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SOUTHEAST IOWA NUT GROWERS COOPERATIVE

Chestnut Market Opportunities
Assessing Upscale Restaurant Interest
in Value-Added Chestnut Products

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PREPARED FOR:
Southeast Iowa Nut Growers Cooperative
Tom Wahl
13882 I Ave
Wapello, Iowa 52653
(319)729-5905

PREPARED BY:
FOOD PROCESSING CENTER
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA - LINCOLN
143 FILLEY HALL, EAST CAMPUS
LINCOLN, NE 68583-0928
PHONE: 402/472-2832
FAX: 402/472-1693

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University of Nebraska Food Processing Center 2003

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I. PROJECT BACKGROUND

The Southeast Iowa Nut Growers Cooperative requested assistance from the University of Nebraska Food Processing Center (FPC) to conduct research on the market for chestnuts. The research consists of:

- Identifying world and U.S. chestnut production and consumption figures, where available
- Determining current applications for chestnuts
- Identifying current channels of distribution for chestnuts
- Market testing three value-added chestnut products in the foodservice market

This report includes summaries of what FPC consultants found from the research that was completed. Additionally, issues are identified and recommendations made that outline whether a successful entry into the various target markets can be achieved.

II. INTRODUCTION

Chestnut trees, and consequently chestnuts, were a large part of American culture at the turn of the twentieth century. The American chestnut, which is one of four primary chestnut species--Japanese, European, and Chinese being the other three--was prominent in many parts of the country but particularly, the eastern part of the United States. The wood from the trees was commonly used in furniture making and the chestnuts from the tree were frequently included on ingredient lists from recipes used during that era. To not be familiar with and eat chestnuts then could be likened to not having heard of and eating cheese today. They were a staple in the American diet.

All that changed with the introduction of the chestnut blight fungus from Asia. The fungus was particularly deadly. It was easily spread and killed the trees it infected. The fungus spread quickly through the forests and within a generation, almost all of the chestnut trees in the U.S. had vanished from the landscape and with them the knowledge and appreciation of the chestnut as an enjoyable food and valuable ingredient. At least two generations exist whose experience with chestnuts amounts to words in a Christmas song—"Chestnuts roasting on an open fire...". Despite the fact the U.S. still imports approximately 20 million pounds of chestnuts annually, U.S. growers and processors of chestnuts face a mostly 'uneducated' market of chestnut consumers and chefs in the U.S. The one exception is Asian consumers. Many originate from countries where chestnuts are still a regular part of life and thus they are avid consumers of available chestnuts in the U.S.

III. WORLD CHESTNUT PRODUCTION AND U.S. IMPORTS

The U.S. Department of Agriculture (USDA) does not report separate statistics on the production and consumption of chestnuts in the United States. Chestnuts are included in the *other tree nuts* category in USDA tree nut statistical reports. The focus in this section of the report is on the production of chestnuts around the world and the volume imported into the United States.

The University of California Cooperative Extension published "*Chestnut Culture in California*" in 2000 by Paul Vossen, a Farm Advisor in Sonoma County. According to the article, current (2000) chestnut production worldwide is about 500,000 tons (454,000 metric tons), or about 1 billion pounds. The leading countries in chestnut production are as follows: China, 40 percent; Korea, 15 percent; Italy, Turkey, and Japan, about 10 percent each; France, Spain, and Greece, about 4 percent each; and the United States, Australia, New Zealand, Chile, and Argentina, less than 1 percent each.¹ The Foreign Agriculture Organization of the United Nations (FAO) provides the world production statistics for chestnuts displayed in the table on the following page.²

¹Vossen, Paul, "*Chestnut Culture in California*," University of California Cooperative Extension Farm Advisor, Sonoma County, 2000.

²FAOSTAT Agriculture, Food and Agriculture Organization of the United Nations, (<http://apps.fao.org/page/collections?subset=agriculture>).

TABLE 1: Worldwide Chestnut Production (Metric Tons)

Country	Year							
	1998		1999		2000		2001	
China	450,000	53.8%	534,631	59.2%	598,185	60.8%	615,000	63.4%
Republic of Korea	109,956	13.1%	95,768	10.6%	92,844	9.4%	90,000	9.3%
Turkey	55,000	6.6%	60,000	6.6%	60,000	6.1%	60,000	6.2%
Italy	78,425	9.4%	52,158	5.8%	70,000	7.1%	50,000	5.2%
Japan	26,200	3.1%	30,000	3.3%	27,000	2.7%	27,000	2.8%
France	11,411	1.4%	12,563	1.4%	13,224	1.3%	13,000	1.3%
Greece	12,820	1.5%	12,000	1.3%	12,000	1.2%	12,000	1.2%
Spain	10,000	1.2%	10,000	1.1%	10,000	1.0%	10,000	1.0%
World	836,378	100.0%	902,653	100.0%	983,237	100.0%	970,310	100.0%

According to the FAO statistics given above, worldwide chestnut production is increasing, showing a total increase of 16 percent from 1998 to 2001. It is also very evident China dominates the world production of chestnuts. As a result, China virtually has control of world pricing of commodity chestnuts (assuming chestnuts are a commodity). The chestnuts produced around the world are viewed by many to be of inferior quality to those that can be produced and distributed in the United States. There are also perceived differences in quality in the varieties currently being produced in the United States. This, coupled with the fact current production in the United States is so small, means one could reasonably argue U.S. produced chestnuts don't fall into the commodity category.

Paul Vossen states that approximately one-third of China's chestnut production and approximately 40 percent of Korea's production is exported to Japan. Japan is a large chestnut producer *and* consumer as well as the biggest chestnut importer. Japan's domestic production is chilled fresh and consumed throughout the winter, especially around the New Year. Another method is to boil the nuts, cut them in half, and eat the nutmeat with a teaspoon. Japanese chestnut prices range from \$3.00 to \$4.00 per pound for ordinary cultivars. The very best varieties can sell for \$7.00 to \$8.00 per pound. It appears that most of the chestnuts sold to consumers around the world are unshelled. Almost all recipes include steps for shelling the nuts with no mention of the availability of shelled chestnut kernels.

Italy is the world leader in the production of candied nuts, *marrone glacé*, and other processed chestnut products. *Marrone glacé* is a chestnut that has been preserved with sugar liquor to a candied consistency. A box of *marrone glacé* chestnuts is more expensive than a box of fine chocolates. In Italy, the traditional use of dried chestnuts and chestnut flour in cooking is declining but overseas the popularity of these, and similar products, is increasing, especially in the United States.

Table 2: Chestnuts: Top 25 Producing Countries³

Chestnuts Production (Mt) ¹	Year			
	1998	1999	2000	2001
World	836,378	902,653	983,237	970,310
China	450,000	534,631	598,185	615,000
Korea, Republic of	109,956	95,768	92,844	90,000
Turkey	55,000	60,000	60,000	60,000
Italy	78,425	52,158	70,000	50,000
Bolivia	30,864	33,603	34,400	34,500
Portugal	22,022	30,811	33,359	27,000
Japan	26,200	30,000	27,000	27,000
Russian Federation	14,000	15,000	16,000	16,000
France	11,411	12,563	13,224	13,000
Greece	12,820	12,000	12,000	12,000
Spain	10,000	10,000	10,000	10,000
Korea, Democratic People's Republic of	8,500	8,400	8,500	8,500
Peru	2,072	2,170	2,100	1,600
Yugoslavia, Federal Republic of	1,400	1,400	1,400	1,400
Hungary	973	1,029	1,015	1,100
Romania	800	900	1,000	1,000
Trinidad and Tobago	915	950	950	950
Slovenia	500	500	500	500
Bulgaria	250	300	300	300
Switzerland	0	200	200	200
Cameroon	100	100	100	100
Malawi	80	80	80	80
Zimbabwe	40	40	40	40
Kenya	50	50	40	40

¹Mt = Metric Ton or 2,200 pounds

In the United States, chestnut production accounts for less the 1 percent of total world production. Based upon government statistics, the U.S. annually imports 10 to 20 million pounds of European in-shell chestnuts primarily from Italy at a retail cost of \$30 to \$40 million according to government data. Some estimate that the volume of chestnut imports could be as high as 40 million pounds annually. Currently, there is a limited amount of *processed chestnuts* being imported into the U.S. The table on the following page shows U.S. imports of chestnuts:

³FAOSTAT Agriculture, Food and Agriculture Organization of the United Nations, (<http://apps.fao.org/page/collections?subset=agriculture>).

**TABLE 3: U.S. Imports of Chestnuts
(Fresh Or Dried, Whether or Not Shelled or Peeled For Consumption)**

Country	1996	1997	1998	1999	2000	2001	2002 Jan - June
	In 1,000 Units of Quantity (Kilograms)						
Italy	3,003	3,197	3,197	3,182	3,059	2,422	30
Korea	253	556	1,522	1,098	778	1,561	118
China	129	171	41	217	280	421	248
Spain	98	209	115	4	43	207	2
Portugal	81	108	104	116	139	137	0
France	21	39	94	52	74	100	10
Total Imports Kilograms	3,669	4,337	5,100	4,722	4,428	4,885	451
Total Imports Pounds	8,089	9,561	5,100	10,410	9,762	10,770	994

Sources: Data in this table has been compiled from tariff and trade data from the U.S. Department of Commerce, the U.S. Treasury, and the U.S. International Trade Commission.

In 2000, imported in-shell chestnuts ranged in price from \$1.50 to \$3.00 per pound, with an average of \$2.10 per pound. Most of the imported in-shell chestnuts come from Italy and Korea. The Italian imports wholesale for approximately \$2.00 per pound and are preferred by wholesale buyers because of their consistent quality (large size and easy peeling). According to Vossen, prices for processed, peeled, and frozen chestnut products in the U.S. have reached more than \$2.75 per pound. The results from this project's market test of processed, peeled and frozen chestnut products produced in the Midwest indicate a potential for much higher prices (\$3.00-\$9.00 per pound). Details of the market test are included in a later section of this report.

