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Staff Paper

Globalization and the Potential for Frozen Potato
Processing in Mexico

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Abstract: An analysis of the potential for the establishment and survival of frozen potato processing in Mexico is provided. Tools used include demand analysis (including demographic data and elasticities) and Porter's competitive forces model. The process of globalization is reviewed, from an agribusiness perspective.

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I. Assumptions: The Agribusiness Perspective

Many agriculture and agri-food industries are currently undergoing rapid globalization. The worldwide frozen french fry industry represents a microcosm of important issues underlying this trend. And as a case study, the recent closing of a frozen potato plant in western Michigan illustrates how global developments can influence a local economy.

There are some fundamental assumptions which guide the decision processes of business managers, for example, executives of frozen potato processing firms. Some of these assumptions will now be explicitly stated. The intention is not to prove these beliefs are true, but rather to provide the foundation upon which business decision makers operate. The first underlying assumption is that *more is better*. An operationalization of this perspective is that the well-being of the citizens of a country is reflected in per capita Gross Domestic Product (GDP.)¹ Another quintessentially American assumption is that *time is money*. An implication is that people should try to minimize the time they spend on daily tasks like food preparation. For example, it is better to buy food at a quick service restaurant than it is to make a meal from scratch. The time saved can be spent on something more enjoyable, like involvement in participatory or spectator sports or some other form of entertainment. Admittedly, some people enjoy preparing food, as evidenced by the specialty cooking classes that are offered through community education classes. These are assumed to be exceptional cases, however.

A final assumption, which is related to the others, is that *bigger is better*. Up to a certain point, the larger the production facility the lower the cost to produce the product. When products are standardized, costs per unit are also reduced. Minimizing cost per unit results in the maximum

¹ Problems with GDP have been identified. For example, this measure does not account for uncompensated work performed in the home or environmental degradation.

output for a given quantity of inputs, i.e. maximum per capita GDP. Further, there are potential gains through specialization. A large, capital intensive food processing operation can produce food using less resources than if each household performed the same operations on a distributed basis. It could also be argued that the level of safety and perceived quality of mass produced food is higher than homemade, but that would be subject to debate.

II. Globalization of the Frozen Potato Industry

According to Blalock (1997), “It’s the french fry that symbolizes the global food market.” For the purposes of this paper, “globalization” refers to increasing international economic integration, as discussed in Davis (1997). The homogenization of consumer preferences that is often considered in the context of globalization is also related to the topic being addressed.

What are the causes of globalization of the frozen french fry industry? One key driver of this process is trade liberalization exemplified by NAFTA and GATT. Another (perhaps more important) driver is the “Americanization” of global culture. The french fry, for better or for worse, epitomizes the American cuisine and lifestyle. The spread of American-style fast food restaurants initially created the need for exports of frozen french fries from American plants. But over time, the pattern has been that as demand in export markets increases, local (in-country) processing capacity and potato production are established in these new markets. Reasons for this shift are both economic and political.²

² The consequences of the globalization of the frozen potato industry are also of interest. Will the spread of American-style fast food restaurants affect gender roles in families in developing countries? This could be the case if the availability of more convenient foods allows for increased participation in the labor force by women. On the other hand, an increase in the number of working women may actually be a cause of the spread of quick service restaurants, as families seek methods of saving time. Another potential consequence is the “denuclearization” of the family. In some cultures, for example in Latin America, meal time is an important occasion for

Growers, both in the U.S. and in developing countries, will be affected by the globalization process. Contract farming is becoming the norm for growers of processed potatoes in the U.S. If large scale frozen potato processing is established in countries with much smaller farms, such as China, it is an open issue whether the contract farming model will be effective. It could be that the transactions and logistical costs of purchasing raw product from large numbers of growers could make such a venture infeasible.

A number of other questions arise from this situation. What has been the role of major processors in the globalization of the frozen potato industry? What should it be? Some factions within the global community are seeking to arrest the expansion of American fast food franchises such as McDonald's. Their varied motivations will be examined, from cultural preservation (e.g. in France) to political symbolism (e.g. in Colombia).

Within the context of these broad situational factors facing North American frozen potato processors, more specific issues will be examined in the remainder of this paper. The basic goal is to assess the potential of the Mexican market from the perspective of U.S. and Canadian frozen potato processors (US/C-FPPs).

III. Key Questions

From the perspective of US/C-FPPs, the size of demand for frozen potato product in

communication among family members. This may be diminished when foods such as french fries are substituted for more elaborate indigenous dishes. The focus of this paper is the response of agribusinesses to the globalization of the frozen potato industry. Although they are interesting, questions concerning the social effects of this process will be left to scholars in other disciplines.

Mexico must be estimated prior to deciding whether and how to serve this market.³ Section IV of this report will address this issue, by considering the following question:

A. How large will the demand for frozen potato products be in Mexico in the medium to long term?

Adequate demand can be seen as a necessary condition to creating an opportunity for US/C-FPPs in Mexico. But in order to take advantage of this potential opportunity, US/C-FPPs must have a competitive advantage compared to other firms who could serve this market. The fifth section of this report will address this issue by examining the following question:

B. How strong are the competitive forces of “rivalry among existing firms” and “threat of potential entrants” likely to be in the Mexican frozen potato processing industry?⁴

If the analysis of the first two sections indicates that US/C-FPPs can benefit from pursuing the Mexican frozen potato market, an appropriate marketing strategy must be selected. Since frozen potato processing technology is widely available, and is not proprietary to any particular processor, a licensing arrangement with a Mexican firm would not be a viable alternative. The sixth section will evaluate other strategic alternatives available to US/C-FPPs embodied in the following question:

C. Which of the following alternative methods of serving the Mexican market would be most appropriate: exporting, forming a joint venture with a local company, or investing in a wholly-owned production facility in Mexico?

