.3%
New York	6.5%		South Carolina	1.2%
South Carolina	4.8%		Indiana	0.5%
Other States	3.3%		Other States	23.4%

Source: USDA 2011

While U.S. cucumber production trends show steady decline since 1998, nominal revenues remain mostly constant. As shown in **Figure 2**, fresh market cucumber production has experienced greater declines than processing pickles. On average, annual change in production of fresh cucumbers declined 3.1 percent, while only 1.4 percent for pickling. However, as indicated in **Figure 3**, sales revenues have remained mostly flat with average annual change in fresh sales reflecting 0.9 percent decline, while processed generated 1.9 percent growth.

Figure 4 shows production values on a per unit basis in both nominal (current) prices and inflation-adjusted prices. Nominal rates, the price received before adjusting for inflation, of both slicers and picklers have increased since 1998, with average annual growth rates of 2.2 and 3.3 percent, respectively. Nominal price growth remains stable except for in 2010 for fresh market cucumbers. In 2010, average seasonal fresh cucumber prices dipped by 10 percent. This is also associated with a substantial decline in production by weight of nearly 20 percent (Not shown).

The light shaded lines in **Figure 4** show the inflation-adjusted prices. Adjusting for inflation shows price growth is much more modest. Real prices of fresh market cucumbers have not kept pace with inflation, exhibiting an average annual decline of 0.3 percent. However, real prices of picklers have modestly exceeded inflation, growing 0.74 percent on average per year. Ultimately, cucumber prices of both segments have mostly kept pace with inflation from 1998 to 2011.