There are a number of attributes that determine chestnut quality and thereby impact the price one will receive for chestnuts of the commodity variety. According to Vossen, the most important quality characteristics are:

- Nut size
- Degree of burr separation from the shell
- Ease of pellicle removal
- Flavor

In the 1990s, very large California chestnuts commonly sold for \$3.00 per pound wholesale; organically produced nuts sold for an even higher price. The wholesale price ranged from \$1.20 to \$5.00 per pound, depending on the grade, market season, and location. Retailers commonly doubled the wholesale price and paid the best prices for the largest sizes. The size of the individual chestnuts is important in the more choosy fresh markets. Large nuts, 0.5 to 1 ounce (14 to 28 g) each, may well command a premium price as high as \$6.00 to \$7.00 per pound at retail markets. The most common variety of chestnuts in California is the Colossal

variety. While larger in size than other varieties, some industry experts believe it produces a chestnut with inferior taste attributes.

Most chestnuts are sold fresh in the shell, but some Italian delis also sell dried, peeled chestnuts. Ethnic markets are the largest outlet for chestnuts, perhaps as high as 80 percent in some locations. As evidenced by the large Japanese, Korean, and Chinese role in the world production and consumption of chestnuts, it is not surprising they are willing consumers of the chestnuts available in the U.S. It would not be a stretch to say the ethnic market is the low hanging fruit for the U.S. chestnut industry. Most of the remaining nuts are sold to upscale consumers for special recipes during the holidays.

In his report, Vossen shares a belief that chestnuts offer good market potential, given appropriate and sufficient marketing and promotion programs, *“especially since chestnuts are considered a health food that is delectable and can easily be grown organically. These positive aspects appeal to many of today’s consumers. Since freshness is a sales factor in chestnut appearance, domestic production has a definite advantage over Europe and Asia due to early ripening.”*

IV. CHESTNUT MARKET OPPORTUNITIES

The focus of this project was the foodservice market; however, the ingredient and retail markets for chestnuts were also explored. Brief summaries of the results are included below.

A. Ingredient Market for Chestnuts

The ingredient market for tree nuts, specifically chestnuts, in prepared foods is a commodity marketplace where supply and demand factors dominate, making price competition extremely important. It is also a marketplace where price fluctuations can be extreme. For example, in the case of pecans, a supermarket bakery reported that the price for pecan pieces sometimes will fluctuate as much as \$3 per pound depending on the time of year and the supply of pecans.

Given the development of the pecan and other well-known nut industries (almond, walnuts, etc.), the quality of such nuts has a higher likelihood of being uniform and availability is widespread. These are two common characteristics of a commodity marketplace. Chestnuts, however, likely fall into another category. Both domestic chestnut consumption and production are currently small. Low volume and sparse production can often lead to a larger degree of variability in nut quality. These are characteristics of a specialty marketplace where a supplier who can provide a consistently higher quality product can gain an edge. While price will always be a factor in the ingredient marketplace, chestnuts currently have the advantage of being a specialty item.

Prepared food products is often the last place a new ingredient or flavor will show up in the food supply. The cost of developing new products and the accompanying failure rate of such products means prepared foods manufacturers work hard at minimizing risk when identifying new product opportunities. Chestnuts as an ingredient must mature in the marketplace before

a food manufacturer would be likely to develop a product that features chestnuts. The use of value added chestnut products, such as flour, is not uncommon in the gluten-free market; however, they are not widely used in the mainstream market.

Chestnuts are different in composition than many other tree nuts; however, they do offer healthful benefits. The functional food market has been growing quickly in recent years. While determining the nutritional benefits of chestnuts is outside the scope of this project, the Southeast Iowa Nut Growers should begin to explore and/or promote the healthy aspect of chestnuts. A brief summary of the functional foods market and the role of tree nuts in that market is included in Appendix C.

B. Retail Markets

An opportunity exists in the retail grocery market for the growers to sell chestnuts. The Food Processing Center believes that a market opportunity exists, especially during the holiday season, in the retail grocery market for chestnuts. Initially, the growers should market *in-shell* bulk chestnuts. As the growers develop value-added chestnut products, they can be introduced to the retail market. The Center does not believe the consumer market is currently sufficiently developed for chestnuts to be marketed throughout the year. Marketing chestnuts during the holidays must be the starting point.

According to a Nebraska retailer, who is part of a chain that also operates in Iowa, the growers have a ways to go in educating consumers and retailers on the use of chestnuts. This retailer indicated that the biggest problem with chestnuts is lack of knowledge concerning preparation and usages. Despite this, based upon the experience of the Food Processing Center, retailers would be willing to carry locally produced chestnuts during the holidays. The holiday season is the season of opportunity for the growers. The growers should heavily market and promote chestnuts during the holidays, explaining usage and encouraging the patronage of restaurants that are serving chestnut dishes so consumers can experience chestnuts in various applications. As consumers become more familiar with chestnuts, the stores' willingness to carry them during the rest of the year will increase.

In Nebraska, the wholesale price (FOB store) paid for chestnuts during the holidays was approximately \$2.75 per pound for California chestnuts. This price was obtained from a Midwest grocery distributor. Based upon an informal survey of the Omaha/Lincoln market, the retail selling price was between \$4.00-\$5.00 per pound during the holidays. These prices are for *in-shell*, fresh California chestnuts. A nut broker could be used to facilitate the introduction of chestnuts to the retail market.

A broker is an independent company providing local and regional sales representation to producers and manufacturers of food ingredients and products. A broker calls on multiple classes of trade (accounts) such as foodservice and grocery distributors, chain grocery stores and restaurants, independent grocery stores and restaurants, and, for food ingredient products, food processing companies. Brokers may represent several manufacturers' products within each defined territory with no conflict of interest.

A nut broker representing the Southeast Iowa Nut Growers would serve as a liaison between the growers and their customers (distributors, retail stores, restaurants, and manufacturers) and serve as the grower's sales representative. The broker is paid a commission for their services and, for new products and companies, may have a minimum monthly compensation requirement referred to as a pioneering fee.

The Food Processing Center interviewed two nut brokers. Neither broker was familiar with chestnuts and/or the chestnut market. One, in fact, confused chestnuts with water chestnuts. Water chestnuts are a common ingredient in Chinese dishes but are different from the chestnuts that are the focus of this report. Advantage Brokerage of Omaha, NE represents food manufacturers and their products in the retail grocery and foodservice markets. Advantage currently represents Diamond of California in Nebraska and Iowa.

The second broker contacted was E.W. Carlberg in the Kansas City. E.W. Carlberg is a commodity nut broker for nut producers and/or shellers. The brokerage firm not only helps negotiate contracts with growers but they also warehouse product (although they never take ownership of the product) for the growers. For example, a distributor or manufacturer has a contract to purchase a certain number of nuts during the contract period at a certain price. Instead of taking the entire contracted quantity at once, the customer can order, as needed through E. W. Carlberg and have the pecans shipped from their warehouse. As the U.S. chestnut industry matures, the services of a broker such as E.W. Carlberg may become necessary. It should be noted that the above brokers are commodity nut brokers. In the case of a value added chestnut product, a food broker could be a more appropriate choice to gain entrance to the retail marketplace.

C. Foodservice

A primary goal of this research was to evaluate white tablecloth restaurants' interest in value-added chestnut products. Determining the market potential of chestnut products in other foodservice outlets was not addressed as part of this project; however, it is likely other foodservice establishments would have limited interest in chestnuts at this stage of the product's reintroduction to the marketplace due to the product's premium price and the limited knowledge of food handlers in utilizing chestnuts in meal preparation.

1. Project Methodology

The Food Processing Center contracted with the Southeast Iowa Nut Growers to develop and process several value-added chestnut products in order to evaluate potential processing technology and conduct a test market of white tablecloth restaurants in the Midwest, using the Omaha/Lincoln market as the test market area. For the market test, white tablecloth restaurants were identified in the Omaha/Lincoln market in Nebraska to be targeted for participation in the project. Approximately 30 restaurants were identified in Nebraska. The first step in the market test was to survey the identified restaurants to determine 1) their existing chestnut purchasing experience, if any 2) their level of satisfaction with existing chestnut products available to them, 3) the general and chestnut specific attributes they desire and, 4) their level of interest in six potential value-added chestnut products (see table below).

TABLE 4: Value-Added Chestnut Applications

Product	Description	Uses
Vacuum packed, frozen-shelled chestnuts	Shelled kernels with the pellicle removed. Ready for preparation in recipes.	Variety of general uses.
Vacuum packaged, sugar-cooked frozen kernels	These are frozen whole kernels cooked in syrup (syrup permeated throughout the tissue) with a yellow color.	Deserts, toppings, etc.
Frozen, sugar-cooked chestnut puree	This is a yellow, not brown, paste that is very sweet.	Sauces, toppings, etc.
Pre-cooked chestnut flour	This would be a dried chestnut puree (not sugar-cooked).	Gravies
Thermally processed, glass-packed chestnuts	Whole kernel canned chestnuts with a texture similar to a boiled red potato.	Stews, etc.
Thermally processed, glass-packed candied chestnuts	Marron glacé.	Desert toppings, sauces etc.

It was determined that restaurants in Nebraska were not only not currently purchasing chestnuts but also had insufficient knowledge of chestnuts and chestnut applications to provide meaningful feedback on which of these products they would be most interested in using. This was not totally unexpected as Nebraska currently produces few chestnuts and as a result has not been reintroduced to the product. A decision was made to target restaurants in Iowa as the Southeast Iowa Nut Growers have been promoting and selling their whole, unprocessed chestnuts in the region for some time. Facilitated by the growers, a total of twenty-one restaurants were targeted for participation in the project. Due to time constraints, these restaurants were not given the first survey. They were contacted and expressed interest in participating in the market test and follow up survey. The results from the first survey are not included in this report as the survey was suspended when it became apparent the Omaha/Lincoln market was not appropriate for the market test.