The final section will contain conclusions.

³ For example, through exporting or foreign direct investment.

⁴ The analysis will use the competitive forces framework of Porter (1980).

It should be noted that this is a conceptual paper which provides preliminary findings of an ongoing research program. Definitive answers to all of the questions asked will not be given. Rather, the goal is to provide structure to a particular decision facing US/C-FPPs, and to identify variables that bear on this process and how each variable is likely to influence the decisions of firms.

IV. Demand Analysis

This section contains material related to demand conditions in Mexico. It considers food demand in general, as well as the different components that make up the diets of Mexicans. Particular attention is paid to the current and potential role of frozen potato products in the diet of Mexicans.

The following quote establishes some basic facts about economic and social development in Mexico. “In 1950, Mexico had 25.8 million people with a life expectancy at birth of 49 years; 43% lived in towns of 2,500 or more inhabitants, 56% of the population was literate; and per capita income was 25% of that of the United States. In 1990, Mexico’s almost 100 million people had a life expectancy at of birth of 69 years, three-quarters of them lived in towns of 5,000 or more inhabitants. Eighty-seven percent of the population was literate; some 55% of the high-school-age population attended secondary school, and its real per capita income was 29% of that of the U.S. in 1990” (Randall, 1996, pg. 5). The trends mentioned, especially increasing urbanization and incomes, will be important in the demand analysis to follow.

One of the variables effecting demand for a good is income. Since incomes depend on economic growth, general macroeconomic conditions in Mexico will also be addressed in this section. A tool pertaining to income levels and food demand is Engel’s Law. This law holds that

income elasticity for food decreases as the level of income increases. This implies that for a given percentage increase in income, a greater proportion of the increase will be spent on food in a low income country than in a high income country. So increasing incomes in Mexico create a greater opportunity for food companies than that created by increasing incomes in the U.S.

An alternative formulation of Engel's Law is that the ratio of food expenditures to total expenditures declines as income increases. It should be noted that the income elasticity of demand for food is lower than for nonfood goods. Further, the income elasticity of demand for staples is lower than for vegetables and meat. Potatoes are not a staple food in Mexico, so it is likely that as incomes grow, demand for potato products will increase more quickly than demand for staples will.

A related concept is Bennett's Law. According to this law, as incomes increase, two things happen. One outcome is that the calorie price of food increases. The other is that consumers' diets become more diversified. Furthermore, as incomes increase in lower income countries, processed foods make up a larger portion of the diets of consumers. In 1994, Mexican GNP per capita was \$4,180, while that of the U.S. was \$25,880 (World Bank, 1996, in U.S. dollars). This suggests that Mexicans' diets will include new foods (e.g. french fries) that are costlier than traditional foods, as incomes in Mexico increase.

The share of major food groups for the U.S. and Mexico for the years 1990-92 illustrates the differences between the diets of the two countries. This information is shown in Table 1.

Table 1. Share of Major Food Groups in Total Dietary Energy Supply, 1990-92

	Share in total DES								
	Vegetable products						Animal Products		
	Cereals	Sugar	Vegetable oils	Roots and tubers	Pulses and nuts	Others	Meat and offal	Milk	Others
	<i>(Percentages)</i>								
Mexico	46.1	15.0	10.3	0.8	5.4	6.1	7.7	4.5	4.1
United States	22.1	16.9	15.0	2.7	2.9	10.5	14.9	10.1	5.0

(Source: UN/FAO, 1996).

There are three differences between the statistics for the two countries that should be noted. Perhaps most importantly, the percentage of total dietary energy supply (DES) from cereals is over twice as large in Mexico than in the U.S. (46.1% vs. 22.1%). The share of Mexicans' DES provided by roots and tubers is less than half that of Americans (.8% vs. 2.7%). The disparity is nearly as great for meat and offal (7.7% of DES for Mexicans vs. 14.9% of DES for Americans). In 1995, domestic utilization of potatoes for food in Mexico was 114,000 metric tons (UN/FAO, 1997). This works out to about 2.8 lbs. per capita consumption of potatoes in Mexico. In contrast, Americans' per capita consumption of potatoes in 1995 was 140.2 lbs. That included 58.4 lbs. per capita of frozen processed potatoes (National Potato Council, 1996).

A comparison between the diets of consumers in Mexico and the U.S. sheds some light on the potential future demand for frozen potato products in Mexico. Table 2 lists per capita dietary energy supply (DES/cap.) for these two countries for three time frames. Mexico's growth rate in DES/cap. over this period was slightly higher than that of the U.S. (.7% vs. .6%). Nearly all of the growth in this variable for Mexico occurred during the 1970s.

Table 2. Per Capita Dietary Energy Supply, 1969-71, 1979-81, 1990-92
(in kcal/day)

Country	1969-71	1979-81	1990-92	Annual Growth Rate, '69-71 to '90-92
Mexico	2,740	3,180	3,190	0.7%
United States	3,230	3,360	3,700	0.6%

(Source: UN/FAO, 1996).

The 1980s were unfavorable economically for Mexico. Consumer purchasing power and real wages declined. The average growth rate of Mexican agricultural production was .84% from 1980-90. For the same period, the average annual growth rate of population was 2.1% (American Farm Bureau Research Foundation, 1991). Mexico joined the General Agreement on Tariffs and Trade (GATT) in 1986 (USDA/ERS, 1992), however, and seems to have turned the corner economically since that time. Average annual growth in GNP per capita in Mexico for the period 1985-94 was .9% (World Bank, 1996). Table 3 shows economic data for Mexico.