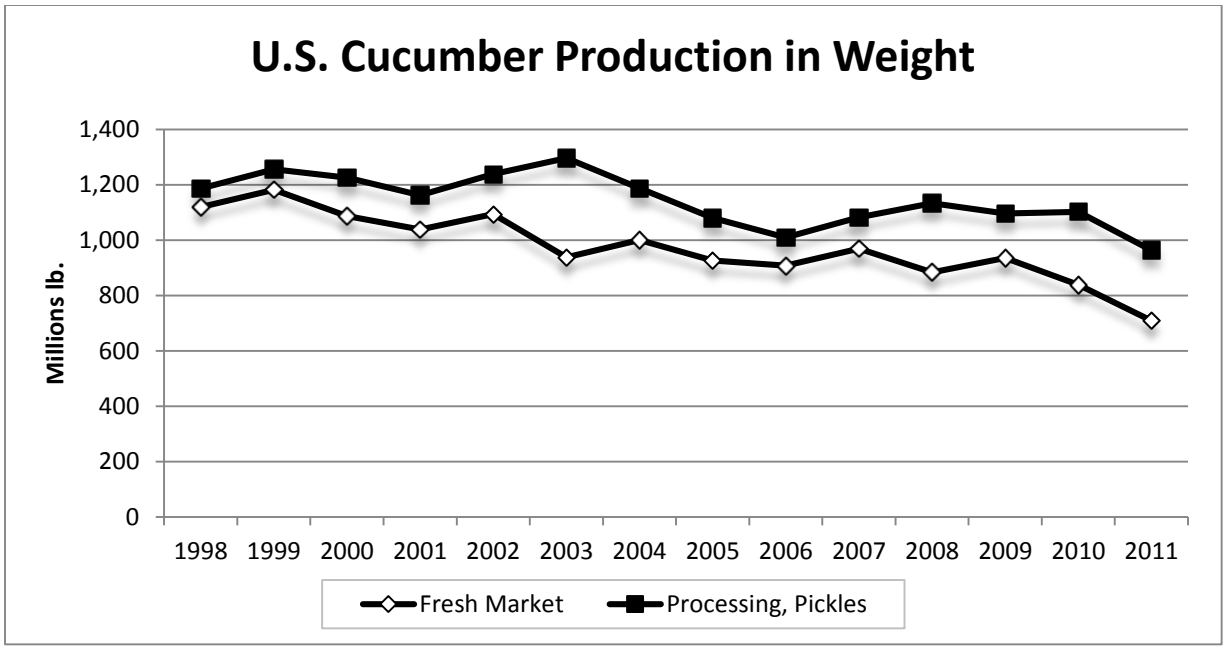

Figure 2. Cucumber Production, Fresh and Processed, 1998 2011
Source: USDA 2011

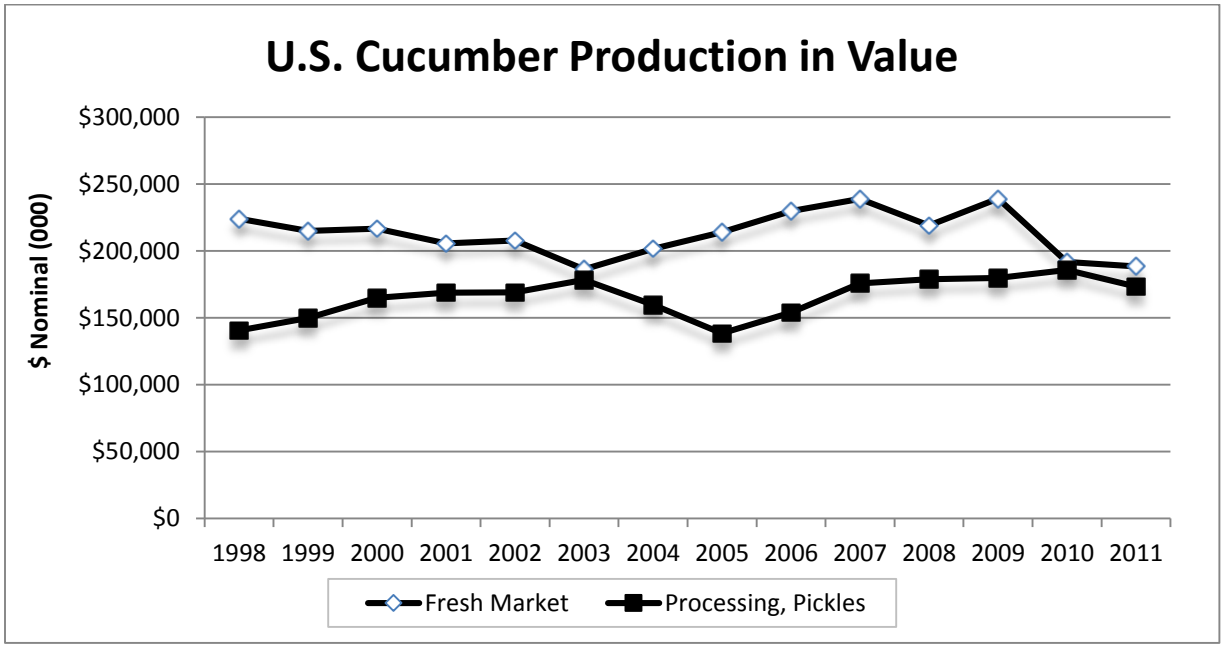

Figure 3. Cucumber Production, Fresh and Processed, 1998 2011
Source: USDA 2011

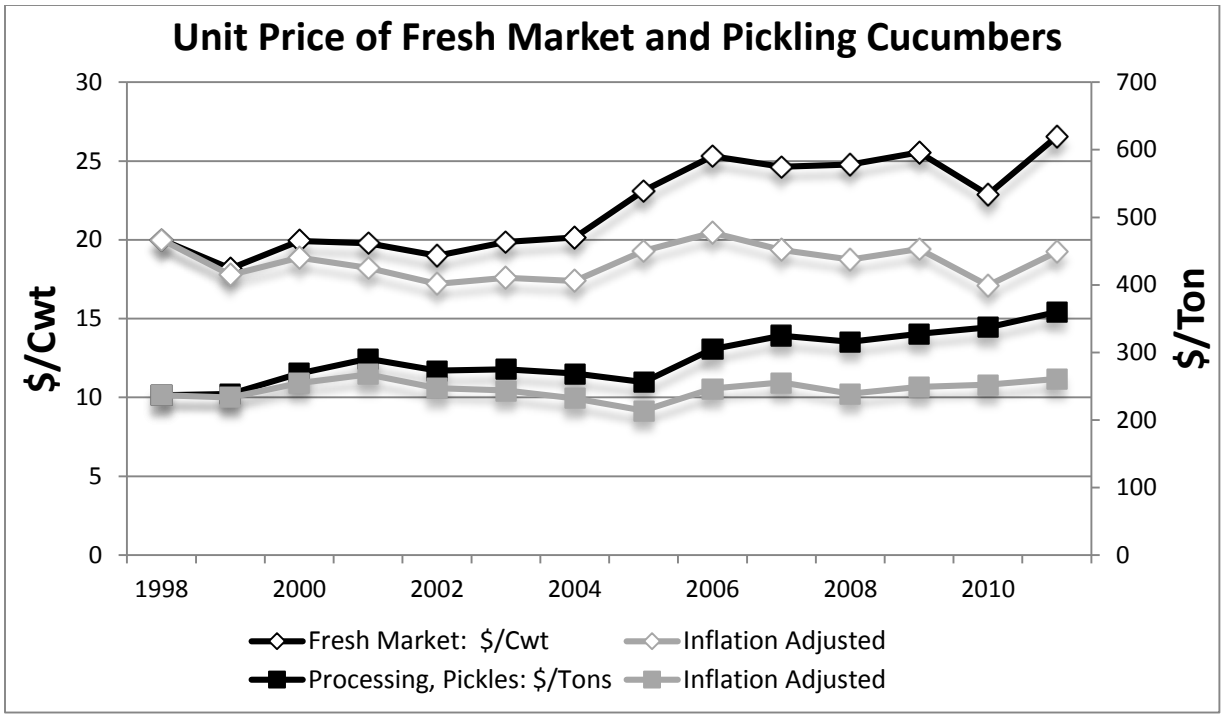

Figure 4. US Season Average Current and Real Price for Cucumbers and Pickles 1998-2011
Source: USDA 2011 and BLS-CPI

Table 4 provides select US production statistics for fresh market production. While Georgia led the nation in fresh market cucumber acres and production in 1998, it has seen large declines in acres harvested and production since 2007. California and Michigan have also seen significant declines in fresh market acres harvested, with both exhibiting 50 or nearly 50 percent declines, while Maryland and New York have shed about 41 and 24 percent, respectively.

Table 5 shows similar statistics for picklers. Here, Florida and Michigan exhibit sizable gains to acres harvested, where the number of acres entering into pickle production exceeds those lost from fresh market. Besides Wisconsin, other states show declines. Texas shed approximately 66 