Three of the six proposed chestnut products were selected for the market test in Iowa— vacuum-packed, frozen, shelled kernels; vacuum-packed, sugar-cooked frozen kernels; and frozen, sugar-cooked chestnut puree. These products were selected based upon their commercial potential and variety of applications. Processing of the chestnuts was conducted at the University of Nebraska-Lincoln Food Processing Center’s pilot plants by Dr. Durward Smith. Dr. Smith is a faculty member of the food science department at the University of Nebraska-Lincoln specializing in the processing and storage of horticulture crops and food laws and regulations. Dr. Smith is particularly interested in minimal processing technologies.

2. Processing Results

One of the goals of the project was to do an empirical evaluation of the shelling technology developed by Dr. Durward Smith. Dr. Smith provides an explanation of the technology in the following report.

*THERMAL BLAST REMOVAL OF PEEL, SKIN OR SHELL:
A New Method that Improves Peeling Efficiency and Reduces Wastes*

By Dr. Durward Smith

Food processing is often continuous from the time of harvest until the food is cleaned and securely protected from microorganisms and macroorganisms. Produce is washed to remove dust, dirt, insect frass, mold spores, plant parts, animal wastes and other filth that may contaminate or affect the flavor, color or aroma. These cleaning systems must not only clean the produce but also be efficient in energy and water consumption, not erode away usable food or provide refuge for microorganisms or other pests.

Peeling operations also reduce microbial loads and remove inedible tissues and undesirable defects from the produce. Peeling systems are often problematic because they often have large water demands and generate waste streams which can attract pests and accumulate microbial loads. In recent years peeling methods have been developed that have reduced water usage, improved energy efficiency of peel removal, and have decreased loss of edible produce. One of these improved peeling methods, Thermal Blast Peeling, was developed in our laboratory. Thermal Blast Peeling is applicable to many foods, and has proven to be more efficient than many conventional peeling methods.

The thermal blast process rapidly and efficiently removes outer coverings and other inedible portions from food products by heating only the inedible outer portion of the food at such a rapid rate that the heat does not penetrate to underlying edible tissues. During this heating process the food is contained in a closed, pressurized vessel and subjected to infrared heat from the vessel wall and conductive heat from the superheated steam pressurizing medium. This intense, rapid heat treatment partially dries and increases the plasticity of the peel tissues, thus facilitating their removal. In the process, a film of heated moisture immediately subtending the peel is heated to a temperature in excess of the boiling point of water at atmospheric pressure and the peels are removed by instantly opening the vessel following this brief heat treatment. The result is an explosion that blows the product from the vessel and simultaneously blasts the outer covering from the food by the violent expansion of the highly energized moisture beneath the covering. The plasticized peel offers resistance to rupture which allows the steam to spread laterally and pressure to build beneath the peel, thus facilitating complete separation from the edible product.

The thermal blast process has several operational advantages over caustic and conventional high pressure steam peeling systems now used in the food industry. Caustic chemicals such as lye are used to peel some food crops, but such peeling requires prolonged exposure to hot caustic solutions and usually results in a softened product with relatively large losses of edible tissue. Processing waste streams which require subsequent cleanup are also generated in conventional peeling systems.

In conventional high pressure steam peeling, pressure and time control the peeling. Pressures up to 300 lb. Per sq. in. (p.s.i.) are often required to reduce processing times to an acceptable level, making it difficult to process delicate or fragile foods.

Apples, for instance, are susceptible to compression bruising. The pressure of the steam compresses apple tissue resulting in tissue damage and bruising that often extends to the core.

In contrast, the thermal blast processing treatments and their effects are controlled in a manner that produces the precise results sought by independently controlling steam temperatures and pressures while maintaining minimal processing times.

Temperatures as high as 1000 °F may be used while limiting pressures to between 30 and 100 p.s.i. for processing times of 4 to 20 seconds. These lower pressures represent a considerable economy in steam generation and allow efficient peeling of the most delicate and fragile foods.

The thermal blast process has been proven effective in peeling fruit and vegetable crops, coring of peppers, skinning of onions, shelling of nut crops, skinning of beef and swine tongues, scaling and skinning of fish, and the removal of shells from shellfish. In contrast, conventional peeling processes are generally limited in application to particular types of foods.

The table on the following page lists a few of the food crops that have been successfully peeled or shelled in our research with the thermal blast peeler. Losses from the thermal blast process are contrasted with the peeling loss from conventional lye and saturated steam peeling processes. High peeled yields have been achieved for most food products, and entirely new processed products, such as canned peeled plums can be produced from crops that were not previously practical to peel. In the case of pimiento and bell peppers, the inedible core is also blown free of the edible pod during the thermal blast treatment. Undersized produce, sweet potatoes for example, now left in the field may be peeled efficiently and utilized as canning stock. The color and texture of most thermal blast peeled commodities is superior to produce peeled by conventional means.

LOSS FROM PEELING AND SHELLING OPERATIONS

<i>Product</i>	<i>Pct. Lost from the raw Produce</i>		
	<i>Thermal blast</i>	<i>Lye</i>	<i>Saturated steam</i>
<i>Apple</i>	2	14	7
<i>Kiwi</i>	6	NP ¹	NP ¹
<i>Peach (pitted)</i>	4	20	NP
<i>Pear</i>	4	17	10
<i>Plum</i>	3	NP	NP
<i>Avocado</i>	3	NP	NP
<i>Mango</i>	12	22	NP
<i>Tomato</i>	4	15	9
<i>Sweet potato</i> ²			
<i>½-1 in. diameter</i>	9	NP	NP
<i>1-1 ½ in. diameter</i>	7	26	25
<i>1 ½ -2 in. diameter</i>	5	24	21
<i>2-2 ½ in. diameter</i>	4	20	18
<i>2 ½-4 in. diameter</i>	3	18	17
<i>Carrot</i>	5	28	25
<i>Beet</i>	3	14	8
<i>Eggplant</i>	2	21	17
<i>Cucumber</i>	3	NP	NP
<i>Pimiento Pepper</i> ³	25	36	NP
<i>Pumpkin</i>	11	NP	28
<i>Onion</i>	5	NP	NP
<i>Shrimp</i> ⁴	45	NP	NP
<i>Catfish</i> ⁵	42	NP	NP
<i>Chestnuts</i>	21	NP	NP

¹Not practical to peel by the above method.

²Canning stock of different size grades peeled to a cork layer peel. Size grades smaller than 1 in. in diameter are not practical to peel by present commercial methods.

³Loss includes the inedible core, which is removed during peeling.

⁴Loss includes head and vein, which are removed during peeling.

⁵Loss includes head, viscera, and fins.

⁶Loss includes shell and testa which are removed during shelling.

Chestnut Processing

Chestnut shelling can be done rapidly and efficiently. The laboratory prototype sheller used by Dr. Durward Smith shells essentially all of the good chestnuts while simultaneously removing the pellicle. This sheller will easily shell two eight-pound batches of nuts per minute or 960 pounds of chestnuts per hour. A sheller with four times the capacity could be equally compact and operate at the same cost. At the current time the chestnut processing bottleneck is separating the shelled kernels from the removed shells and pellicles. This separation operation (removing the shelled kernels from a tank of water after skimming the

floating shells and pellicles from the surface of the water) has been done by hand. A new chestnut receiver (catch vessel) has been designed. The receiver will be built primarily from stainless steel for sanitary operation. Basically this receiver will consist of a stainless vessel with a conveyer on the bottom to convey shelled nuts from the vessel to a rod-type washer. The receiver will have a skimmer to simultaneously remove floating shells, etc. A cover providing high volume sprays of recycled water will decelerate and prevent the kernels from overshooting the receiver.

Chestnut Products

Three chestnut products were prepared after the whole, unshelled chestnuts went through the peeling process and a quantity of shelled kernels were available. The three products were vacuum packed, frozen-shelled chestnuts; vacuum packaged, sugar-cooked frozen kernels; and frozen, sugar-cooked chestnut puree. The processing and ingredient information for each of the products was as follows:

Frozen vacuum packaged chestnuts: Shelled chestnuts were washed and pre-frozen with no added ingredients, then vacuum packaged and stored at minus 10°F.

Frozen sugar cooked kernels: Shelled chestnuts were blanched in a sucrose syrup solution containing 0.5% salt and a small quantity of food phosphates to help maintain color.

Frozen sugar cooked chestnut puree: Contained pureed chestnuts, pieces of cooked chestnut, salt sugar, vanilla bean extract, and food phosphates to help maintain color.

3. Market Test Results

The goal of the market test was to evaluate the level of interest of chefs at white tablecloth restaurants in locally produced, value-added chestnut products. The objective in administering the follow-up survey was to provide a framework for the feedback received from the chefs on the chestnut samples. The market test was not intended to provide data that could, using statistical analysis, be generalized to determine the size of the foodservice market for value-added chestnut products, rather, it was designed to assess the potential of such products in individual upscale restaurants. Would the chefs know how to use the products? How would their customers respond to the menu items prepared with chestnuts? How much value would the chefs attach to the value-added chestnuts compared to imported and/or raw, unshelled chestnuts? What criteria do they use when selecting products to use in their restaurants? To aid the chefs in using the various chestnut products, some sample recipes were included with the chestnut samples. The majority of chefs who indicated the dishes they prepared utilized their own recipes in preparing chestnut dishes.

The empirical and anecdotal information received on the above mentioned topics provides an interesting and positive insight into the potential of value-added chestnuts in the upscale foodservice market.

Specifically, the survey included questions that sought to identify the attributes chefs deem important when sourcing food products, the perceived value of having a chestnut item on their menu, the quality of the chestnut product samples, and the chef's purchasing intentions should each of the sampled chestnut products become available for sale. A copy of the survey is included in Appendix A.