Table 3. Economic Data for Mexico

	1989	1990	1991	1992	1993
Population	84.5	86.2	87.8	89.5	91.2
GDP (billions of new pesos)	507.6	686.4	865.2	1,019.2	1,127.6
Real GDP growth rate (%)	3.3	4.4	3.6	2.8	0.6
Exchange rate (new pesos/\$U.S.)	2.641	2.945	3.071	3.115	3.106
Inflation (%)	20.0	26.6	22.7	15.5	8.6
Current accounting (\$U.S. billions)	(5.8)	(7.5)	(14.9)	(24.8)	(23.4)
Reserves (excluding gold, \$U.S. billions)	6.3	9.9	17.7	18.9	25.1

(Source: Krug, 1997).

In 1995, a monetary crisis occurred and the peso lost over half its value versus the U.S. dollar. A slowdown in business activity has been experienced since that time. The U.S.

government, the World Bank, and the IMF provided a total of U.S.\$24.9 billion in emergency loans to Mexico (Krug, 1997). This crisis now appears to be a temporary setback that will be overcome, however. For example, exports to the U.S. increased by 33.5% during the first five months of 1995 compared to the same period one year earlier.

Assuming that the long run economic growth will continue, the following hypothesis may be formulated:

H1. The per capita quantity of frozen processed potatoes consumed by Mexicans will increase over time.

Empirical studies should be performed to confirm or disprove this hypothesis. Two forces can lead to increased consumption of frozen potato products in Mexico. In accordance with Bennett's Law, increasing incomes will cause an increase in per capita consumption of frozen processed potatoes. Further, population growth will lead to larger quantities of frozen potato products being consumed, even if per capita consumption remains constant. If hypothesis H1 is true, and population continues to increase in Mexico, then the increase in quantity of frozen potato products demanded in Mexico will be substantial. Note that a steady increase in population is shown in Table 3.

The preceding analysis suggests a somewhat linear progression in the composition of Mexicans' diets that tends to become more like that observed in the U.S. Such a "gringocentric" view may not be accurate, of course. There is evidence that Americans are adopting significant amounts of Mexican foods. Sales of Mexican foods in the U.S. amounted to \$2.5 billion in 1995, and they are expected to explode to \$3.5 billion by 1999 (Sloan, 1996.) Furthermore, salsa has surpassed catsup as America's favorite condiment.

In the past, the staple food of a region depended on its agro-ecological conditions. For example, in the upper midwest of the U.S., the soil and climate were well suited to producing potatoes.⁵ It was quite natural and convenient, therefore, to serve some type of potato dish with nearly every meal. On the other hand, the soil and climate in the southern U.S. were different, and unsuitable to producing potatoes. It is much easier to grow corn there. The side dishes that were developed from this staple crop include grits, corn bread, and hush puppies. These have become regional specialties.

Over time, processing technology and refrigerated storage improved and transportation systems became much more efficient and effective in the U.S. This enabled firms to distribute frozen french fries to every county in the U.S. Further, fast food franchises, most notably hamburger chains, achieved nationwide penetration⁶.

It would be informative to compare trends in per capita consumption of frozen potato products and the corn-based side dishes mentioned above in the upper midwest and southern U.S. No applicable data has been located, but it is likely that in the south, frozen potato products have taken over some of the “share of stomach” formerly held by the corn-based side dishes. It is also likely that per capita consumption of frozen potato products in the two regions has converged over time. This is but one manifestation of the homogenization of American culture that has occurred in recent decades. Factors that have contributed to this homogenization include a more

⁵ Potatoes were also a staple food in the mother countries of many of the immigrants to that area, e.g. Ireland and Germany.

⁶ Major factors that contributed to the spread of hamburger chains include the following: economies of scale in purchasing inputs and advertising in national media, and more favorable customer quality perceptions through standardization.

mobile population, a better network of freeways, an improved air travel system, and national media (e.g. the broadcast television networks).

The composition of Mexicans' diets is vastly different from Americans' diets. The present difference between American and Mexican diets is probably greater by an order of magnitude than the difference that existed earlier this century between the north and the south of the U.S. Corn and wheat are the staple crops in Mexico, and beans are also an important component of the diets of Mexicans.

When fully implemented, NAFTA is expected to allow a much freer flow of capital and goods between the U.S. and Mexico. The degree of integration between the two countries will never rival the current connection between the north and the south of the U.S., however. On the other hand, satellite technology has made American television programming widely available in Mexico. And recently, American fast food chains have expanded rapidly in Mexico. This suggests that Mexican culture is picking up some American traits.

This discussion has focused on the agricultural commodity that is the ingredient of the staple food as a primary determinant of the composition of a country's diet. Another potential factor that influences diets is the food preparation technology. Frozen french fries are prepared by deep frying them in oil. It may be that cultures that use this method for preparing other foods will adopt french fries into their diets more quickly and/or to a greater extent than those cultures that do not currently deep fry foods.

In China, for example, deep frying foods has been common for centuries. In Japan, in contrast, deep frying only became widely adopted about 100 years ago. Interestingly, consumption of frozen french fries has expanded rapidly in Japan in recent years. In Mexico,

frying is a common method of cooking food, although deep frying is not prevalent. This would suggest that there is no insurmountable barrier to the adoption of frozen french fries, a deep fried food, in Mexico.

The potential demand for frozen potato products in Mexico was analyzed in this section. The general implication is that this market shows promise for significant demand expansion. This conclusion largely rests on the assumption that incomes will rise in Mexico, however. It should also be noted that the lack of deep frying as a cooking method may hinder the adoption of french fries.

