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Staff Paper

Demand and Supply Assessment for the Michigan Frozen
Potato Industry.

Prepared by
The Michigan State University
Frozen Potato Industry Team.

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Demand and Supply Assessment for the Michigan Frozen Potato Industry

Introduction

This report presents a general assessment of the demand and supply conditions affecting the Michigan frozen potato industry. The information has been drawn from various secondary sources and interviews with key industry informants. The report is one of the major outputs of an ongoing study being prepared for the Michigan Potato Industry Commission and funded by the Michigan Agricultural Experiment Station.

This analysis was necessitated by the 80% reduction in Michigan frozen processing potato acreage by Simplot in 1997. This reduction of 5,000 acres for the Grand Rapids processing facility has created both short-term and long-term concerns for the Michigan potato industry. This assessment provides broad background information relevant to determining why this cutback occurred and its likely impact if continued in the future.

The report begins with a consideration of demand conditions, including both domestic and international demand trends for consumption and consumer preferences. The report then discusses supply issues, including current North American production capacity, international sourcing trends, competition from Canadian imports, cost considerations, processing innovation, and industry consolidation. The report concludes with a section addressing key strategic issues suggested by the demand and supply trends.

Frozen Potato Demand

Demand Overview and Summary

Domestic demand for frozen potato products steadily rose between 1976 and 1994, and continues to be dominated by frozen french fries. In 1996, however, french fry consumption in the U.S. market experienced its slowest growth in a decade and is not expected to realize significant gains in the near future. The food service (quick-service restaurant) sector, which has spurred much of the growth in fry markets since the late 1950's, continues to account for the majority of frozen processor sales. However, demand in this segment has now reached a saturation point and growth is stagnant. Almost all growth in domestic french fry markets last year came from the retail sector, but the relatively small scale of this market indicates only limited total consumption growth outside of quick-service restaurants. Retail prices for french fries in the U.S. market have remained stable throughout the 1990's.

The total market volume for frozen potato products within a 300 mile radius of the Grand Rapids plant is estimated to be roughly 20.0 million cwt. (2.0 billion pounds of finished product) in 1997. With finished uct capacity of 1.75 million cwt., the Grand Rapids facility could supply 8.8% of the region's demand. However, regional consumption is expected to be down 1 million cwt.¹ from 1996 which is 57% of the plants capacity.

Domestically, consumer preferences continue to grow increasingly sophisticated as incomes rise due largely to the increasing number of dual income households. One of the most notable conclusions of proprietary consumer taste tests has been the realization that consumers prefer frozen potato products made from Western grown potatoes. Changes in consumer tastes present opportunities for the development of new frozen potato products, e.g., flavored fries.

Though domestic frozen potato consumption appears to be lagging, especially for french fries, foreign markets provide sizable opportunities for frozen processors. International consumption, particularly in Pacific Rim markets, is still growing. Of these countries, Japan, Singapore, South Korea, and more recently, China, all present growing markets. The greatest portion of this growth will come from the food service sector as Asian consumers continue to acquire westernized palates. In developing Asian economies like China, tastes tend not to be as sophisticated as they are in other Pacific Rim countries such as the Japanese marketplace. Other industrialized countries, including most in Europe, are experiencing many of the same consumption trends found in the U.S. South American tastes are similar to European food preferences and tend to be highly influenced by indigenous palates for fresh, localized foods.

Domestic Demand Trends

Total Consumption Total U.S. per capita consumption of all potatoes (fresh and processed) rose slightly by 0.2 pounds between 1995 and 1996 to 140.4 pounds, and is forecasted to increase by 2.9 pounds in 1997. Fresh market consumption fell by 1.3 pounds per person in 1996 to 48.5 pounds. Though fresh potato consumption has been relatively flat in recent years, private industry surveys have indicated shifts toward fresh usage are expected to continue as the U.S. population gets older. By the end of 1997, fresh consumption is predicted to rise by 3.8 pounds per person (USDA/ERS).