Approximately 450 pounds of chestnut products were produced and packaged into one-pound packages. These were hand-delivered to the Iowa restaurants with a cover letter explaining the goals of the project, a compilation of suggested recipes for them to try, and the follow-up survey for them to complete once they had a chance to use and evaluate each of the product samples. Each of the restaurants received approximately 10-15 pounds of samples. The follow-up surveys were collected during April and May, 2003. A total of twelve restaurants responded to the survey resulting in a response rate of 67 percent.

Importance of Product Attributes When Making Product Selection Decisions

Q. How important are the following in *selecting* the food products that your establishment purchases? Rate on a scale of 1 to 7 with 1 being Not at all Important and 7 as Very Important. Please circle one number under each attribute.

The chefs were asked to indicate the relative importance of criteria they use when considering new products for use in their restaurants. Chefs were consistent in their opinions that product taste and quality are still the most important attributes when evaluating a product. This is consistent with findings from a representative survey of consumers on their interest in purchasing local food completed in 2001, "*Attracting Consumers with Locally Grown Products*" [Zumwalt, 2001]. An additional survey taken of chefs that are members of the Chef's Collaborative, "a national network of more than 1,000 members of the food community who promote sustainable cuisine...", also identified taste and quality as the most important product attributes [Zumwalt, 2003]. It should be noted a product's taste and quality are not as much differentiating attributes as they are minimum requirements for consideration. The chefs in the chestnut market test were also in agreement with the Chef's Collaborative members in that products which are locally grown/produced are given additional positive consideration.

Interestingly, results from the Chef's Collaborative survey indicate that 94 percent of chefs say product freshness is either very or extremely important. Consistent product quality was equally important, with 98 percent indicating it as very or extremely important. The image of a restaurant is dependent upon a patron having a predictable experience each time they come to the restaurant, including the taste and quality of their favorite dishes. These product selection attributes may be especially important for the Southeast Iowa Nut Growers as an alternate, local, fresh source of chestnuts does not readily exist for the restaurants in their region. Product freshness and consistent quality can be an important differentiating factor when marketing their value-added chestnut products.

For the chefs in the chestnut market test, the potential of a product to become a signature item for their restaurant and its ease of preparation were less important. It should be noted that the

relative lack of importance of the ease of preparation attribute is likely significantly impacted by the fact the chefs evaluating the samples were well-trained in the culinary arts and working in upscale restaurants. If restaurants further down the value chain were targeted, the ease of preparation issue would likely increase in importance.

Potential Value of Chestnuts to Your Restaurant

Q. For chestnuts *in general*, please evaluate their potential value to your restaurant. Rate on a scale of 1 to 7 with 1 being Poor and 7 as Excellent. Please circle one number for each attribute.

The intent of this question on the survey was to assess the marketability of chestnuts in general for the restaurants. Would featuring a chestnut dish be a draw for consumers? Given the response for this survey question, the Food Processing Center believes there was some chef confusion as to the intent of the question; however, the identified uniqueness factor is still believed to be important.

Chestnuts bring a unique set of characteristics to the table in terms of their potential value as an ingredient in a featured dish that may be used as a consumer draw for the restaurants. It is probably safe to say a large percentage of people in the United States have heard of a chestnut and attach some image to it—most likely something associated with the holidays. This may be positive or negative. It is also likely very few people know what it tastes like and/or how it might be prepared. The latter is not as much an issue for consumers who are considering a chestnut dish in a restaurant as consumers tend to be more adventuresome when eating out at a restaurant than when preparing something at home. There has been an increasing trend in recent years of consumers branching out and trying new flavors and cuisines. Ethnic dishes, in particular, are popular as consumers broaden their palates.

Chefs were asked to rate customer perceptions of chestnuts, chestnuts potential as a signature item for their restaurant, chestnuts likelihood of being perceived as nutritious and healthy, and finally, chestnuts potential to be promoted as a unique offering in the chefs' restaurants.

The only attribute to be rated as having good to excellent potential value to their restaurants was uniqueness. Chestnuts were deemed to have little value in terms of customer perception, as a signature product for their restaurant, and as nutritious and healthy. The Food Processing Center believes the absence of consumer knowledge likely contributes to the chestnut's lack of value for consumers.

Evaluation of Chestnut Samples, Level of Interest, and Potential Volume

Q. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please evaluate each product type on the following attributes. Rate on a scale of 1 to 7 with 1 being Poor and 7 as Excellent. Please circle one number for each attribute for each product type.

Q. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please indicate your **level of interest in purchasing** each product. Rate

on a scale of 1 to 7 with 1 being Not Interested and 7 as Very Interested. Please circle one number for each product.

- Q. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please indicate, 1) Anticipated number of pounds needed for the products in which you have an interest in purchasing, 2) Desired unit size for each product, 3) Price you expect to pay for each product.

For each of the chestnut product samples they received, the chefs were asked to evaluate it on seven different attributes—quality, taste, texture, presentation qualities, uniqueness, ease of preparation, and variety of menu applications. Additionally, they were asked their level of interest in purchasing each of the chestnut products, the projected number of pounds they would likely purchase on an annual basis, desired unit size, and price per pound they would expect to pay for each product. While almost all of the chefs tried each of the three different products, it was clear from the survey results and in conversations with them that the vacuum packed, frozen, shelled chestnuts were the preferred product by those chefs that expressed the most interest in a chestnut product. One chef wrote, *“We were extremely pleased with the chestnut products. The ‘natural’ chestnuts were the best.”*

Vacuum packed, frozen-shelled chestnuts

The vacuum packed, frozen-shelled chestnuts were the only product to have good to excellent mean ratings (5.0 or above on 7.0 scale) in every category. They were rated highest in taste (6.55) and presentation qualities (6.18) and lowest in variety of menu applications (5.45). The lower rating in variety of menu applications represents an opportunity for the Southeast Iowa Nut Growers. Chestnut kernels have been used in a wide range of dishes including soups, desserts, stuffing, jam, salads and many others. This is a characteristic the chefs valued. One chef included the following comment, *“This is an excellent and special product. We are able to use it in a variety of ways”*. Since the chefs have already indicated a preference for the frozen kernels, the growers can likely increase the volume of frozen kernels used by the chefs by educating them about alternative applications for this product. A chef comment supports the need for additional education. *“I have little experience [with] chestnuts so [it] was difficult to rate”*, he said. Another factor influencing the interest in the frozen kernels was that this was the only unprocessed product. For those restaurants committed to organic foods, they were only interested in the frozen kernels.

While the chefs’ level of interest varied somewhat for the frozen kernels, all but one indicated at least some interest in purchasing the frozen kernels. There were four restaurants that were very interested (≥ 6.0) in purchasing the frozen kernels. These four restaurants represent almost 90 percent of the anticipated number of pounds needed per year for the frozen kernels. Among all restaurants the total volume of frozen kernels anticipated was 339 pounds. While this represents a very small percentage of the grower’s likely volume, it should be noted that chestnuts are a new item to the restaurants and it is difficult to project what actual usage may be should a chestnut dish become a regular part of their menu plan. One chef indicated it was difficult to project volume as their menu changes often.

The two restaurants that are very interested in using chestnuts indicated an annual volume level of approximately 100 pounds. This may be more representative of the volume potential for an individual restaurant willing to feature a chestnut dish periodically. Nevertheless, the indicated volume should be considered a starting point to be built upon. In fact, one chef indicated that the expected volume they would use is only a starting place. One chef prepared a chestnut soup dish that he sold out of very quickly and has since had customers come to his restaurant requesting the soup. “*Best soup I have ever made*”, he said. Opportunity certainly exists for growing the volume as the chefs become more familiar with the product and increasingly include it on their menus.

The preferred unit size for the chestnut packages ranged from one pound up to twenty-five pounds. Each of the top three volume purchasers identified a different preferred unit size. One preferred one-pound packages, another five-pound packages, and the third twenty-five pound packages. The growers will have to work with the chefs to determine an agreed upon unit size for the packages as it would be highly inefficient to attempt to package product in multiple size packages, at least initially.

The chefs indicated a wide range in the price they were willing to pay for the frozen kernel product. On the low end, one of the larger volume purchasers indicated a price of \$3.00 per pound. At the high end, the fourth largest purchaser and a smaller purchaser indicated a willingness to pay around \$10.00 per pound. The remaining chefs that shared a price expectation fell right near the middle of that range around \$5.00 per pound. It is difficult to draw any conclusions from this data except that restaurants do not have a clear sense of what the frozen kernels should cost nor the value chestnuts could potentially bring to a menu item. The true market price for the product likely lies somewhere in the range of \$5.00-\$7.00 per pound. It should be noted that the chefs likely indicated a price lower than they were actually willing to pay, especially for a high quality product. The degree to which they may have understated their willingness to pay, though, is difficult to assess.

Vacuum packaged, sugar-cooked frozen kernels

The chef’s evaluation of the attributes of the vacuum packaged, sugar-cooked frozen kernels was very similar to that of the vacuum packaged, frozen kernels for each of the attributes with variety of menu applications again receiving the lowest rating (4.7); however, the mean scores for the sugar-cooked kernels were lower across the board. This becomes even more evident when the chef’s level of purchasing interest is calculated. The chef’s level of interest in the frozen kernels was good (5.09); however, for the sugar-cooked frozen kernels their interest was substantially lower (3.10). Only two of the chefs that participated in the market test indicated a purchasing interest in the sugar-cooked kernels. The sugar-cooked kernels had the lowest level of interest score of the three chestnut products sampled. A commonly cited comment was that this product had few applications.

The anticipated number of pounds needed was also much lower at approximately 76 pounds, with 60 pounds of this coming from one restaurant. This restaurant’s preferred unit size was one-pound packages. They did not indicate a price they would be willing to pay for the sugar-cooked product.

Frozen, sugar-cooked chestnut puree

The frozen, sugar-cooked chestnut puree was rated on a par with the other chestnut products. Chefs indicated the puree was a little easier to work with than the other two products as it received the highest ease of preparation score of the three products (6.4). It was rated the lowest in presentation qualities but this is not unexpected as a puree product does not lend itself to enhancing the presentation qualities of a dish. There were four chefs who were very interested (≥ 6.0) in the frozen puree product. Those chefs not interested in the puree indicated showed very little interest as three of the four rated their interest level at 2.0 or below. Two chefs did not indicate a level of interest and one indicated he/she was neither interested nor disinterested. One comment regarding the puree was that it was not as smooth and tasty as the chef expected. The development of a puree product should be refined to overcome these issues as the growers move forward.