V. Current and Predicted Characteristics of the Mexican Frozen Potato Industry

This section presents an analysis of the Mexican frozen potato industry. It will draw upon the competitive forces framework introduced by Porter (1980). In this framework, five competitive forces determine the level of potential profitability in an industry. These forces are: the power of buyers, the power of suppliers, the threat of potential entrants, the threat from substitute products, and the degree of rivalry among existing firms. When the strength of the forces (considered jointly) is high, profits in the industry are limited.

Buyers and substitute products were touched upon in the previous section, and suppliers will be examined in the next section. The focus here will be on rivalry among existing firms and potential entrants. By considering firms in the industry, potential entrants, and producers of substitute products, the competitive forces model avoids problems of industry definition. In this case, the industry could be defined geographically as Mexico or as a regional market including Mexico, the U.S., and Canada. Under the first definition, US/C-FPPs would be potential entrants, while under the second they would be existing firms. In the competitive forces framework, their

effect is the same either way they are classified.

At present, all significant frozen potato processing capacity in North America is located in the U.S. and Canada (Peterson et al, 1997)⁷. Conceiving of the industry as “The Mexican Frozen Potato Industry,” the US/C-FPPs are potential entrants. The leading North American frozen potato processors are listed in Table 4 below, in declining order of capacity. It is clear from Table 4 that the North American frozen potato processing industry is concentrated. The top four processors (Lamb- Weston, McCain, Simplot, and Nestle) command over 80% of the total capacity in North America. An important reason for this observed concentration has to do with cost. This issue will be considered later in a discussion of comparative advantage. Another hypothesis may be stated at this point.

H2. Large scale frozen potato processing will not develop unless a large amount of capital can be raised to invest in a modern production facility.

A new, large potato processing facility was recently constructed and opened by AVIKO in Jamestown, North Dakota. The cost of this facility was U.S.\$45 million, not including storage warehouses. A large scale production facility is required to produce efficiently enough to be competitive. The fast food chains, which are the primary customers of frozen potato processors, are putting a great deal of pressure on their suppliers to reduce the cost of their products. The fierce price competition at the retail (i.e. restaurant) level is forcing this behavior. The result is that the large amount of capital required to enter this industry serves as a barrier to entry.

⁷ The discussion about North American frozen potato processing capacity that follows borrows extensively from the Peterson et al (1997) paper.

Table 4: Leading North American Frozen Potato Processors

Company	Raw Capacity	Percent of North American Capacity
Lamb-Weston	73.0 Million cwt.	30.0%
McCain	56.3	23.1
Simplot	52.0	21.3
Nestle	14.5	5.9
Ore-Ida	12.0	4.9
Cavendish	9.0	3.7
All others	27.1	11.1
Total	243.9	100%

(Source: Peterson, et al, 1997).

Frazier's Potato News (1997) published a "report card" of the processors, which is presented in Exhibit 1. This information can be used in competitor analysis, e.g. to assess the likelihood of each firm to pursue the Mexican market. Although a complete competitor analysis is beyond the scope of this paper, it would be instructive to briefly characterize the major players listed in Table 4 above. Lamb Weston is a subsidiary of Con-Agra, a diversified, publicly traded firm. McCain Foods, based in New Brunswick, Canada, is family owned. They have been expanding rapidly. Simplot is also a closely held, family owned corporation. Its aging founder and major shareholder, Jack Simplot, is considered to be one of the last men to make a fortune from the natural resources of the western U.S. Finally, Nestle is a global food company based in Europe.

As mentioned earlier, frozen potato processing does not exist in Mexico on the scale observed in the U.S. and Canada. Mexican firms are involved in processing other frozen vegetables, however. These firms can also be considered potential entrants into the frozen potato

processing industry in Mexico. As of 1991, there are three Mexican firms selling frozen vegetables (American Farm Bureau Research Foundation, 1991). These firms are called La Huerta, Covemex, and Legumbres Congelados. In addition, the American firm Campbell's processes frozen vegetables in Mexico. Fifteen types of frozen vegetables, including potatoes, are being sold in Mexico. Frozen vegetable mixes are also sold. The conclusion is that there is a base structure of frozen food processing in Mexico which can be built upon. It would be possible for the existing frozen food companies to diversify horizontally into processing and selling frozen potatoes.

The preceding analysis indicates that there are substantial barriers to the development of frozen potato processing in Mexico. Due to the fact that a base of frozen vegetable companies currently exists, these barriers may not be completely insurmountable, however.

A tool used by economists called subsector analysis can provide insight to the structure of industries. This analytical approach can be characterized in the following way. "An agricultural subsector is viewed as an interdependent array of organizations, resources, laws, and institutions involved in producing, processing, and distributing an agricultural commodity. A subsector normally includes several industries (firms that are similar in functions performed and products produced)...Subsector analysis is more than an analysis of the various industries that are part of a subsector, however. Although such industry analysis may be useful, the essential characteristic of subsector analysis is focusing in on the total vertical complex as *a system*." (Marion, 1986, pg. 52, emphasis in original).

Basically, subsector analysis is an adaptation of the Structure-Conduct-Performance model of Bain (1956). It posits that in addition to structure, certain basic conditions influence the

conduct of firms (Marion, 1986). Examples of basic conditions are production trends, consumption characteristics, trade, laws, and government policies. Further, vertical coordination, which is often neglected by economists, is a key aspect of subsector analysis. The following dimensions of performance are used in this approach: resource allocation, equity, transaction costs, accessibility of markets and information, and dynamic stability.