percent of its pickling acreage between 1998 and 2011, while Indiana and North Carolina both lose about 58 percent of theirs. In 2011, total harvested acres were about 20 percent lower than in 1998.

Table 4. Production Measures of Fresh Market Cucumbers

	Acre Harvested			Production, Measured In Cwt			Yield, Measured In Cwt/Acre		
	1998	2005	2011	1998	2005	2011	1998	2005	2011
California	6,000	4,600	3,000	1,920,000	989,000	465,000	320	215	155
Florida	9,100	10,500	9,500	2,594,000	2,835,000	2,375,000	285	270	250
Georgia	13,000	15,000	8,000	2,600,000	2,625,000	1,280,000	200	175	160
Maryland	850	770	500	73,000	39,000	25,000	86	50	50
Michigan	6,500	5,200	3,700	1,235,000	936,000	703,000	190	180	190
New Jersey	3,100	3,200	3,100	558,000	480,000	496,000	180	150	160
New York	3,800	3,600	2,900	760,000	432,000	464,000	200	120	160
North Carolina	6,000	5,000	5,300	750,000	525,000	742,000	125	105	140
South Carolina	2,000	1,700	1,700	160,000	119,000	340,000	80	70	200
Texas	1,500	700	1,200	113,000	98,000	150,000	75	140	125
Virginia	4,200	1,700	1,300	374,000	187,000	59,000	89	110	45
US Total	56,530	51,970	40,200	11,197,000	9,265,000	7,099,000	198	178	177