The total indicated volume for the puree product was 75 pounds, with over 90 percent of it coming from two chefs. Five-pound packages of puree were the unit size of choice for those who indicated an interest in the frozen puree product. The two chefs who indicated a price range for the frozen puree product ranged from \$3.50 to \$8.75. As with the other chestnut products the market price likely lies in the \$5.00-\$6.00 range.

Timing of Purchasing Intentions

Q. Which of the following best describes your purchasing intentions? (Circle only one)

Since most American consumers who are familiar with chestnuts perceive them as a seasonal item to be consumed around the holidays, chefs were asked about the timing of their purchases. Were they most likely to purchase the chestnut products for which they indicated an interest only during the holidays, mostly during the holidays, or throughout the year? Six of the eleven restaurants indicated they would likely purchase the chestnuts throughout the year. Another four restaurants indicated that while most of their purchases would probably take place around the holidays, they were also likely to be purchasing them during other times of the year. *Only one restaurant indicated that they were likely to purchase chestnuts only during the holidays.* This is a very positive response for the growers in that it provides opportunities to increase the volume of chestnuts restaurants consume as the chefs do not just consider chestnuts to be a holiday item.

V. Recommendations

The primary goal of this project is to assess the potential of value-added chestnuts in upscale, or white tablecloth, restaurants in the foodservice market. Objectives include identifying value-added chestnut products that have the most potential and evaluating, on an empirical basis, the prospects of a shelling technology developed by Dr. Durward Smith. Several insights were gained as a result of this project and serve as the basis for the following recommendations.

It is the belief of the Food Processing Center that an excellent market opportunity exists for the Southeast Iowa Nut Growers. Chestnuts are a familiar, yet unknown, product for most U.S. consumers and many U.S. chefs. An example of this is people's confusing chestnuts with water chestnuts, which was discussed in the broker section. The extent of consumer and chef's knowledge of chestnuts is not known. Except for the well-known 'chestnuts roasting on an open fire...' Christmas song, there is little other exposure to chestnuts in today's culture. Nonetheless, the Food Processing Center believes the product's name familiarity will aid in marketing the product to consumers and chefs. Many consumers probably have some concept of what a chestnut is and may have purchased them during the Christmas holidays. Unfortunately, many of those purchased chestnuts may have been unshelled, poor in quality, and relatively expensive for the quality received. Additionally, it should be noted that most consumers, even though they have heard of chestnuts, probably lack knowledge when it comes to shelling, preparing and eating them. The combination of a potentially poor prior experience and gap in knowledge in knowing how to shell, prepare and eat chestnuts presents a challenge in reaching the consumer market.

This is where the foodservice market, specifically white tablecloth restaurants, can play an important role. It has been believed for many years that the restaurant industry leads the rest of the food industry. New ingredients, ethnic dishes, and exotic flavors are first introduced to the marketplace in a few select restaurants. Other restaurants eventually begin to add similar items to their menus. Consumers experience these new ingredients and flavors in restaurants and try to replicate them at home. As some of these flavors gain in popularity and become more mainstream, prepared food manufacturers begin to develop products that take advantage of the emerging trend. While this pattern has blurred some in recent years as food manufacturers and supermarkets have made efforts to compete more directly with foodservice outlets, it is still the way most consumers are introduced to new ingredients and flavors.

The extent to which upscale restaurants represent a substantial market for chestnut producers was not determined as a result of this project; however, it is clear that the quality of the chestnut samples provided to the chefs were of a superior quality and that the chefs have an interest in utilizing chestnuts in their restaurants on a fairly regular basis. Given the above evolution of ingredient and flavor introduction to mainstream markets, the ability of the Southeast Iowa Nut Growers to market their products to upscale restaurants is an important opportunity.

Seizing and building upon this opportunity requires the coordination and simultaneous pursuit of multiple goals. These goals make up the remainder of the Food Processing Center's recommendations.

- 1) **Create an 'Iowa Chestnuts' Brand:** The chestnut industry in the United States is very early in its development. No region has clearly established itself or become known as the premier source for chestnuts, although California is moving in that direction. This is potentially the biggest opportunity the Southeast Iowa Nut Growers have in the marketplace. The Southeast Iowa Nut Growers believe in the superior quality of their chestnut products. The results from the chestnut market test did nothing to dispel this belief and in fact, added to its credibility. It is the opinion of the

Food Processing Center that the Southeast Iowa Nut Growers immediately begin work to establish an “Iowa Chestnuts” brand. Following the example of California Almonds, Idaho Potatoes, Georgia Peach, etc. the Southeast Iowa Nut Growers have an opportunity to establish Iowa as the source of the best chestnuts in the country.

The growers should work with the Iowa Department of Agriculture, Practical Farmers of Iowa and/or the Leopold Center on this activity. In Wisconsin, the Wisconsin Department of Agriculture heavily promotes the Wisconsin cheese brand and has firmly established it in the marketplace. These organizations in Iowa could help the growers develop a logo and promotional plan.

This brand could provide multiple benefits to the chestnut industry in Iowa. First, it provides a layer of protection from competitive threats as other regions begin to grow chestnuts and compete in the market. Second, as the reputation of the brand grows, it should help the Southeast Iowa Nut Growers attract additional growers that want to market chestnuts under the brand. This would enable the growers to market their product to larger customers and/ markets. This is important as potential high volume users of an ingredient are often reluctant to use it until a proven, consistent supply can be identified. Third, it brings recognition to chestnuts as a viable industry and creates consumer awareness. The window on such an opportunity can close quickly. California has a proven track record in branding the products they produce. Their chestnut industry, while focused on a potentially inferior variety of nut according to some experts, is growing. The Food Processing Center and/or Practical Farmers of Iowa could assist with this effort.

- 2) **Pursue Development of Shelled, Frozen, Vacuum-Packed Chestnut Product:** The shelled, frozen vacuum-packed chestnut kernels were the preferred value-added product of the chefs participating in the market test. One chef summed it up very well, “*Chestnuts are high labor if unprepared (i.e.—in the shell) so the frozen kernels are ideal...*”. The Southeast Iowa Nut Growers should focus their efforts on processing and marketing this product. While it is the preferred method of the chefs, consumer trends would indicate that consumers would be much more likely to try and eat chestnuts if they were available in a ready-to-use product. Consumers’ demand for convenience products is well documented. It continues to evolve and grow with more portable foods and packaging. The growers must strive for a balance between developing an economically feasible product and satisfying the demands of the market. In this case, that likely means identifying an efficient method for producing a shelled chestnut product.

The volume of chestnuts the chefs indicated they would be interested in purchasing was small; however, it should be kept in mind this is only a starting point. The restaurant that made the soup had customers coming back clamoring for more. Be it a dessert, soup or some other dish, if a restaurant’s consumers show great interest in a dish that includes chestnuts, a restaurant’s purchases could easily increase. This market test is only a starting point for developing the foodservice market for chestnuts. The growers will need to continue to work with the chefs on recipe development and

product specifications. However, the Southeast Iowa Nut Growers should confidently pursue this market as a means of reintroducing chestnuts to consumers.

- 3) **Explore Shelling Technology Options:** As mentioned above, the shelled, frozen, vacuum-packed chestnuts were the preferred value-added product by the chefs participating in the market test. This product should be the initial product form developed by the Southeast Iowa Nut Growers. In order to produce this, or any other value-added chestnut product, it is necessary for the growers to identify a means of efficiently shelling their raw chestnuts. The technology used in producing the samples for the market test was Dr. Durward Smith's thermal blast technology. While the efficiency of the shelling for the market test was below par, Dr. Smith has indicated the process and technology can be easily enhanced to vastly improve the efficiency.

It is the recommendation of the Food Processing Center that the Southeast Iowa Nut Growers utilize the remaining chestnuts to further evaluate, learn, and refine Dr. Smith's shelling technology for chestnuts. The growers should identify one or two members to process alongside Dr. Smith in order to become familiar with the technology. Additionally, the growers could work with Iowa State University in refining and/or customizing the technology for chestnuts. If it is deemed an economically feasible option for shelling chestnuts, the growers should work with Dr. Smith in developing a licensing arrangement for the use of the technology. The Food Processing Center is not aware of another viable, efficient means of shelling chestnuts. If the Southeast Iowa Nut Growers are aware of such a technology or other shelling method, it should be further evaluated for commercial use.

- 4) **Educate, educate, educate!:** Consumers and chefs have a degree of familiarity with chestnuts. They don't, however, know how to shell, prepare, or eat them. The familiarity of chestnuts is a positive, but it also means most people have a pre-conceived image of their usage. Just as the turkey industry has been striving to get people to eat more turkey throughout the year as opposed to just on Thanksgiving, so to will the chestnut industry have to work to change the image of the chestnut from that of a holiday tradition to a tasty food and ingredient that can be used throughout the year. The challenge in accomplishing this hinges on the level of familiarity consumers have with chestnuts and the extent to which chestnuts are perceived as a holiday product.

The growers have several options when it comes to educating both consumers and chefs about chestnut usage. First, they could take advantage of the American image of the chestnut and its association with the Christmas holidays. This leverages most American's image of the product, but reinforces its holiday traditions. Second, the growers could utilize people's familiarity with the chestnut to prompt trial but promote chestnuts in applications such as desserts, soups, or simply as a snack that would likely lead to more year-round usage. Finally, the growers could take advantage of the chestnut's European and Asian heritage and market them as an ethnic food. This would be difficult given the familiarity of the word 'chestnut' in the U.S. as well as potential confusion with water chestnuts.