The size of the potato sector in Mexico is very small compared to that of the U.S. To get a picture of what would have to develop in Mexico to make large scale frozen potato processing possible, one should look at the existing potato subsector in the U.S.⁸ Four parallel channels (fresh, dehydrated, frozen, and chipping) make up the U.S. potato subsector (Marion, 1986). Growers often produce for more than one channel, so the channels may be combined for the purpose of analysis. The frozen potato channel is illustrated in Exhibit 2. It is important to note that different varieties are necessary for different end uses. There can be a surplus in one variety and a shortage in another variety at the same time. Further, different groups of varieties (e.g. small and round vs. long, football shaped) require different agro-ecological conditions.

The frozen potato channel in the U.S. is distinct from the other channels, i.e. frozen potato processors are typically not involved in the other channels. Frozen processors generally contract with growers for nearly all of their raw product. Contracts are negotiated in the spring for delivery in late summer and fall. The contract price of potatoes for frozen processing is based at least in part on grower production costs. Storage is an important issue in the potato subsector, especially in the processed channels. An excerpt from Peterson et al (1997) describing important

⁸ This is not to say that there is only one way to organize an agricultural subsector. Examining a developed subsector does give an indication of some of the characteristics that a subsector will have if it is established in another location.

considerations related to potato storage is included as Appendix A. The key point of the passage is that a great deal of risk is involved in storing potatoes. In the 1980s, processors took title to potatoes grown under contract at harvest time and stored them until processing. This channel characteristic has changed somewhat in recent years. Grower storage and “just-in-time” delivery to frozen processors has become more common.

Finished product from frozen potato processing plants is packed in polyvinyl sacks and placed into cold storage either on site or in leased facilities. Approximately 90% of the potatoes processed in frozen potato plants in North America are made into french fries. And approximately 85% of the frozen french fries produced in North America are sold in the food service market (American Frozen Food Institute, 1996).

Now that the frozen potato subsector in the U.S. has been described, its Mexican counterpart must be considered. Most of Mexico’s spring and fall vegetable production is produced by small farmers with minimal/no grade and quality standards (American Farm Bureau Research Foundation, 1991). In addition, the vertical coordination of the potato subsector in Mexico evidently needs to be improved. In 1995, more than 10% of Mexican potato production was included in the utilization category “Waste” (UN/FAO, 1997).

Inefficiencies also exist downstream in the distribution of other frozen vegetables in Mexico. Products are individually quick frozen and packed into 500 gram polyvinyl bags. Old ice cream freezers are used to display products in retail stores (American Farm Bureau Research Foundation, 1991). Each processor places a freezer in retail stores, and they each maintain their own stock. Another hypothesis may now be introduced.

H3. Frozen potato processing will not develop in Mexico until significant improvements are made

in the vertical coordination and distribution of the subsector.

It should be noted that some efficiency improvements have been achieved at the retail distribution level, however. Supermarket chains are expanding their market share at the expense of small, neighborhood stores. Some chain stores are increasing refrigerated shelf space at the store level. GATT now gives wholesalers and retailers access to state of the art equipment. In addition, major improvements in physical distribution are expected in the next decade in Mexico (American Farm Bureau Research Foundation, 1991).

An institutional change was recently made in Mexico that will affect this subsector. In 1990, legislation went into effect that protects the intellectual property rights of firms that invest in Mexico. Increased investment in enterprises such as fast food outlets by American restaurant chains is expected to result (Krug, 1997). French fries are an important menu item for fast food outlets. If this expansion occurs, Mexican consumers will have greater access to processed potato products. The quantity of frozen french fries demanded in Mexico will increase, therefore.

VI. Factors Affecting Alternative Methods of Serving the Mexican Frozen Potato Market

This section will consider the question of how best to serve the Mexican frozen potato market. It builds on the results of the preceding two sections, i.e. that adequate potential demand exists and that industry structure is favorable. The alternatives available to US/C-FPPs for serving the Mexican market include exporting, forming a joint venture with a local company, and direct investment in a wholly owned production facility.

Exporting is typically viewed as the lowest risk method of international expansion. It doesn't involve a large capital investment in the target country, and the risk of expropriation that would entail. Forming a joint venture with an indigenous company is the next lowest risk

strategy. Having a partner from the host country helps the project to receive more favorable treatment from the host government. On the other hand, the potential returns of a joint venture are lower than those from a wholly owned operation. In a joint venture, profits must be split with the other equity holder.

One theory that is often used to explain the location of economic activity is called the theory of comparative advantage. An extended quotation will explain this principle. “According to the principle of comparative advantage, a country will export goods that are relatively cheap compared with other goods it can produce in terms of the resource cost per unit of output. Its imports will consist of goods that are relatively expensive to produce at home” (Truett and Truett, 1987, pg. 395).

Potatoes are not included as a major crop in Mexico. Table 5a below shows the relative importance of potato production in Mexico and the U.S., and Table 5b provides the same information for maize. The first fact to note from these tables is that Mexico’s maize production relative to the U.S. in terms of area planted is greater than its potato production relative to the U.S. There is no simple answer to why this is the case. Both production and demand factors come into play to create this result. The second fact to note is the small amount of acreage of potatoes harvested in Mexico.

Table 5a. Potato Production Information for Mexico and the U.S.

Yr.	Area Harvested, 1000 HA				Yield, 1000 KG/HA				Production, 1000 MT			
	89-91	‘94	‘95	‘96	89-91	‘94	‘95	‘96	89-91	‘94	‘95	‘96
Mex	76	61	64	62	15.5	19	19.9	19.8	1114	1167	1269	1231
U.S.	543	558	555	577	33.1	37.9	36.2	39	17995	21185	20122	22549

Table 5b. Maize Production Information for Mexico and the U.S.