Domestic per capita consumption of all processed potatoes climbed from 90.4 pounds to 91.9 pounds between 1995 and 1996, but is anticipated to decline by .9 pounds in 1997. In reference to frozen markets, roughly one-third of all potatoes grown in the U.S. are used in frozen potato processing. This figure is up significantly from 5% in 1959/60 and 14% in 1965/66. The quantity of all frozen potatoes packaged in the US grew by 60 million pounds (less than 1%) to 8.46 billion pounds in 1996. Frozen per capita consumption in 1996 equaled 60.0 pounds compared to 58.4 pounds a year earlier, an increase of 1.6 pounds per consumer. However, of the four major processed potato categories, frozen per capita consumption is the only one forecasted to decline in 1997, dropping 2.7 pounds per person to 57.3 pounds. Including the 1997 forecast, frozen

¹ Cwt. is an abbreviation for hundredweight, i.e., 100 lb. Sack.

potato per capita demand has now been stagnant or declining since 1994. (See Exhibit 1 for per capita consumption of all potatoes, 1976-97).

French Fry Consumption French fries continue to dominate all frozen potato market segments, accounting for approximately 86% of frozen potatoes packaged by processors. In 1996, processors packed 7.25 billion pounds of french fries, an increase of 50 million pounds (less than 1%) from 1995. Domestic frozen french fry markets, which generate roughly \$3 billion in sales annually, expanded by 2.5% in 1996, the smallest gain since 1987. In comparison, this measure averaged 6.4% annually between 1993 and 1995, peaking in 1994 at 8.0%. Thus far in 1997, french fry processing usage is down, suggesting sluggish growth in U.S. consumption. In 1996, the growth rate for french fries packed by processors grew 0.6%, the slowest rate in a decade. This compares to 9.4% and 5.4% in 1994 and 1995, respectively. According to the North American Potato Market News (NAPMN), domestic french fry consumption is not expected to experience much more growth in the foreseeable future. Additionally, NAPMN reports that domestic fry consumption during 1997 will grow slightly faster than the current population growth rate of 1.5%. This is consistent with industry experts who predict that 1997 french fry packages for all market sectors (i.e., foodservice, retail, and bulk) will increase by a modest 2%.

The food service sector, long the growth engine for domestic fry consumption, uses roughly 6.5 billion pounds annually and continues to be the largest buyer of french fries. Nearly 90% of US fries are sold (consumed) in domestic and foreign foodservice outlets. However, this segment was unchanged between 1995 and 1996 at about 6.54 billion pounds.

In contrast, the volume of domestic retail markets totals roughly 0.73 billion pounds of french fries annually. Fries packaged for this market sector accounted for almost all of the growth in fry production during 1996, increasing 12.1% from 650.2 million pounds to 728.8 million pounds between 1995 and 1996.² (See Exhibits 2 and 3 for domestic packs of frozen potato products). Furthermore, retail french fry prices have remained steady since 1990, averaging \$0.865 per pound in 1996 compared to \$.861 a year earlier. These prices have been kept in check by increases in production capacity over the last few years. Relatively low prices have also added to the consumer appeal of french fries in recent years, helping to increase domestic demand and consumption. Thus far in 1997, retail prices have averaged \$0.921 per pound, an increase of \$0.056 per pound over the 1996 price average. (See Exhibit 4 for retail price trends of frozen french fried potatoes). Given the supply situation, it is unusual that retail prices could be up so strongly (6.5%). Further research is needed to understand this change.

Regional Market Volume The total market volume for frozen potato products within 100/200/300 miles of the Grand Rapids plant was estimated to be roughly 21 million cwt. (2.1 billion pounds) in 1996. Holding population constant and adjusting for the forecasted drop in per capita consumption in 1997, the total market volume in a 300 mile radius of Grand Rapids is

² Though not a direct measurement, analyzing what markets processors are packaging for provides a general indication of U.S. consumption trends.

estimated to be 20 million cwt. (2.0 billion pounds) of finished frozen potato products this year, down 1 million cwt. from 1996.

The Simplot plant in Grand Rapids generates approximately 1.75 million cwt. of finished product annually. If the 1996 market volume calculations are correct, then roughly 19.25 million cwt. (21 million cwt.-1.75 million cwt.) of finished product is being supplied to this market by other frozen processors, possibly including other Simplot operations. If the Grand Rapids output were totally consumed within the region, it would have an 8.8% market share, however the predicted 1 million cwt. decrease in regional consumption for 1997 is 57% of the plant's capacity.

When volume estimates are segmented by distance from the plant, the greatest market volume falls within the 100-200 mile radius at 10.4 million cwt. consumed in 1996. The next largest is in the 200-300 mile radius at 7.64 million cwt. and 0-100 miles at 2.70 million cwt., respectively. Again, per capita estimates for 1997 will result in lower regional market volumes. (*See Exhibits 5 and 6 for the volume of frozen potato markets within in 100/200/300 miles of Grand Rapids and a map of these markets, respectively*).