Source: USDA 2011

Table 5. Production Measures of Processing Cucumbers

	Acre Harvested			Production, Measured In Tons			Yield, Measured In Tons/Acre		
	1998	2005	2011	1998	2005	2011	1998	2005	2011
Florida	7,000	6,500	13,000	59,500	42,900	84,500	8.5	6.6	6.5
Indiana	2,000	1,600	830	12,160	6,560	2,490	6.1	4.1	3.0
Michigan	26,000	33,000	31,600	130,000	158,400	176,960	5.0	4.8	5.6
North Carolina	17,500	16,000	7,400	78,750	68,800	34,780	4.5	4.3	4.7
Ohio	2,900	3,400	2,600	35,320	29,240	17,910	12.2	8.6	6.9
South Carolina	2,100	4,100	2,000	6,010	14,350	6,000	2.9	3.5	3.0
Texas	9,400	7,800	3,200	59,220	35,880	15,680	6.3	4.6	4.9
Wisconsin	4,200	4,500	5,600	31,880	29,610	30,690	7.6	6.6	5.5
US Total	102,870	110,500	82,630	593,720	540,080	482,030	5.8	4.9	5.8

Source: USDA 2011

Both **Tables 4 and 5** show most states have experienced declines in both acres harvested and production by weight, but yields have largely remained constant. It is interesting to note that production yields of fresh market (**Table 4**) and process cucumbers (**Table 5**) tend to move together over time. This is likely associated with shared weather patterns from overlapping geographies between the two products, as states that produce slicers tend to also be states that produce pickles – in particular, Florida, Michigan and North Carolina.

Tables 6 and **7** show USDA production value estimates of fresh and processing pickles, respectively, across major producing states. Evident when comparing **Table 6** to **Table 7** is that fresh market prices are largely homogeneous across states, but processing market prices largely deviate. **Table 7** shows that some states have consistently higher prices and others lower prices, year over year. For example, Florida and Ohio and largely Texas growers consistently benefit from higher prices, while South Carolina and Wisconsin have consistently lower prices. It is interesting to note that average Indiana prices rose substantially in 2006 from the lowest price state to remain at or above par for the US average.

Table 6. Cucumbers, Fresh Market - Production, Measured In $/Cwt

	California	Florida	Georgia	Maryland	Michigan	New Jersey	New York	North Carolina	South Carolina	Texas	Virginia	US Total
1998	30.9	20.0	13.9	25.0	17.3	19.3	19.3	13.5	28.0	23.8	22.0	20.0
1999	26.8	18.3	12.0	30.0	15.5	17.6	26.0	11.0	23.5	23.4	13.0	18.2
2000	28.5	20.2	13.0	24.0	18.8	19.6	25.4	14.0	27.5	24.1	21.0	19.9
2001	30.0	22.6	12.8	23.0	20.0	15.9	27.5	13.0	14.2	24.2	14.0	19.8
2002	27.8	20.8	11.3	28.0	18.0	17.7	27.2	15.0	25.0	24.6	16.0	19.0
2003	33.3	22.2	10.6	25.0	20.4	20.0	23.6	17.0	25.9	21.0	22.0	19.9
2004	23.7	20.1	16.6	26.0	17.2	22.7	27.6	18.0	23.0	21.0	17.0	20.2
2005	23.9	26.0	23.9	30.0	16.0	20.2	28.3	16.0	21.0	26.9	13.1	23.1
2006	23.6	31.1	23.0	45.0	18.5	23.1	34.7	18.6	25.0	23.6	18.1	25.3
2007	22.2	26.8	26.4	50.0	17.9	17.8	34.3	16.0	25.0	23.0	18.7	24.6
2008	25.9	21.9	32.6	30.0	18.6	24.1	34.5	18.0	20.0	23.0	22.0	24.8
2009	29.1	29.6	23.6	42.0	19.2	28.0	41.8	20.0	18.0	27.0	22.0	25.6
2010	19.5	20.6	24.0	40.0	22.7	23.4	38.8	17.5	24.0	26.0	21.0	22.9
2011	36.6	21.9	28.5	42.0	23.0	31.4	40.0	23.3	26.0	27.0	25.0	26.6