Yr.	Area Harvested, 1000 HA				Yield, 1000 KG/HA				Production, 1 million MT			
	89-91	'94	'95	'96	89-91	'94	'95	'96	89-91	'94	'95	'96
Mex	6918	7851	7500	7900	1913	2323	2158	2190	13	18	16	17
U.S.	27054	29470	26303	29602	7184	8708	7171	7975	194	256	187	236

(Source: U.N.-FAO, 1996).

Frozen potato processing capacity is geographically concentrated in North America. Washington, Oregon, and Idaho have 71% of North American capacity, while Canada has 14%. Within Canada, nearly all capacity is in either the prairie province of Manitoba or in the Atlantic provinces of New Brunswick and Prince Edward Island. These areas contain such a large fraction of the continent's frozen potato processing capacity because these are the most favorable areas for growing the appropriate varieties. Frozen potato plants are always located near the growers.

The finished product yield of a modern plant is about 50% of the weight of the raw product used. Being located close to the growers reduces transportation costs, since most of the transporting is done after the weight of the product has been reduced. The cost of transportation of finished product is a relatively small proportion of the price of frozen potato products. For example, it costs about \$2/cwt.⁹ to ship frozen french fries from Idaho to Syracuse, N.Y. Shipping costs are relevant because for retail and foodservice outlets in Mexico, frozen potato products produced in the U.S. are substitutes for frozen potato products produced in Mexico. This is especially true since 1994, when NAFTA went into effect.¹⁰ The cost of raw product is

⁹ Cwt. is an abbreviation for "hundredweight," i.e. a 100 lb. sack.

¹⁰ NAFTA entails a gradual reduction of tariffs and increases in quotas. This makes it easier for U.S. firms to export to Mexico, and vice versa. Tariffs and quotas on processed potato

the largest component of the cost of frozen potato products.

Due to the cost relationships described, under conditions of free trade, a frozen potato processing plant can only be viable if it is located in an area where the long, football-shaped potato varieties can be grown at a competitive cost. This implies that there will either be a significant frozen potato subsector in Mexico or none at all. This is due to scale economies, and is an example of the effects of lumpy technology in agricultural development.

In the past two seasons, the contract price of potatoes for frozen processing has been about \$5.50 per cwt. in the U.S. Exhibit 3 contains a breakdown of the cost of production for growing an acre of potatoes for frozen processing in the Montcalm County area in Michigan. Assuming a yield of 350 cwt. per acre, returns to fixed factors are \$261.40 per acre. According to industry sources, in Mexico potatoes currently cost between \$18 and \$20 per cwt.

To make a definitive determination of the reason(s) why potatoes cost over three times as much in Mexico is beyond the scope of this paper. A few potential reasons for this can be introduced, however. The substantial cost of fertilizers, lime, and pesticides (over 21% of total production cost) highlights the importance of agro-chemicals in potato production in the U.S. Potato crops in Mexico are plagued with pests (Rochin, 1997). Perhaps Mexican potato growers are underusing pesticides due to high cost or lack of availability. Mexico's joining GATT will provide agricultural producers in Mexico with access to lower priced imported agro-chemicals. Yields should increase which will lower the cost of agricultural products, including potatoes. Another hypothesis is suggested.

H4. Large scale frozen potato processing will not develop in Mexico until Mexican potato

products will be phased out over a fifteen year period, for example.

growers become competitive with their American counterparts.

Another possible cause of the high cost of potatoes in Mexico is related to the agrarian structure. It is necessary to consider the history of Mexico to obtain a clear picture of the agricultural system. The Mexican revolution ended in 1910. Article 27 of the Constitution of 1917 provided for the expropriation of land from large landholders (Hine, 1993). These tracts were organized into government-owned systems called “ejidos.” These units were governed by complex rules. These rules prohibited the growers who worked the land from selling it, restricted their access to credit to one government agency, and limited their cultural practices (de Janvry, Sadoulet, Davis, and Gordillo de Anda, 1997).

In late 1991, a major reform of the ejido system was passed by the Mexican legislature. The law was intended to address inefficiencies created by the system. Provisions of the reform are described in Appendix B (excerpted from Hine, 1993, pg.12). Further, a new water law was passed in 1993 which eliminated cities’ priority for water over agriculture (Whiteford & Bernal, 1997). It is projected, however, that the price of water to campesinos will actually rise. It is too early to ascertain the impact that these reforms will have on prices for agricultural products such as potatoes. This certainly presents an opportunity for research.

The cost disadvantage of raw potatoes in Mexico is far too great to be overcome by lower costs in other aspects of production of frozen potato products (e.g. lower hourly labor rates). The conclusion of this section is that frozen potato processing in Mexico will not become competitive with processing in the U.S. and Canada until producer costs can be reduced to a level on par with that observed in those countries.

The volume of exports of processed potato products by the U.S. to Mexico is given in

Exhibit 4. It showed an increasing trend until 1994, when the peso devaluated. Finally, Mexico has been identified as one of the twenty fastest growing markets for U.S. food exports (Schweikhardt and Batie, 1998).

VII. Conclusions

This report presented some of the fundamental assumptions of agribusiness decision makers. Some issues related to the globalization of one particular industry, the frozen french fry industry, were discussed. Following this background information, a specific problem facing frozen potato processors in the U.S. and Canada was considered in some detail. The problem was whether a potential market for frozen potato products well develop, and if so, how this market should be served.

The implication of the demand analysis is that the quantity demanded of potatoes, and frozen potato products in particular, should increase. The industry analysis section brought out the important fact that a large amount of capital will be required to establish a competitive frozen potato processing plant in Mexico. Problems were revealed through an analysis of the Mexican potato subsector, however. A great deal of inefficiency was identified, which must be eliminated for Mexican production of frozen potato products to become competitive with U.S. product. The increased access to agro-chemicals and distribution equipment made possible by Mexico's joining GATT provides a ray of hope for the Mexican frozen potato industry.