Consumer Preferences Dietary movements toward healthier eating and a more well-balanced diet continue to be the buzzwords of the 1990's. Even so, health conscious consumers cannot resist the appeal of the french fry and the convenience of take-out foods. Many nutritionists, some of who have long denounced fried foods, have given in to these appeals by admitting that fried potato consumption, in moderation, is acceptable. However, the quest continues for healthier products such as low fat french fries that still taste good.

As preferences become more sophisticated and incomes grow, frozen potato products other than fries may penetrate specified consumer markets, but the fry still dominates the frozen product market. Proprietary taste tests show that a significant portion of consumers prefer frozen potato products made from Western grown potatoes as opposed to Midwestern and Northeastern potatoes. Many of these surveys also indicate that people favor a crispier fry that holds heat and integrity longer. For example, 60% of all fries sold at fast food chains are sold via the drive-thru window. Once fries are placed in a take-out bag combined with other hot foods, the quality begins to deteriorate quickly as trapped steam accumulates in the bag and causes the fry to be soggy. When the bag is opened, the cooling process ensues and the consumer is left with a cold, soggy, greasy french fry. Processors that have identified this problem are working to solve it in order to meet the quality standards of their customers (i.e., fast food chains).

One way to address this problem is to coat the fry with potato flour, wheat starch and dairy protein. This prolongs the useful life of the fry and is one advantage to developing new fry coatings. Another advantage to coating is that flavors (e.g., cajun) can be added to create a new, more exciting product for the consumer. Flavor coated frozen products are preferred more by adults than by children who like regular products. However, the aging of the U.S. population makes movement toward more adult tastes a critical issue, as does the fact that more patrons are taking out food rather than eating in the restaurant. (More information about the coating process is provided in the supply section of this report.)

Supersizing, which caused much of the growth and rapid consumption in fry markets throughout the early part of the 1990's, appears to have run its course according to industry sources. This is probably due to having reached the saturation point for new demand for supersized servings. However, it may also be due to consumers placing more emphasis on smaller serving sizes that reduce waste and calorie intake. In fact, surveys conducted within the food industry suggest that increasing numbers of consumers are seeking serving sizes that reduce waste, yet are large enough to satisfy.

In recent years, french fry demand has mirrored an upward trend in Away-From-Home (AFH) dining. Private surveys indicate that end-user consumers purchase about one-half of their AFH meals at fast food restaurants. Increasing household incomes spurred by a greater number of dual income homes has extended consumer purchasing power for AFH eating. In 1995, 47% of every food dollar was spent on meals outside of the home. This compares to only 28% in 1965. In addition to increased purchasing power, people today lead more hectic lifestyles, resulting in less leisure time and less energy to prepare homemade meals. Coupled with the "working mom" trend, these factors have helped to boost demand for frozen potato products.

Related to the AFH trend is the movement toward Home Replacement Meals (HRM) and prepared meals that consumers can pick up from grocery stores on their way home. These meal solutions differ from fast food take-out in that they provide a sense of fresh, homemade dining without the hassles of cooking. HRM provides new frozen potato product opportunities, such as, better tasting mashed potatoes. However, this trend probably threatens frozen french fry consumption given the short life, even with coatings, of french fries as a take home item. According to some industry sources, consumers are apt to purchase new frozen potato products from well-identified, well-established brandname firms (e.g., Ore-Ida). Simplot having a limited brand identity of its own is not well positioned strategically to take advantage of this HRM trend.

International Demand Trends

Consumption In contrast to what appears to be a maturing U.S. frozen potato marketplace, foreign markets continue to experience strong growth indicating increases in consumption. Much like the domestic market, international frozen potato consumption is also dominated by french fries. The international fry industry, which generates about \$2.9 billion in sales annually, continues to grow at a rate of 6.1%. U.S. exports of frozen potato products reached 1.7 billion pounds in 1995 and is predicted to continue being a significant market outlet for U.S. frozen processors. Fry exports from the U.S. accounted for 9% of all domestic fry usage in 1995, and are growing. This figure is up from 5% in 1990 and 2% in 1985.

The majority of foreign market growth has come primarily from Pacific Rim nations. Japan accounts for over one half of all U.S. fry exports, making it the largest fry export market for the U.S. The value of fry sales in Japan increased by 19% to \$124 million in 1995. (*See Exhibit 7 for U.S. exports of french fries to Japan compared to the world*). French fry sales to South Korea and Singapore also rose in 1995 and are expected to continue rising. Improving economic conditions, enhanced household incomes, and fast-food expansion in Asia and other foreign

regions will all lead to increased international frozen potato consumption, especially in french fry markets.