Table 7. Cucumbers, Processing, Pickles - Production, Measured In $/Tons

	Florida	Indiana	Michigan	North Carolina	Ohio	South Carolina	Texas	Wisconsin	US Total
1998	390.0	166.0	169.0	220.0	299.0	200.0	332.0	170.0	236.7
1999	385.0	172.0	164.0	265.0	347.0	215.0	340.0	165.0	238.5
2000	465.0	188.0	215.0	270.0	300.0	225.1	380.0	182.0	269.0
2001	451.0	179.0	246.0	280.0	370.0	200.0	346.0	195.0	290.5
2002	461.0	154.0	190.0	290.0	358.0	236.0	436.0	169.0	272.9
2003	465.0	187.0	200.0	295.0	337.0	239.0	412.0	178.0	275.0
2004	464.0	160.1	205.0	280.0	333.0	220.0	448.0	157.0	268.8
2005	476.0	163.0	168.0	290.0	374.0	222.0	235.0	195.0	256.2
2006	470.0	312.0	194.0	270.0	395.0	237.0	422.0	198.0	304.8
2007	470.0	348.0	230.0	305.0	445.0	237.0	484.0	187.0	324.9
2008	420.0	350.1	220.0	285.0	428.0	235.0	516.0	207.0	315.6
2009	468.0	366.0	260.0	226.0	460.0	330.0	511.0	216.0	327.8
2010	501.0	366.0	250.0	289.0	450.0	220.0	500.0	251.0	337.2
2011	445.0	357.8	255.0	305.0	490.0	220.0	234.0	233.0	359.8

Source: USDA 2011

Pickling Cucumbers are often planted under contractual agreements between farmers and briners. Contracts are usually based on size and quantity. Generally, contracting processors will purchase any excess production that exceeds contract-specified tonnage if they are not oversupplied. What cannot be sold is generally not harvested. Pickling cucumbers are trucked in bulk to processors, who grade and size the cucumbers based on packing industry standards. The size of the fruit is determines the price that briners pay and fruit that is too large or too small generally have little to know market value.

As shown in **Table 8**, nearly all acres planted in 2010 were under contract arrangements. This is true across all reporting states. However, Texas and Florida had relatively more acreage planted without prior contract arrangements. Compared to 2005 (Martinez, Thornsbury, & Nagai, 2006), the percent of total U.S. pickle-producing acreage under contract rose from 79 percent to 91 percent in 2010.

Additionally, in all but two states, 2011 planting intentions showed noticeable declines in 2011. However, planting intentions may not reflect actual 2011 outcomes.

Table 8. U.S. Cucumber for Pickle Total Area Planted, Total Area under Contract, and Contract Intention, 2010-2011

State	2010 Area Planted				2011 Planting Intentions	
	Total	Contract	Area Harvested	Share under contract	Contract	Change in 2005-2006
	---------- Acres ----------			----- % -----	-Acres-	------- % -------
Michigan	32,000	30,000	31,000	94	29,000	-3
North Carolina	9,700	8,100	8,900	84	8,000	-1
Texas	6,100	4,500	5,300	74	5,200	16
Florida	9,800	7,800	9,800	80	5,000	-36
Wisconsin	6,300	6,200	6,100	98	5,600	-10
South Carolina	2,000	2,000	2,000	100	2,000	0
Ohio	2,100	1,900	2,000	90	3,200	68
Indiana	1,500	1,500	1,200	100	1,200	-20
Other States	22,800	21,800	21,900	96	15,400	-29
U.S.	92,300	83,800	88,200	91	74,600	-11

Source: USDA, 2011

Pickling cucumbers are generally harvested 40-50 days after planting when fruit is picked before full maturation. Harvest timing is vital, as producers have about a 24-hour window for harvesting for optimal fruit quality. Most Michigan pickles are channeled to briners, where graded pickles are placed in large tanks of salty solution for brining. The resulting brine stock can be made into sweet, dill or sour pickles and relishes. The brined stock can be stored for up to three years with proper storage, though most stock is rotated within a year (Martinez et al., 2006).

Larger fresh market cucumber growers tend to operate their own packinghouses, while smaller growers, and transport cucumbers local or regional packinghouse. In the packinghouse, cucumbers are graded by standards set by the industry and USDA by fruit size. They are then sorted, packaged by grade. Producers generally use brokers or state farmers' markets to sell to wholesale outlets. However, larger growers may sell to retail outlets directly.