The Food Processing Center recommends a combination of the first and second approach. The holiday season is a perfect time to generate trial of chestnut products and dishes. While marketing chestnuts in supermarkets would result in meaningful sales, promoting the use of chestnuts in restaurant dishes during the holiday season will not only achieve broader consumer trial of a chestnut product but also increase the likelihood the experience will be a positive one. While a chestnut stuffing would be an appropriate holiday menu item, the growers should encourage chefs to prepare additional chestnut-based dishes such as desserts, soups, etc.

By first encouraging consumer trial of a dish made with chestnuts, the growers have laid the foundation for additional consumer education and usage throughout the rest of the year. Consumers will have a reference point for chestnuts and should potentially be more open and interested in purchasing and consuming them. Educating consumers generally involves sampling. They like to ‘try before they buy’ and this is especially true with a product with which they have limited experience. This is the start, however, to generating consumer purchases in supermarkets and consumption at home.

- 5) **Continue and Expand Marketing to Asian Markets in U.S.:** Chestnuts have not only a strong European heritage, but also an Asian one. As seen in the production and import data, most of the world’s chestnuts are produced in China and imported into Japan. The U.S. Asian population is currently 4.2 percent of the U.S. population at 11.9 million people; however, it is growing 5-6 times faster than the overall population. In an informal survey of ethnic Asian restaurants, it was determined there was strong interest in chestnuts. Interestingly, though, the chefs at Asian restaurants were not interested in the chestnuts for their restaurants, but rather for their own personal use. While the Southeast Iowa Nut Growers are identifying and/or refining a technology for shelling the chestnuts for value-added applications, a ready market appears to exist for raw, unshelled domestically produced chestnuts in the Asian population. The growers should pursue this market with their existing crop of chestnuts while the rest of the American market develops.

- 6) **Focus on Product Quality and Taste:** The chefs involved in the market test, consumers interested in local foods, and chefs from the Chef’s Collaborative all indicated that product quality and taste were areas of immense importance when deciding what food products and ingredients to purchase.⁴ The Southeast Iowa Nut Growers must continue to grow and produce a product with superior taste and quality attributes. This is paramount not only when striving to broaden a product’s market, but also when attempting to create a brand for that product. Chefs participating in the market test also thought chestnuts were perceived to be unique. Chestnuts could be a marketer’s dream—product familiarity combined with perceived product uniqueness.

⁴ Zumwalt, Brad, “*Attracting Consumers with Locally Grown Products*”, Food Processing Center, 2001.
Zumwalt, Brad, “*Approaching Foodservice Establishments with Locally Grown Products*”, Food Processing Center, 2003.

The growers should work hard to promote the chestnuts quality, uniqueness and locally produced heritage.

As stated in the beginning of the recommendations, the Food Processing Center believes the Southeast Iowa Nut Growers have an excellent market opportunity with value-added chestnut products; however, several issues must be resolved. First, the growers must identify an *economically feasible* method of shelling the chestnuts. This is the key to profitably entering the foodservice market. While the chefs indicated a high degree of satisfaction with the chestnut samples, price will always be an issue. Second, activity A does not always lead to result A. In other words, if chefs begin to use chestnuts on their menu on a regular basis, it is not a guarantee that consumers will automatically follow through with purchasing them from other outlets. The growers likely face a long road in educating the consumer, foodservice and retail markets about the use of chestnuts. This is not a task that can be accomplished overnight, but it is one that the growers must begin immediately.

VI. Appendix A – Survey Instrument

Upon completion of your evaluation of all three chestnut products, please take a few moments to complete and return this survey.

1. How important are the following in *selecting* the food products that your establishment purchases? Rate on a scale of 1 to 7 with 1 being Not at all Important and 7 as Very Important. Please circle one number under each attribute.

<i>Attribute</i>	<i>Not Important</i>			<i>Very Important</i>			
	1	2	3	4	5	6	7
Product's Quality	1	2	3	4	5	6	7
Product's Taste	1	2	3	4	5	6	7
Product is Nutritious & Healthy	1	2	3	4	5	6	7
Product's Cost	1	2	3	4	5	6	7
Unique or Specialty Products	1	2	3	4	5	6	7
Signature product for my establishment only	1	2	3	4	5	6	7
Product has a variety of menu applications	1	2	3	4	5	6	7
Product is locally grown	1	2	3	4	5	6	7
Ease of preparation	1	2	3	4	5	6	7

COMMENTS: _____

2. For chestnuts *in general*, please evaluate their potential value to your restaurant. Rate on a scale of 1 to 7 with 1 being Poor and 7 as Excellent. Please circle one number for each attribute.

<i>Attribute</i>	<i>CHESTNUTS</i>						
	<i>Poor</i>			<i>Excellent</i>			
	1	2	3	4	5	6	7
Customer perception	1	2	3	4	5	6	7
Signature Product for My Establishment	1	2	3	4	5	6	7
Nutritious & Healthy	1	2	3	4	5	6	7
Uniqueness	1	2	3	4	5	6	7

3. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please evaluate each product type on the following attributes. Rate on a scale of 1 to 7 with 1 being Poor and 7 as Excellent. Please circle one number for each attribute for each product type.

<i>Attribute</i>	<i>FROZEN KERNELS</i>							<i>FROZEN SUGAR BLANCHED KERNELS</i>							<i>CHESTNUT PUREE</i>						
	<i>Poor</i>			<i>Excellent</i>				<i>Poor</i>			<i>Excellent</i>				<i>Poor</i>			<i>Excellent</i>			
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Quality	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Taste	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Texture	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Presentation qualities	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Uniqueness	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7

Ease of preparation	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Has a variety of menu applications	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7

COMMENTS: _____

4. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please indicate your **level of interest in purchasing** each product. Rate on a scale of 1 to 7 with 1 being Not Interested and 7 as Very Interested. Please circle one number for each product.

	<i>FROZEN KERNELS</i>							<i>FROZEN SUGAR BLANCHED KERNELS</i>							<i>CHESTNUT PUREE</i>						
	<i>Not Interested</i>			<i>Very Interested</i>				<i>Not Interested</i>			<i>Very Interested</i>				<i>Not Interested</i>			<i>Very Interested</i>			
Level of Interest in Purchasing this Product	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7

IF YOU INDICATED AN INTEREST IN PURCHASING (4 OR ABOVE) ANY OF THESE PRODUCTS, PLEASE CONTINUE.

IF YOU INDICATED NO INTEREST IN PURCHASING (3 OR BELOW) ANY OF THESE PRODUCTS, PLEASE SKIP TO QUESTION 7.

5. For the three types of chestnut samples you received (frozen kernels, frozen sugar blanched kernels, and puree), please indicate, 1) Anticipated number of pounds needed for the products in which you have an interest in purchasing, 2) Desired unit size for each product, 3) Price you expect to pay for each product.

	Number of Pounds	<i>Number of Pounds</i>	<i>Number of Pounds</i>
Anticipated Number of Pounds Needed per Year (If Interested)	_____ Pounds	_____ Pounds	_____ Pounds
Desired Unit Size of Product	_____ Pound(s)	_____ Pound(s)	_____ Pound(s)
	Price Per Pound	<i>Price Per Pound</i>	<i>Price Per Pound</i>
Price You Would Expect to Pay	\$ _____ Per Pound	\$ _____ Per Pound	\$ _____ Per Pound

COMMENTS: _____

6. Which of the following best describes your purchasing intentions? (Circle only one)

Only During the Holidays Mostly During the Holidays Throughout the Year

7. Name of
restaurant: _____
(For purposes of tracking returned surveys only, will be kept confidential)

THANK YOU FOR PARTICIPATING

VII. APPENDIX B – SURVEY RESPONSES

Important Attributes in Selecting Food Products	Products Quality	Products Taste	Product is Nutritious and Healthy	Product's Cost	Unique or Specialty Product	Signature Product for My Establishment Only	Product has a Variety of Menu Applications	Product is Locally Grown	Ease of Preparation
Restaurant A	7	7	4	5	6	7	6	7	1
Restaurant B	7	7	6	4	7	1	6	7	7
Restaurant C	5	5	3	7	6	4	5	7	3
Restaurant D	7	7	6	6	6	4	5	6	6
Restaurant E	7	7	6	6	5	2	5	5	5
Restaurant F	7	7	7	4	5	5	6	7	5
Restaurant G	7	7	7	7	7	6	7	5	4
Restaurant H	7	7	5	4	7	5	5	7	3
Restaurant I	7	7	5	5	6	7	7	4	6
Restaurant J	5	7	6	5	5	1	4	7	6
Restaurant K	7	7	5	7	7	1	5	6	1
Mean Score	6.64	6.82	5.45	5.45	6.09	3.91	5.55	6.18	4.27

Potential Value of Chestnuts to Your Restaurant	Customer Perception	Product is Nutritious and Healthy	Signature Product for My Establishment Only	Uniqueness
Restaurant A	1	5	1	7
Restaurant B	7	1	5	5
Restaurant C	3	2	1	4
Restaurant D	4	6	6	6
Restaurant E	6	2	5	5
Restaurant F	6	6	7	7
Restaurant G	5	4	6	7
Restaurant H	7	4	4	7
Restaurant I	4	4	5	6
Restaurant J	4	2	7	6
Restaurant K	4	3	5	7
Mean Score	4.64	3.55	4.73	6.09

Sample Attributes	Quality	Taste	Texture	Presentation Qualities	Uniqueness	Ease of Preparation	Has a Variety of Menu Applications
	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen
Restaurant A	7	7	7	7	6	4	1
Restaurant B	7	7	7	7	7	7	7
Restaurant C	7	6	5	6	4	4	5
Restaurant D	6	6	6	6	6	7	7
Restaurant E	6	7	6	7	5	6	7
Restaurant F	6	7	5	4	6	7	6
Restaurant G	5	7	5	7	5	6	6
Restaurant H	7	7	7	7	7	7	5
Restaurant I	4	5	5	6	6	5	6
Restaurant J	6	7	6	6	6	7	3
Restaurant K	5	6	5	5	4	6	7
Mean Score	6.00	6.55	5.82	6.18	5.64	6.00	5.45