Unfortunately, the dramatic rise in international demand is also causing an dramatic increase in international supply which is reported on in the next section of the report. This expansion of supply will threaten U.S. exports of frozen product, primarily for processors in the Pacific Northwest where most U.S. exports originate..

Consumer Preferences One of the most notable international trends comes from Asian markets, where more consumers are acquiring a westernized palate. Evidence of this can be seen in the growth of fry exports to Pacific Rim nations, the significant expansion of fast food outlets, increased purchasing power spurred by economic growth, and a willingness to pay premium prices for desired U.S. foods. In contrast to North American and Asian taste preferences, South American (Latin) markets tend to be linked more closely with European and indigenous palates. This is partly the result of a greater European cultural influences mixed with indigenous tastes that are deeply rooted in the historic development of these countries. Preferences in other developed industrialized nations reflect those seen in the U.S., with cultural influences being the differentiating factors in consumer cuisine.

Frozen Potato Supply

North American Production Background and Capacity

Potatoes were introduced in the United States in the seventeenth century. Although they originated in South America, potatoes were introduced and became accepted in Europe before they were introduced in North America (Dean, 1994.) Prior to the development of efficient transportation systems, potatoes were grown close to major metropolitan areas and marketed fresh to urban consumers for table consumption.

Developments in processing had a profound effect on the potato industry. Improvement in packaging frozen potato products, especially for the fast food and institutional markets, was the major advancement in this area. The frozen potato pack in the Northwestern U.S. serves as an illustrative example. In the early 1950's, engineers for J.R. Simplot Company discovered a method to effectively freeze potato products through blanching and compressing. Six million pounds were packed in 1953 and 262 million pounds were packed in 1959 (The Diamond Book, 1989.) In subsequent decades, the frozen potato industry developed and expanded rapidly.

Exhibit 8 lists the location, ownership, and capacity of plants in the North American frozen potato industry. The U.S. Northwest (Washington, Oregon, and Idaho) has 172.5 million cwt. of capacity, or 70% of the total North American capacity. All other U.S. plants represent 16% of capacity while Canadian plants are 14% of capacity. The top three processors, Lamb-Weston, McCain, and Simplot, control 74.5% of total capacity. Leading processors in order of capacity are:

<u>Company</u>	<u>Raw Capacity</u>	<u>Percent Capacity</u>
Lamb-Weston	73.0 m cwt.	29.5%
McCain	58.8	23.9
Simplot	52.0	21.1
Nestle	14.5	5.9
Ore-Ida	12.0	4.9
Cavendish	9.0	3.7
All others	27.1	11
TOTAL	246.4	100%

The raw processing capacity of 246.4 million cwt. translates at a 50% yield rate into approximately 123.2 million cwt. of finished product. At 1996 U.S. frozen product demand levels (and taking into account rough estimates of U.S. exports, U.S. imports and Canadian consumption), the North American industry is likely to be operating at approximately 75% of capacity, but could be operating at as little as 70% or as much as 80%. Whatever the specific number in this range, the industry clearly suffers from excess capacity at this point in time.

International Sourcing Issues and Trade

Potatoes are an important export crop for the U.S. (National Potato Council, 1990, pg. 49.).³ During the 1980's, exports increased from 474,439 metric tons to 555,768 metric tons. Potato exports in 1996 were valued at \$613 million (down 1 percent from 1995), while U.S. imports increased 34 percent to \$242 million.

Conditions were uniformly favorable for growing potatoes in 1996 worldwide. A record U.S. crop of 48.8 billion pounds was produced. This sent prices plummeting, from about \$8/cwt. to about \$2/cwt. during the 1995-1996 marketing season. This is only about a third of what it costs U.S. farmers to grow potatoes. Potato acreage and processing capacity have been expanding in Canada recently, also. This development, combined with a relatively weak Canadian dollar, has caused a large influx of imported potato products from the north. Canadian processors such as McCain Foods and Cavendish Farms exported 450 million lbs. of frozen french fries to the U.S. last year at low prices (Stuebner, 1997).

The trend in U.S.-Mexico processed potato trade has been rather promising in recent years. During the period from 1990 to 1995, U.S. imports from Mexico never exceeded \$40,000 per year. Exhibit 9 below gives the value of U.S. processed potato exports to Mexico for this period.⁴ The decline from 1994 to 1995 is likely due to Mexico's financial crisis following the devaluation of the Peso in late 1994.