Retail Markets

Per capita cucumber consumption in the US has remained mostly stable since 1994 though not constant. **Figure 5** shows that while fresh cucumber consumption remains mostly constant since at least 1996, pickling cucumbers consumption varies significantly. Annual variation in U.S. per-capita cucumber consumption is mostly driven by variation in pickled cucumber consumption. However, less evident in Figure 5 is that as per-capita consumption of fresh cucumbers has climbed year-over-year, while per capita pickle consumption has declined. This trend is persistent since at least 1970 as shown in **Figure 6**. In 1970 per capita pickle consumption far exceeded fresh cucumber consumption. Since then, fresh cucumber consumption has risen sharply while pickle consumption gradually declined, creating an inversion where, now fresh cucumber consumption exceeds processed on a per-capita basis.

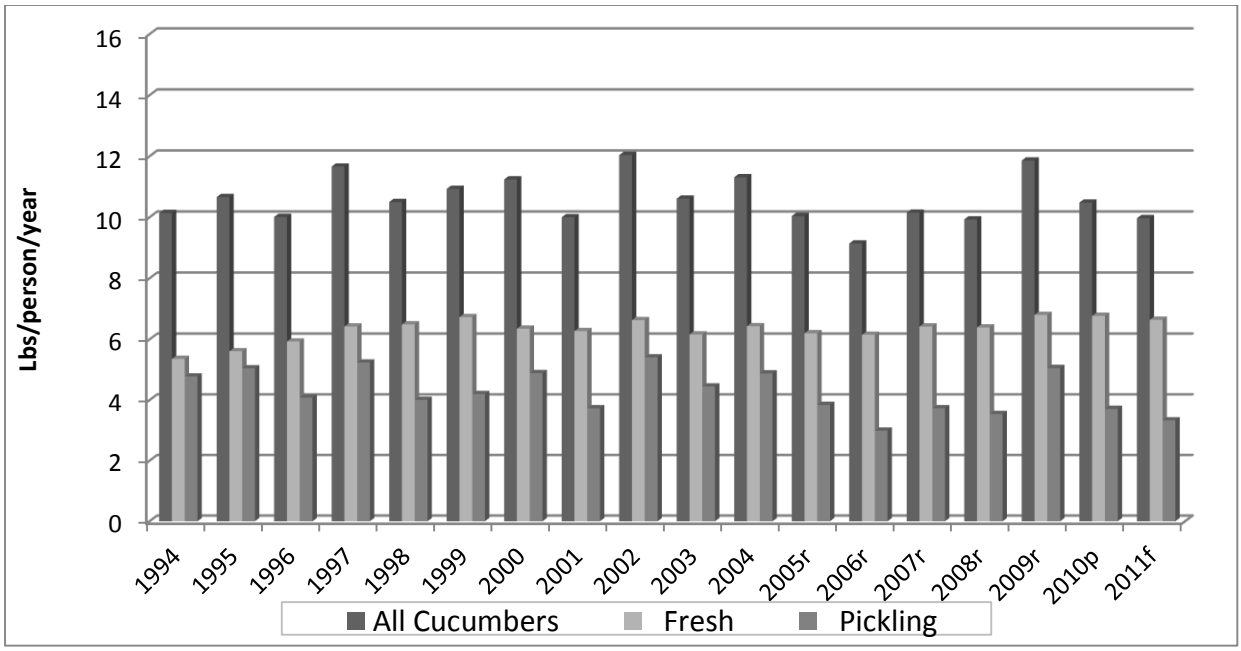

Figure 5. Annual U.S. Per Capita Consumption of Cucumbers

According to Richard Hentschel, former executive vice president of Pickle Packers International, the pickling segment, made up of pickles, relishes and other pickled products is a $1.5 billion industry. It is a mature industry, based on a process that has been around for some 4,500 years. However, producers continue to innovate. For example, the current trend is toward hot and spicy packs (Cruz, 2002). Indeed, there appears to be a revival of the traditional pickle over the last decade advocated by Sandor Ellix Katz, author of the book "Wild Fermentation: The Flavor, Nutrition, and Craft of Live-Culture Foods" (Koenig, 2009).