Sample Attributes	Quality	Taste	Texture	Presentation Qualities	Uniqueness	Ease of Preparation	Has a Variety of Menu Applications
	Sugar	Sugar	Sugar	Sugar	Sugar	Sugar	Sugar
Restaurant A							
Restaurant B	7	7	7	7	7	7	7
Restaurant C	5	5	4	6	4	4	2
Restaurant D	6	6	6	6	3	3	3
Restaurant E	6	6	6	6	5	6	6
Restaurant F	5	6	5	5	6	7	6
Restaurant G	5	6	5	7	5	5	6
Restaurant H	7	7	7	7	7	7	5
Restaurant I	6	6	4	4	5	7	2
Restaurant J	6	6	6	6	6		3
Restaurant K	6	6	5	6	7	6	7
Mean Score	5.9	6.1	5.5	6.0	5.5	5.8	4.7

Sample Attributes	Quality	Taste	Texture	Presentation Qualities	Uniqueness	Ease of Preparation	Has a Variety of Menu Applications
	Puree	Puree	Puree	Puree	Puree	Puree	Puree
Restaurant A							
Restaurant B	7	7	7	7	7	7	7
Restaurant C	2	2	5	4	4	4	4
Restaurant D	6	3	3	4	4	6	6
Restaurant E	6	6	6	7	6	7	7
Restaurant F	6	6	5	5	6	7	5
Restaurant G	7	7	7	5	6	6	6
Restaurant H							
Restaurant I	7	6	7	2	5	7	2
Restaurant J	6	7	6	6	6		3
Restaurant K	7	7	5	3	7	7	7
Mean Score	6.0	5.7	5.7	4.8	5.7	6.4	5.2

Sample Attributes	Frozen				Sugar				Puree			
	Purchasing Interest	Pounds Needed	Desired Unit Size	Price Per Pound	Purchasing Interest	Pounds Needed	Desired Unit Size	Price Per Pound	Purchasing Interest	Pounds Needed	Desired Unit Size	Price Per Pound
Restaurant A	4	10	1									
Restaurant B	7	50	5		1				7	50	5	
Restaurant C	4	10	1		3				1			
Restaurant D	5	10	2		2				2			
Restaurant E	7	100	25		3				4			
Restaurant F	6	30	5		1				1			
Restaurant G	5				4				6			
Restaurant H	7	120	1		7	60	1					
Restaurant I	4	5	5		2	5	5		7	10	5	
Restaurant J	4				3				3			
Restaurant K	3	4	1		5	11	1		6	15	1	
Mean Score	5.09	339	1	\$ 6.60	3.10	76	1	7.75	4.11	75	5	\$ 6.13

The listed order of restaurants in this table has been shuffled to preserve the confidentiality of the restaurant's responses on the other questions in the survey. Additionally, the individual responses on the prices willing to be paid have also be removed. A mean price is listed for each product.

	Seasonal Purchasing Intentions	
Restaurant A	3	1=Holidays Only
Restaurant B	3	2=Mostly Holidays
Restaurant C	1	3=Throughout the Year
Restaurant D	3	
Restaurant E	2	
Restaurant F	3	
Restaurant G	2	
Restaurant H	2	
Restaurant I	2	
Restaurant J	3	
Restaurant K	3	
Mode	3	
Median	3	
Mean	2.45	

VIII. Appendix C -- Functional Foods Market

Functional foods are foods that, by virtue of physiologically active food components, provide medical or health benefits beyond basic nutrition, including the prevention and treatment of disease.⁵ Consumer interest in, and consumption of, functional foods has been increasing and is expected to continue increasing. According to Nutrition Business Journal, the *global* functional foods market is estimated to be \$47.6 billion, up from around \$30 billion in 1995. The United States is the largest market segment at \$18.25 billion, followed by Europe at \$15.4 billion and Japan (the only country with a regulatory framework) at \$11.8 billion. Germany is the largest European functional food market at \$5.59 billion, ahead of France at \$3.37 billion and the United Kingdom at \$2.4 billion. The U.S. market, which grew 8.5 percent in 2001, is expected to enjoy a similar level of strong growth around 7.5 percent until 2005, tapering off to 4-5 percent later in the decade as the market matures.⁶

TABLE 1: U.S. Functional Food Sales

	Estimated 2001 (Billions of \$)	Projected 2010 (Billions of \$)	Projected % Change
Beverages	\$8.9	\$13.4	51%
Breads & Grains	\$4.9	\$7.2	47%
Packaged/Prepared	\$1.6	\$4.8	200%
Dairy	\$1.1	\$4.0	264%
Snack Foods	\$1.6	\$4.8	200%
Condiments	\$0.15	\$0.1	33%
Total	\$18.25	\$34.3	88%

Source: Nutrition Business Journal, 2002.

In the U.S., the term "functional foods" has no official, universally accepted definition. Foods don't have to pass any test or meet any standard in order to be described as functional. The best way to find out whether a food has any scientifically established health benefits beyond basic nutrition is to look for a special type of statement called a "health claim" on the food label. Health claims must be pre-approved by the Food and Drug Administration (FDA) before they can be used. This differs from the procedure used for structure/function claims on the labels of foods or dietary supplements. Structure/function claims are expected to be truthful, but they do not require FDA pre-approval.

Many functional foods have been found to be potentially beneficial in the prevention and treatment of cardiovascular disease (principally heart disease and stroke), the leading

⁵ Encompassing both nutraceuticals and functional foods, the entire category will simply be designated as functional foods in this report.

⁶ "The Top 10 Functional Food Trends: The Next Generation," *Food Technology*, May 1, 2002, Vol. 56, No. 4, Pgs. 32-57.

cause of mortality in the United States. These foods include soybeans, oats, psyllium, flaxseed, garlic, tea, fish, grapes, and nuts. When eaten in adequate amounts on a consistent basis, these foods may aid in decreasing the risk of cardiovascular disease by several potential mechanisms: lowering blood lipid levels, improving arterial compliance, reducing low-density lipoprotein oxidation, decreasing plaque formation, scavenging free radicals, and inhibiting aggregation.

A survey conducted by the International Food Information Council (IFIC) showed that consumers believe nutrition plays a great role in maintaining or improving health and strongly believe in the benefits of functional foods.⁷ The IFIC survey found that 94 percent of consumers believe functional foods may reduce the risk of disease, particularly heart disease, and about a third said they add particular foods or ingredients to keep healthy. Sixty-three percent reported eating functional foods in 2002, up from 53 percent in 1998.

But while consumers are familiar with functional foods, some segments of the population remain unaware of specific benefits, which signal an ongoing need for consumer education. For example, only 39 percent of people with a high school education and 42 percent of men knew antioxidants may ward off cancer, and only 40 percent of women knew calcium reduces the risk of osteoporosis. Eighty-five percent of consumers want to learn more about functional foods and their health benefits.

One particular functional food that has grown tremendously in recent years is soy foods and food products that contain soy. Most of this increase is attributed to the FDA approved health claims that are being added to the labels **and** the level of media attention that has been given to the health benefits associated with soy consumption.

Another functional food receiving greater attention in recent years is upscale dairy beverages. As adults and baby boomers learn to take greater control of their own health through the foods they eat, there has been increased awareness of the benefits that dairy-based beverages and protein drinks provide. Research conducted by Michigan State University (Lansing, MI) recently documented the benefits of using hazelnut meal in dairy-based beverages to improve flavor and acceptability among adult consumers.

Researchers began by developing several varieties of a low-fat dairy beverage in caramel, caramel-coffee, and caramel-coffee-chocolate flavor blends. Three of the formulas included 2 percent hazelnut meal; the other three did not. After the six dairy beverage formulas were developed, sensory evaluations were conducted using both trained and untrained panels. A total of 85 panelists evaluated the products. Each panelist was given the six different product formulations and instructed to rate the samples for aroma, flavor, mouth feel and after taste. The panelists used a 9-point hedonic scale with 9 being the highest (most liked) and 1 being the lowest (least liked). According to the consumer sensory tests, the low-fat hazelnut beverage flavored with coffee and caramel was the most preferred dairy formulation, receiving an overall ranking of 6.6. The second-ranked

⁷“U.S. Regulators Eye Functional Foods,” Functional Foods & Nutraceuticals, June 2002.

beverage was the hazelnut and coffee combination, with a rank of 6.3. Beverages *without* hazelnuts received overall rankings that averaged below 5.7.

The results of the study conducted at Michigan State University showed that coffee and caramel flavors combined with hazelnuts significantly improve the overall liking and acceptability of low-fat dairy beverages. Products retain their stability and show no adverse effects from the addition of hazelnut meal. Most importantly, hazelnuts provide manufacturers with an excellent way to fortify their products with essential fatty acids, calcium and vitamin E, making them well suited to nutritional beverages.

Colorado State University conducted another study utilizing hazelnuts to enhance a food's value, specifically nutrition bars.⁸ Over the course of eight weeks, 23 different nutrition bar prototypes were developed, containing a variety of ingredients and hazelnuts in different forms and levels, and then tested by 240 consumer panelists. Mean scores obtained from consumer sensory tests indicate the hazelnut nutritional bars were highly rated. They were in the top one-third of the scoring scale for overall acceptability and were rated highly for appearance, aroma, texture and flavor. The panelists rated the bars evenly when it came to the use of natural versus roasted hazelnuts (48 percent preferred natural hazelnuts, whereas 42 percent preferred roasted hazelnut meal). From a nutritional standpoint, it is clear that hazelnuts can be used to make a nutrition bar that is low in fat (especially saturated fat), high in complex carbohydrates, and low in sodium, making them a healthy alternative to high-fat and high-sugar snack items. In addition, the high level of shelf stability provided for this product makes it well suited to today's market demand for portable, nutritional products.