French fries are the primary use of processed potatoes today. Exhibit 10 shows the growth in the U.S. pack of frozen potato products from 1987 to 1996. This essential element of fast food meals caused a huge increase in potato production as these restaurants spread across the globe. What initially was a bonanza for American potato producers is being threatened as potato processors obtain local sources internationally (Stuebner, 1997). Exhibit 11 illustrates the expansion of potato production and processing capacity in selected countries. Earlier this year, McCain (a Canadian company) purchased two of Ore-Ida's three frozen french fry processing plants and the right to use the Ore-Ida name in the food service market. According to industry sources, this action may have been an attempt to counteract political reaction to their huge increase in exports from Canadian processing plants to the U.S.

Global supply and demand conditions also impact the North American frozen french fry industry. Western Europe is another major frozen potato processing region. However, frozen processors in this region are also experiencing the effects of maturing European frozen potato markets and are expanding sales in other foreign markets. North and South America are potential new markets for these potential competitors. The establishment in 1996 of a new processing plant in North Dakota by the Dutch firm AVIKO provides an example of such an expansion strategy.

³ Frozen products and dehydrated products are multiplied by conversion factors of 2 and 8, respectively, to convert to a "fresh weight equivalent."

⁴ Source: USDA FAS "NAFTA Agricultural Fact Sheet: Processed Potatoes."

The Challenge of Canadian Supply

In 1998, the tenth year anniversary of the enactment of the United States/Canadian Free Trade Agreement (USCFTA), the U.S. and Canadian tariffs on all fresh and processed potatoes will be eliminated. Prior to 1989, both the U.S. and Canadian tariff on frozen french fries was 10%. But USCFTA has not fully opened the Canadian potato market because Canada instituted two non-tariff barriers to restrict imports of U.S. french fries and fresh potatoes.

In one year U.S. exports of frozen french fries to Canada increased almost 40 fold from 1.7 million pounds (product weight) in 1989 to 68.8 million pounds in 1990, Exhibit 12. Reacting to this dramatic influx of french fries, Canada enacted a packaging policy aimed at the food service industry that essentially prohibited U.S. firms from selling french fries to Canada in the industry norm five-pound bag which filled a standard food industry frying unit. However, Canadian firms were granted a two year exemption from this packaging requirement. In December 1995, Canada liberalized its packaging requirement. It was estimated that the prior packaging requirement cost U.S. firms \$40 million annually in potential french fry exports to Canada (FAS Staff Paper, July 1996).

Canadian french fry processing capacity continues to increase to meet the food service sector's demand for french fries. Recently a few Canadian processors have been reported to have won large contracts to supply U.S. fast-food chains with french fries. Canadian processors need a tremendous volume of raw potatoes to meet their french fry demand. The Canadian potato industry currently cannot meet this demand while continuing to supply its fresh market. Therefore, the Canadian processing market pulls in U.S. fresh table stock potatoes to meet the retail need.

However, Canada continues to prohibit international and interprovincial trade of bulk potatoes in containers weighing over 50kg net weight. This policy makes bulk shipments of fresh table stock potatoes for processing uneconomical to transport. However, some U.S. bulk potatoes were exported to Canada for processing in 1994 and 1995 under a waiver granted by Agriculture and Agri-Food Canada.

The majority of U.S. imports of french fries currently enter east coast markets from Eastern Canada in the Prince Edward Island region. Canadian processors have benefitted from the U.S./Canadian exchange rate which makes Canadian exports cheaper for U.S. buyers. Potato production and processing capacity is expanding rapidly in the province of Manitoba. Central and Midwestern states in the U.S. could serve this region.

Exhibit 13 shows the U.S.- Canadian exchange rate from 1983 to 1997. Since 1991, exchange rates have trended downward, thus making Canadian products cheaper to import.

Almost 100% of U.S. frozen potato imports come from Canada, predominantly french fries. Total frozen french fry imports from Canada have steadily increased since USCFTA was enacted. Exhibit 14 shows the U.S./Canadian french fry trade from 1989 to 1996. In 1989, frozen french fry imports from Canada were 94 million pounds (product weight) and rose to 423 million pounds in 1996. After a decrease from 1990 levels of 68.8 million pounds (product weight), U.S. exports

to Canada increased from 12.8 million pounds (product weight) in 1991 to 28.8 million pounds in 1996. In 1995, Canada exported 332 million pounds (product weight) of french fries to the U.S. and the U.S. exported to Canada 16.6 million pounds (product weight). On a per capita basis, Canada (population 28.5 million) imported 0.6 pounds per capita and the U.S. (population 263.8 million) imported 1.25 pounds per capita.