Perhaps the most daunting challenge to the establishment of a frozen potato industry in Mexico was revealed by considering the comparative advantage in potato production of Mexico versus the U.S. The high cost of growing potatoes in Mexico at the current time makes producing frozen potato products uncompetitive. The overall conclusion of the report is that

based on economic and production factors, it is unlikely that there will be any large scale frozen potato processing in Mexico in the foreseeable future.

It is possible that the actors involved in investment decisions will not behave as this analysis predicts. Consider the following two facts. First, Mexico's population is over one third the size of the U.S. This represents a huge potential market for American quick service restaurant chains. Second, American fast food franchises are sometimes viewed as a symbol of American imperialism. In fact, after austerity measures were imposed following the peso devaluation in 1995, an incident of vandalism occurred at a McDonald's restaurant in Mexico City (Krug, 1997). Four masked men entered the restaurant, overturned tables, and smashed windows and cash registers as an act of protest.

It is possible that American chains could support a local frozen potato plant as an act of political appeasement. The chains could guarantee the purchase of a substantial amount of output from the plant at prices that would allow a reasonable return. The plant would purchase its raw product from local growers. This would create the impression that the American fast food chains were contributing to the community. Although their fries would cost more than if they imported them from the U.S., this premium may be viewed as a cost of doing business in Mexico. In fact, this pattern of foreign direct investment has already been observed in Asia.

A problem with the establishment of frozen potato processing was alluded to earlier. This is the "chicken and egg" problem: the growers will not grow before the plant is there, and no one would build a plant until they know the growers can deliver. So if the government has a goal to

promote a frozen potato industry,¹¹ there is scope for intervention. Strategically, it may be a good policy for the government to provide subsidized inputs and guarantee a minimum price for output to the growers for a few seasons. The subsidies would only be temporary and could be justified using the infant industry argument. If adequate capital and training are provided to the growers and the weather is favorable, they will produce good potato crops. This should be adequate to lure an investment in a frozen potato processing plant.

The government should go into such a project fully aware of the costs, however. These plants have serious environmental impacts. Residents living near frozen potato plants have complained about odors from potato waste, and there is the risk of spreading blight. On the other hand, a positive effect is that potato waste can be fed to livestock.

A final observation is that the issue addressed is many-faceted, and that a paper of this scope can not completely cover all aspects. Furthermore, the recent changes in Mexican institutions will almost definitely affect outcomes related to this topic. There are plenty opportunities for additional research for interested scholars.

¹¹ For example, because of the new jobs that would be created in the plant and through multiplier effects.

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Exhibit 1. Grades for North American Frozen Potato Processors.

(Based mostly on their performance for the first half of 1997. Source: Frazier's Potato News, June 26, 1997).

GRADE	NAME	COMMENTS
A plus	Ore-Ida	Management and staff at Ontario, Oregon could have punched in with reduced effort after parent Heinz cut the company off at the knees. . . Loss of beer-battered fries a big blow. However, employees have dedicated their work to success at retail. Seems to be paying off!. . . Ore-Ida has sound record for treating Malheur and Treasure Valley growers as valuable suppliers.
A	McCain Foods	Entire grade based on Harrison McCain's sheer guts in paying \$500 million US for Ore-Ida's foodservice business, including two huge fry plants. . . Analysts wondered if sales force could move all the product. . . However, all plants seem to be thriving.
A minus	Aviko USA	Recovering from poor choice of name. Fry production is surging along. New plant in Jamestown, North Dakota seems technically perfect. But can they <u>sell</u> fries? If they can't, they sure are putting on a bold front.
A minus	Logan International	With new plant at Oregon's Port of Morrow, company is impressing niche buyers with quality and service.
B	Twin City Foods	Good sales structure. . . Good growers. . . Holds own against big multi-nationals.
B minus	Northern Star	"In thought" in fry markets; had to pull back. Production and marketing of "refrigerated products" makes the company a winner.
C	Nestle	Trudging along. Seems content with second-echelon status. Sales morale is questioned in some quarters.
D plus	Lamb-Weston	Had nearly perfect record for first five months with great products, aggressive sales. . . Report card then badly blotted with insulting 1998 contract offer in Idaho. Saw Idaho growers as vulnerable. . . Still time in last half of 97 to show more respect for potato growing partners. . . Grade would have been lower but marks are added for support of daring RDO/Navajo initiative in New Mexico.

D	Simplot	Viewers worry recent pull-backs will leave Simplot out of the loop when the U.S. fry industry stages its next leap forward. Some employees seem demoralized. . . Could have ben a B but lost points for leading south central Idaho growers to believe contract volume would be close to normal. (It was cut 50%). . . Has potential for fabulous earnings and a much higher grade if groundwork in China pays off. Could take five years or more.
D minus	Cavendish Farms	Technical excellence in production. Owners preaching about lower costs is wearing on growers. Can't shake sour image since \$4.5 million of govt. money grabbed for Poole's Corner storage. (To be fair, money was dumped in Irvings' lap by a govt. since gone south). Should give money back. Would reverse image. . . Grade would have been worse except the company paid Maine growers reasonable prices all winter.