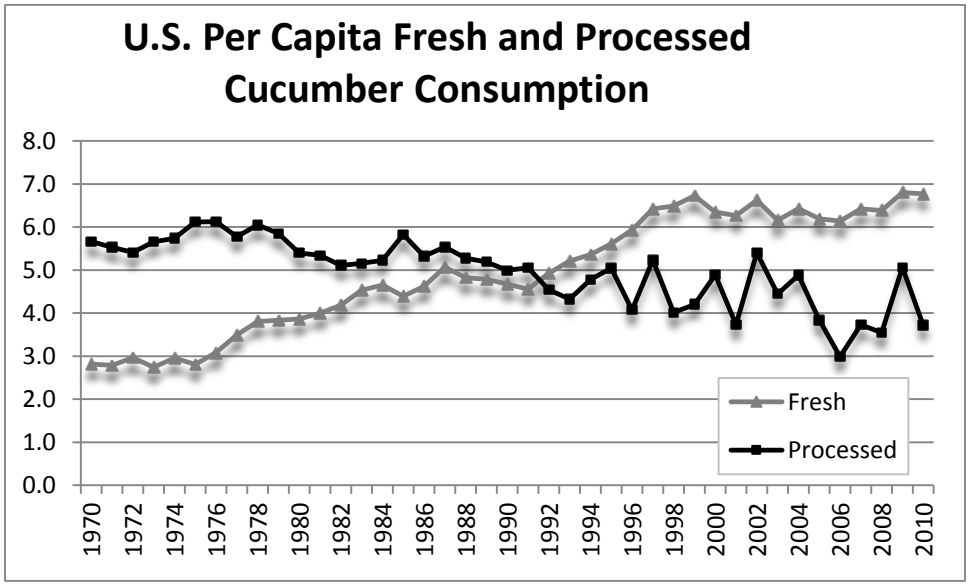

Figure 6. Fresh and Processed Cucumber Consumption Per-Capita: 1970 to 2010

The pickle segment is generally broken out into retail and food services categories. Retail accounts for a minority stake in total sales of41 percent. The segment is largely regional, small and large regional brands distributing to 5 through 15 states and a handful of few national brands, like Claussen, Vlasic, Mt. Olive and HJ Heinz.

Factors effecting consumption of pickles include a growing emphasis on healthy eating, and changes in in-home versus out-of-home eating habits. The USDA and NGOs have, in recent years, set out new campaigns to encourage healthy eating practices. This emphasis is also reflected in public attitudes toward healthier food choices (Beaudoin, Fernandez, Wall, & Farley, 2007). Pickles are also considered a healthier snack-food option to traditional salted snacks. However, such changes in consumer purchasing habits do not appear to be reflected in the current statistics of cucumber consumption, where per-capita consumption remains mostly flat since 1994.

Other factors impacting the market include household preferences for eating out. Economic uncertainty is generally associated with increased home consumption of meals. Mintel's custom consumer research finds that consumers who cook frequently at home and those who identity with having higher levels of cooking skill are more apt to using condiments. While condiments may be viewed by some as inferior processed ingredients, it turns out that the more skilled home cooks consider themselves, the more likely they are to use most types of condiment. The finding suggests that home consumption has potential for growth. Away from home consumption is seen to increase pickle consumption by more than in-home consumption. Pickles are more likely to be consumed when consumers eat out for lunch than when they pack a lunch for work. Consumers generally curtail eating out during economic recessions lowering per-capita consumption of pickles through the restaurant channel (Mintel 2012).

Total U.S. retail sales of pickles, olives and relishes grew 8 percent from 2007 to 2012 to $2.5 billion and represent the largest (26.1) segment of condiment sales. The segment is made up of multiple major labels, private label providers and enumerable regional and artisanal providers. According to InfoScan, major labels held about 46 percent of the segment market (Mintel 2012). Private labels accounted for about 29 percent, while others account for the remaining 25 percent. The major labels, Pinnacle Foods Corp, Mt. Olive Pickle Co. Inc. and Kraft Foods Inc., account for about 28 percent of the segment market.

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