One can also look at imports as a percentage of consumption. Exhibit 15 shows U.S. imports from Canada as a percentage of consumption from 1989 to 1994. In 1989, 2% of U.S. domestic french fry consumption was met by imports from Canada. By 1993, this had risen to 5% and fell slightly in 1994.

International Trade Commission Report Findings — The International Trade Commission (ITC) has distributed a report in late July 1997 concerning Canadian dumping of frozen potato products into the U.S., but did not conclude as to whether or not dumping has occurred. Much of the information contained in the ITC report did confirm many of the findings within our assessment of the frozen processed potato subsector. There was, however, a mild discrepancy regarding the issue of processing capacity. After discussing this issue with ITC officials, they explained that many different published measurements pertaining to capacity exist and there is no agreed upon figure.

Asian Market

Frozen french fries continue to dominate potato product exports, but the upward trend appears to be slowing. Exhibit 16 shows U.S. exports of french fries to selected countries from 1993 to 1996. In 1996, exports to Japan, Hong Kong, South Korea, Taiwan, Malaysia, Philippines and Singapore accounted for approximately 80% of total french fry exports.

European Competition

U.S. exports to western Europe have been declining in recent years. Increased potato production in the Netherlands, the United Kingdom and other European countries significantly slowed U.S. exports to European countries. Total potato exports to the Netherlands in 1996 decreased 96% (from 1995 levels).

Cost Components

The primary cost components of frozen french fries tend to determine the location of processing plants. The most important element is the cost of raw potatoes. A potential difficulty arises, however, when comparing costs in different regions. An example will illustrate this difficulty. In one region, the processor may pay a premium for transportation to distant growers. This premium is included in "Raw Product Cost." In another region, the processor may send company-owned semi-trailers to pick up the potatoes. In this case, these costs would be categorized as "transportation." Thus, direct comparison of raw product costs across regions may be difficult. Processors are generally seeking to source their potatoes within a smaller radius (less than 25 miles) of the plant.

Transportation costs can also be considered in another way--as a fraction of finished product cost. There is a stark difference between tablestock potatoes and frozen french fries in this respect. Transportation cost is a relatively larger part of the cost of tablestock potatoes for the retailer. For frozen french fries, transportation cost is a relatively smaller portion of finished product cost. This is obvious from the normal 50% yield of finished from raw in frozen potatoes products. Exhibit 17, panels A and B, shows arrivals of tablestock potatoes to Detroit and Chicago from major growing states during selected months of 1995 and 1996.⁵ It can be seen from the charts that even in the tablestock market, where transportation costs are relatively more important, distance does not correlate well with producers' market share. If this lack of correlation is true for tablestock, it should be even more true in the frozen product market. Factors such as quality and production costs would appear to be more important than transportation costs in determining sourcing location and market shares.

The cost of raw product being "out of condition" is also important. This presents an opportunity for cost reduction through the implementing of quality improvement programs involving suppliers. In fact, material handling is an essential management task for potato processors. There is a significant risk involved in storing potatoes. For example, a grower with 50 acres of potatoes will produce 15,000 cwt. of potatoes (50 x 300 cwt./acre). If fully distributed cost of production is \$4/cwt., the producer has \$60,000 invested in these potatoes. Putting the potatoes into and removing them from storage adds to the cost of potatoes delivered to the buyer.

Potato tubers are living tissue and respiration is a process which goes on at all times during the growing season, after harvest and during storage. Respiration, which utilizes carbohydrates and oxygen producing carbon dioxide, water and energy, generally in the form of heat, increases gradually with rising temperatures. Storage temperatures for potatoes for processing into frozen french fries are generally maintained at 45-50° F and 90-95% relative humidity. Storage temperatures below 45° F increases reducing sugars resulting in a darker colored fry.

Potato storages are equipped with through-the-pile air systems and current technology, ambient temperature, relative humidity and air distribution can be controlled with a high degree of accuracy. State-of-the-art storages are designed and managed to avoid free moisture accumulation during storage which could lead to decay, rot and breakdown caused by various pathogens such as late blight.