Exhibit 2: The Frozen Potato Channel Within the U.S Potato Subsector

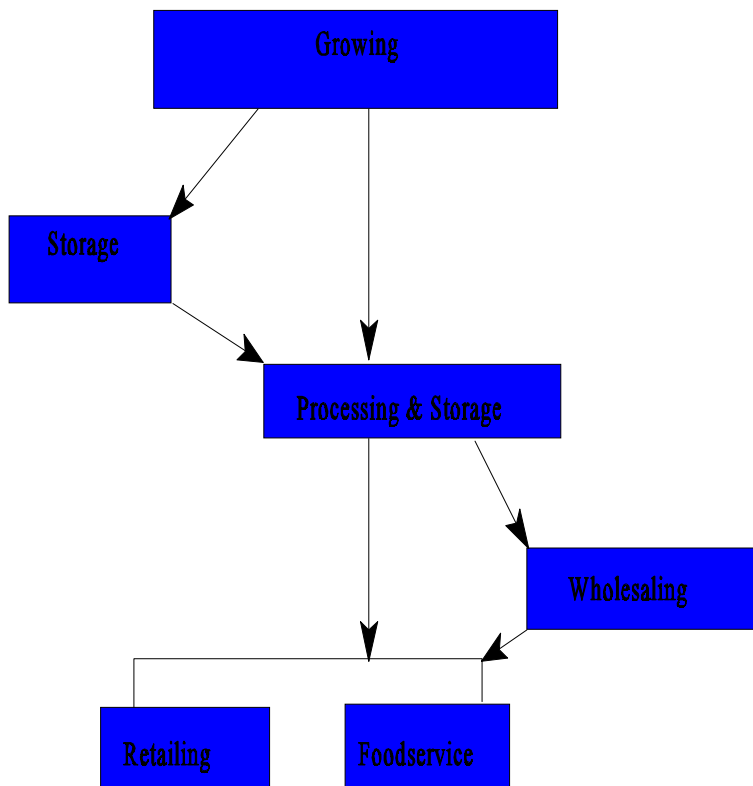


Exhibit 3 Cost of Producing One Acre of Potatoes for Frozen Processing in Montcalm County, Michigan

Input Item	Unit	Units/Acre	\$/Unit	\$/Acre	\$/Acre
1. Seed					\$194.50
a. Potatoes	cwt	20	9 1	80	
b. Rye (Cover Crop)	bu	3	3.5	10.50	
c. Inoculant - Bark			4		
2. Fertilizer & Lime					120.075
a. Potash 0-0-60	lbs	375	0.065	24.375	
b. Starter 10-34-0	gal	30	1.264	37.92	
c. Liquid N 28-0-0	gal	60	0.703	42.18	
d. Urea N 45-0-0	lbs	90	0.115	10.35	
e. Lime, ave/year	lbs	500	0.0105	5.25	
3. Herbicides					21
a. Pre-plant none					
b. Pre-emergence					
Lorox	lbs	1.5	9	13.5	
Dual	pint	1	7.5	7.5	
c. Post-emergence None					
4. Insecticides					72.6
Admire	pint	1	60	60	
Pyrethrin - 2 apps	ounce	6	1.05	12.6	
5. Nematicides					
Vapam (alt. years)	acre	200	100	100	
6. Fungicides					147.425
Manzate - 4 apps	lb	2	3.1	24.8	
Bravo ZN - 9 apps	pint	2	4.375	78.75	
Sec 18 - 2 apps					
Curzate	lb	1.5	9	13.5	
Tatoo	pint	2.25	13.5	30.375	
7. Vine Desiccation					
Diquat w/suf - 2 apps	pint	1	9.375	18.75	18.75
8. Fuel and Energy	acre				120
a. Irrigation	acre-inch, 5		9	45	
b. Field & Trucking	acre				75
9. Repairs & Supplies	acre				150
a. Irrigation	acre			25	
b. Field - Preharvest	acre			50	
c. Harvest	acre			25	
d. Post-harvest	acre			50	

10. Labor	acre				260
a. Irrigation	acre			50	
b. Field - Preharvest	acre			100	
c. Harvest	acre			50	
d. Post-harvest	acre			60	
11. Scouting	acre				7.5
12. Custom Hire					84.25
a. Spray - 15 apps	acre	15	4.75	71.25	
b. Urea - airplane	acre	1	6	6	
c. Potash	acre	1	3.5	3.5	
d. Cover crop - rye	acre	1	3.5	3.5	
13. Micellaneous					44
a. Crop Ins - Hail	acre	1	24	24	
b. Prop Ins	acre	1	20	20	
14. Interest					
a. Operating	acre	1100	0.09	49.5	49.5
15. Total Variable Cost			\$1,389.60		
16. Mach & Equip Ownership Cost				125	125
17. Land Control Cost	acre			150	150
18. Total Cost	acre			\$1,664.60	

(Source: Dr. G. Schwab, Dept. of Ag. Econ., Michigan State Univ.)

Appendix A: Potato Storage Issues

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 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 higher 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/her own potatoes, he/she 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.

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" processed potatoes. 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.

(Source: Peterson, Schweikhardt, Masterovsky, Phillips, & Schulz, 1997, pg. 11-12)

Appendix B: Modifications to Article 27 of the Mexican Constitution

“a) End land distribution - The “ejido” system now accounts for over 22 million acres or about 50% of Mexico’s arable land.

b) Authorize ejidos to associate with outside investors - approximately 30% of the population is directly or indirectly affected by changes in the ejido system, according to the USDA. The Salinas administration is hoping that the change in land tenure laws will result in enough interest by outside investors to prevent further flight from rural to urban areas of the country.

c) Authorize ejidos to establish individual property rights - By allowing such flexibility, the Mexican government is in essence “privatizing” land and creating new capital for the rural areas which is not government sourced.

d) Establish agrarian law courts - By specializing the court system, quicker decisions regarding ownership and property rights are possible.”

(Source: Hine, 1993)