The two studies cited above are indicative of the positive applications of tree nuts in food products. While tree nuts are often classified as a functional food, media attention and widespread consumer awareness of the potential health benefits from tree nut consumption does not exist. If positive media coverage of the health benefits of nut consumption increases, thereby increasing consumer awareness, per capita consumption of tree nuts and products utilizing tree nuts should increase.

Promoting Tree Nuts as Functional Foods

Functional foods epitomize the old saying *health equals wealth*. As consumers increasingly embrace a new do-it-yourself approach to health and the belief that healthy eating is a better way to manage illness than medication, the demand for fortified, functional, and medical foods will soar. Elizabeth Sloan, President of Sloan Trends & Solutions, believes that as major nutraceutical markets continue to mature, new growth opportunities will emanate from up-and-coming new markets, mega market sub-segments, and novel niches.⁹ The practice of *positive eating* is growing—86 percent of consumers buy foods because they contain desirable nutritional ingredients; 80 percent

⁸Wickland, Stacey E., Johnston, J.J., and M.B. Stone, "Effects of Hazelnut Meal on the Functional and Sensory Properties of Nutritional Bars," Department of Food Science & Human Nutrition, Colorado State University.

⁹"The Top 10 Functional Food Trends: The Next Generation," *Food Technology*, May 1, 2002, Vol. 56, No. 4, Pgs. 32-57.

because they don't contain undesirable ingredients, and 76 percent choose foods fortified with specific nutritional substances. Despite demands to deliver health benefits at a cost on par with other foods, one-third of consumers still agree that foods fortified with extra nutrition are worth paying a slight premium for.

For consumers that are trying to figure out how to eat smart and stay healthy, there are many reasons to choose nuts. Frequent consumption of nuts has been shown to reduce the risk of chronic illnesses such as heart disease and cancer. Nuts are an important source of protein and fiber, they are loaded with minerals and vitamins—especially the antioxidant vitamin E—and they contain the amino acids necessary for normal growth and development. Following are examples of the benefits associated with nuts. These benefits are important selling points and should be incorporated in the promotional materials developed.

Nutritional Benefits: Good Source of Protein. Nuts are a natural high-energy snack that provides the much-needed protein power to vegetarians and dieters alike. Nuts have long been a mainstay of vegetarian diets because of their high protein, meatless content, low level of saturated fat ("bad" fats), and favorable taste. Many of the essential amino acids and minerals found in animal protein are also present in nuts, making them a near-comprehensive meat substitute. There are the antioxidants found in vitamin E; several essential minerals such as magnesium, selenium, copper and manganese; and even fiber for more effective digestion. Thiamin, niacin, folate, phosphorus and zinc are also found in nuts.

The Natural Marketing Institute reports that 9.1 percent of the general population are managing their protein intake and 14.3 percent their carbohydrate intake. About half of adults believe that high protein consumption is a sound scientific principle, and 49 percent believe it helps them lose weight. Just over one-third of shoppers say a "high protein" claim is *very/extremely important* on food labels; 13 percent of women and 6 percent of men started buying a food product for its high protein content.

Soy protein is presently in the enviable position of receiving the lion's share of the attention. However, as the dairy industry begins to promote whey protein's higher biological value, expansive complement of sulfur and branched-chain amino acids, and other bioactive health benefits, the source of protein will become an important consumer issue. One of the latest, best-tasting, and innovative high-protein products is Cold Fusion Foods' *Protein Juice Bars*. They contain 11 grams of high-quality whey protein, no added sugar, and 100 percent fruit juice and offer 100 percent of the recommended daily allowance (RDA) for antioxidant vitamins A, C, and E, as well as biotin, chromium, and manganese.

Nuts figure prominently in many high-protein diets, including the well-known Atkins Diet. Following is a breakdown of protein content for various types of nuts:

Protein (grams) Per Ounce

- Pine nuts – 7
- Cashews - 4

-
- Almonds - 6
 - Pistachios - 6
 - Brazil Nuts – 4
 - Walnuts – 4 (Black walnuts have more protein than English walnuts.¹⁰)
 - Hazelnuts – 4
 - **Chestnuts - 3**
 - Pecans - 3
 - Macadamias – 2

Nuts make nutritious snacks, with their healthy balance of protein, fat and fiber. Because the protein, fat and fiber found in nuts take longer to absorb and digest than fast-burning carbohydrate snacks, nuts also satisfy between-meal hunger and give the consumer fuel to burn. Experts recommend eating about 2 to 3 servings per day from the meat, poultry, fish, dry beans and nuts food group to maintain your health and get the protein you need.

Medical & Health Benefits. As the leading cause of death in the U.S., concern over heart disease is growing. Gallup (2001) projects that coronary heart disease (cardiovascular disease, CVD), high blood pressure (HPB), high cholesterol, and obesity will be among the health problems with *above average growth* for the decade ahead. CVD (up 19 percent), high cholesterol (up 18 percent) and HBP (up 16 percent) rank one, two, and three on their list of projections for increases in women by 2010. CVD ranks first for men (up 22.5 percent), cholesterol ninth (up 18.9 percent), and HBP 12th (up 15.2 percent). With approved health claims for soy protein, cholesterol-lowering plant sterol and stanol compounds, and a limited heart health claim for omega-3 fatty acids, functional food marketers are poised to capture their share of the exploding heart health market.

Researchers at Pennsylvania State University have conducted a comprehensive review of the available epidemiological and clinical evidence and concluded that frequently eating small amounts of tree nuts or peanuts can have a strong protective effect against coronary heart disease.¹¹ The review concludes that it is appropriate to recommend inclusion of nuts in a healthy diet that meets energy needs to reduce risk of coronary heart disease.

The review shows that consuming 1 ounce of nuts more than five times per week can result in a 25–39 percent reduction in coronary heart disease risk among people whose characteristics match those of the general adult U.S. population. Nuts consumed in the epidemiological studies included almonds, Brazil nuts, cashews, hazelnuts, macadamia nuts, pistachios, and walnuts, as well as peanuts. The effects of *specific* nuts on coronary heart disease risk were not evaluated in this study.

On another front, two published studies have examined the relationship between general nut consumption and cancer, in particular, prostate cancer.¹² Both found nut consumption to have a protective effect. In one study, data from three case-control

¹⁰“About Black Walnuts,” Diamond, (http://www.diamondwalnut.com/nuts_black.htm).

¹¹Pennsylvania State Department of Public Information, May 8, 2001.

¹²Jain et al, *Nutrition and Cancer*, 34(2): 173-84, 1999. Herbert et al, *Journal of the National Cancer Institute*, 90(21): 1637-47, 1998.

studies involving 1,253 subjects followed for five years revealed a decreased risk for prostate cancer with an increased intake of beans, lentils, and nuts. The second study, published in the *Journal of the National Cancer Institute*, included data for men ages 45-74 years from 59 countries. As the consumption of nuts and oilseeds increased, prostate cancer mortality decreased.

New research shows that the antioxidant vitamin E could play a role in preventing certain kinds of cancer and coronary heart disease (CHD). Vitamin E comes from plant materials and isn't produced by our bodies. The major sources of vitamin E are edible oils like those from **tree nuts**, peanut products, soybeans, liquid vegetable oils and related types of foods. A study by the University of Georgia found that pecans have total vitamin E levels similar to those in almonds, pistachios and walnuts, and higher amounts than cashews, macadamia nuts and dry roasted peanuts.¹³ In addition, no matter the variety or the region of the U.S. where the pecans are grown, the vitamin E content remains abundant and constant.

While nuts show promising benefits for a multitude of health and medical concerns, some consumers worry about the high fat content of nuts. Despite the fact that nuts are relatively high in fat, most of the fat is not saturated fat or "bad" fat. On average, 85 percent of the fat in nuts is *unsaturated*.¹⁴ Unsaturated fats, such as polyunsaturated and monounsaturated fats, can actually lower low-density lipoprotein (LDL, or the "bad" cholesterol) levels, thereby reducing the risk of coronary heart disease (CHD). Clinical trials have shown that snacking before lunch and before dinner can lead to weight loss by cutting down on appetite. In one study of a 1,300-calorie weight-loss diet, both the nut snackers and the control group (who munched on snacks other than nuts) lost about three pounds in two weeks.

In a controlled metabolic clinical study on the health benefits of pecans, researchers from Loma Linda University in California discovered that a heart-healthy diet that incorporates pecans can significantly lower blood cholesterol levels.¹⁵ In fact, the daily addition of pecans more than doubled the effectiveness (cholesterol-lowering ability) of a traditional low-fat diet. In addition, even on the higher fat pecan diet (containing 11 percent more fat than the traditional heart-healthy diet), study participants did not gain weight.

Black walnuts are not only high in unsaturated fats that lower "bad" cholesterol but they are also high in omega-3 essential fatty acids which is vital for a healthy heart and for brain and eye development and function.¹⁶ In addition to helping fight heart disease, omega-3s have also shown promise against arthritis. Gold Circle Farms in Boulder, Colorado has been very successful in marketing their vegetarian-fed, hormone-free, cage-free, Omega-3 eggs; and they do command a price premium.

¹³ "Study Demonstrates Pecans A Consistent, Rich Source Of The Beneficial Antioxidant Vitamin E," National Pecan Shellers Association, <http://www.ilovepecans.org>, July 26, 2002.

¹⁴ *Nutrition in a Nutshell*, The International Tree Nut Council, (<http://www.nuthealth.org>).

¹⁵ "Eat Nuts to Lower Cholesterol," Food Navigator Web site, (<http://www.foodnavigator.com>), September 7, 2001.

¹⁶ Clarke, Andrea, "Beyond Planting The Trees: American Black Walnut Industry Structure and Cooperative Producer Efforts," American Black Walnut Nut Production Conference, Springfield, Missouri, April 6-7, 2000.

Just about anything in the marketplace that demonstrates positive health benefits will receive attention by consumers. The beneficial nature of various tree nuts, both nutritionally and medically, is a very unique but probably not very well known aspect that could certainly be capitalized upon in terms of marketing the product to consumers.