In addition, the burning of carbohydrates and other processes will cause the potatoes to shrink. An estimate of the cost of keeping the potatoes in storage is roughly \$0.10-\$0.15/cwt. per month, excluding shrinkage. If the grower stores his own potatoes, he will effectively have a greater incentive to manage the storage. If the processor is storing them, growers have less incentive to take care of the potatoes in harvest to assure their storage quality.

⁵ Source: "Marketing Michigan Vegetables, 1994 Crop" and "Marketing Great Lakes Vegetables, 1995 Crop," MDA and USDA AMS Fruit and Vegetable Division.

One final aspect of raw product storage is that the climate of the location will impact the storage technology. For example, the potato-growing region of Idaho is quite dry. Since this reduces the risk of rot, potatoes may be stored in larger warehouses. In a humid state like Michigan, a warehouse must be divided into smaller bins so that pockets of degradation may be easily accessed and isolated. More importantly, smaller bins allow for the storage of “identity preserved” potatoes used for processing. This allows the grower to be rewarded for the quality of the finished product, and to provide and store a wider variety of potatoes. However, partitioned storage costs about twice as much as non-partitioned.

The second largest component of processing cost is labor. Labor cost can be measured in two different ways. The first is as cost per labor hour. All other things being equal, the plant that operates in an area with lower average wages will have a cost advantage. The second way to measure labor cost is per pound of finished product. This also takes into account the efficiency of the plant. In comparing two potential sources for frozen french fries, it is necessary to consider both the hourly wages of the workers and the technology in the facilities.

Another major consideration is the cost of waste disposal. One plant that was built in the 1980's is reported to have waste disposal costs three to four times higher than planned. In fact, objections about the environmental impact of processing plants have made it impossible to get a new plant sited in Oregon and Washington. In the Firth, Idaho area, local residents have organized to oppose the nuisance odors and potential public health problems caused by potato processors. They have complained that they are unable to open their windows in the summer time, due to odors from potato waste. These environmental limits to capacity expansion in the Northwest may provide an opportunity for capacity expansion in other areas, including Michigan.

Technological Considerations in Processing

On the face of it, the technology of frozen french fry processing has remained relatively stable. The basic method of cutting fries using a water gun cutter has changed little over the past twenty years. Likewise, the “Individually Quick” freezing technique has also remained relatively consistent in recent years.

There are five primary quality characteristics for potatoes intended for use in frozen product processing. These are: color, texture, solids (or moisture), length, and defects. Finished frozen french fries are categorized into grades. The grades, in declining order of quality, are: extra long fancy (XLF), long “A,” “line flow,” and “B” grade. Higher grades have tighter quality specifications and are sold for higher prices.

One example of technological progress in frozen french fry manufacturing involves machine vision. This is an automated inspection process. After the fries are sliced, they are transported on a conveyor belt. Vision equipment “examines” the fries. In recent years, consumers in general have become more quality conscious, and french fry eaters are included in this trend. Potatoes may develop black spots if they are bruised during handling. Machine vision equipment can detect whether there is a black spot in the middle of a fry. A mechanism can cut out the black spot, and two smaller fries result. Quality is improved because the customer does not get fries with black

spots. Waste is reduced also. The processor does not have to dispose of the whole fry, since most of it is saved. The quality of this technology varies a great deal from generation to generation. Comparing “no technology” to the best technology, automatic defect sorting and removal can cut down raw product handling labor by about two thirds. Percentage yield is also a key indicator of the efficiency (and profitability) of a frozen potato plant.⁶ Considering the large capacity of these plants, an increase in yield from 50% to 52% can cause a significant increase in annual profits.

Another important technological development in the frozen french fry processing industry is the introduction of coated fries. The coating is made of a liquid mixture that contains potato flour, wheat starch and dairy protein. The coating on fries provides two benefits to the food service operator. First, it provides a medium for adding flavors to the fries. It is now possible to sell many different varieties of fries. The rapid introduction of new flavors of potato chips indicates that the public will accept a series of new product varieties. The second advantage that coated fries provide to the food service operator is that it increases the salable life of the fries after cooking. It is estimated that ordinary fries will “stand up” for about five minutes after they are cooked. Coated fries will “stand up” (stay crispier) for twenty minutes. This allows the operator to obtain a huge cost savings through waste reduction when switching to coated fries.

Due to these advantages, there has been a tremendous demand for the output of plants which have the capacity to produce coated fries. There is a significant advantage to building a new plant that includes this technology. For a new plant, it costs approximately \$2-3 million additionally to equip lines to run coated products. But, unique difficulties are encountered when retrofitting an existing factory. It may be necessary to knock down walls, and pipelines must be installed in circuitous routes around immovable equipment. The bottom line is that it costs about ten times as much to retrofit an existing plant for coated fry production as it does to include it in a new facility.

Some of the fast food companies have switched to selling coated fries. McDonald’s has not, for the simple reason that there is not enough coated capacity in the world to meet McDonald’s demand. In addition, the Company stated in the November 4, 1996 issue of the Food Industry Management report (FIM) that its fries don’t need to be improved, i.e., coated. Foodmaker Inc.’s Jack in the Box, Arby’s, and A&W have introduced coated fries. Grand Metropolitan’s Burger King tested coated fries in 1,000 of its 6,900 units in 1996 and have not announced the outcome (FIM, Nov. 1996, p.4). Frozen fry processors are currently scrambling to either convert existing capacity to coated or to add coated capacity. Lamb Weston Inc. and McCain, through its 1997 acquisition of Ore-Ida Foods Inc., both currently have coated capacity.

Industry Consolidation

⁶ For frozen french fries, weight of output is typically about one half of raw product input weight. If “off shoots” from the fry line can be made into specialty products, the efficiency of the plant improves.

A key economic concept is that prices and quantities sold are determined by the interaction of supply and demand. Until recently, per capita consumption of french fries in the United States has been increasing and exports have been expanding. In 1995 and 1996, plants were running at about 95% capacity. Plants that processed for 300 days per year in the past were kept in operation for 325 days per year. Processors have reacted by adding capacity, notably on Prince Edward Island and in North Dakota. Last year, the change in demand was negligible while capacity increased. This has created the existing excess capacity in the industry. Simplot closed one of its Caldwell, Idaho plants. This was a sobering moment for the company, because decades ago it was in this very plant that the method of freezing potatoes was perfected.

The changes in supply and demand in the frozen potato market actually exacerbated a trend of consolidation that is being observed throughout the agri-food sector.⁷ The smaller, family-owned food processors are either going out of business or are being acquired by global giants. Marketing is a key factor in frozen french fry production. Any entrepreneur with enough capital can build (or buy) a fry plant. The questions that must be answered are “To whom will output be sold?” and “For how long?” With the advent of scanning technology, retailers have access to valuable information about consumer buying behavior. This shifts power away from the processors to retailers. A retailer like Kroger typically sells private label products, such as, frozen french fries. They can very easily switch suppliers if they obtain a lower bid (as long as the new supplier can meet the basic quality requirements.) The customer is unaware of who made the “Kroger” fries.

In the french fry industry, about 90% of the output is sold to the food service segment. Most of this segment is fast food which has a degree of power similar to that of retailers. This is evident by the huge volume purchased fast food companies. As in the retail segment, fast food fries are more or less an undifferentiated commodity. Probably very few customers know where McDonald’s fries are produced.⁸

Smaller processors have been unable to compete in such a price-driven environment. One by one, family-owned suppliers have been exiting the business. In March, for example, Northern Star in Minneapolis shut down its fry line. The plant, owned by Michael Foods, has a capacity of 2.5 million cwt. and is currently for sale.

⁷ In a recent speech at Michigan State University, Dr. Brendan Fox highlighted three pervasive forces in agriculture today: consolidation, integration, and globalization.

⁸ And if they are satisfactory, it is unlikely that they would be concerned with the identity of the source.

IMPLICATIONS AND CONCLUSIONS

The industry profile that emerges from this assessment of demand and supply in the frozen potato industry is a rather negative one from the perspective of U.S. industry profitability for the foreseeable future. On the demand side, U.S. demand has probably peaked on a per capita basis. As a result, total demand will not grow faster than the population as a whole--a 1-2% per annum growth rate. The industry should thus be considered mature. There may be some growth of frozen product at the retail level, but Michigan's frozen potato processing subsector in its current state is not positioned to take advantage of this growth. International demand is growing rapidly, but it will likely be supplied by locally sited processing facilities owned by mostly large international firms. On the supply side, the industry is in an over capacity situation that will not be relieved any time soon by demand expansion. Profits will be squeezed. Market share gains will go to those firms that invest in the most modern plant technology in regard to defect sensing and fry coating. As quality becomes an even more important issue to consumers, older, ineffective plants will be a major disadvantage in the competitive environment on that is likely to characterize the frozen potato industry. Though Michigan's frozen potato processing sector has experienced serious raw potato storage problems, the analysis in this report suggests that the acreage cutback has causes that are far more extensive and complex than raw potato quality alone.

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