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Adding Value to Tennessee Agriculture Through Commercial Food-Processing Enterprises

Center for Profitable Agriculture

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THE UNIVERSITY of TENNESSEE

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Anne Dalton
Extension Assistant
Center for Profitable Agriculture

Mike Davidson
Professor and Head
Food Science and Technology

George Grandle
Associate Professor and Interim Head
Biosystems Engineering and Soil Science

Rob Holland
Principal Investigator - Feasibility Specialist
Center for Profitable Agriculture

Shasta Hubbs
Former Marketing Specialist
Agricultural Development Center

Bill Morris
Professor
Food Science and Technology

www.picktnproducts.org

Foreword

"Adding Value to Tennessee Agriculture Through Commercial Food-Processing Enterprises" was originally written and published in 2001-2002 as part of a grant with the Tennessee Department of Agriculture. Since its development, the publication has become one of the most utilized publications in our Center.[1] Because of its usefulness and popularity, this publication has been revised and reprinted in 2007. A few items in the original version have been revised and a few new items have been added. Overall, this revised version mirrors the original publication in format, layout and content.

The interest in farmer-owned, value-added businesses and enterprises in Tennessee has increased since the early to mid-1990s. Farmers and agri-entrepreneurs have invested in their operations, not only through the traditional methods of merely diversifying crops, expanding production and striving for efficiency, but rather by enhancing the value of agricultural commodities through processing, packaging and marketing. Some of the interest in value-added enterprises has resulted from low commodity prices, increasing production costs and limited resources. However, to a large degree, these changes reflect the notion that consumer-driven markets and producer-controlled markets are critical for the continued growth of Tennessee agriculture.

Ideas for numerous types of value-added enterprises have been considered in Tennessee. More than 100 farmer-initiated, value-added projects have been accepted, evaluated and completed initial analyses in the Center. Approximately 55 percent of the projects have been classified as "food-related" and a majority of these projects have involved a food-processing element of some type. Pertinent to the development of these food-related projects have been the evaluation and consideration of a commercially inspected and regulatory-approved food-processing facility. While there are certainly some characteristics of a commercial food-processing facility that are specific to certain projects, a majority of the issues facing entrepreneurs considering such an operation are similar. For example, a minimum set of construction, inspection, operation and approval criteria apply broadly to commercial food-processing facilities.

The consideration of a commercial food-processing facility as a value-added enterprise has been historically pertinent to fruit and vegetable producers and those who participate in advanced marketing methods, such as farmers' markets and roadside stands. Therefore, consideration of commercial food-processing facilities by these implementers should include a fairly standard set of criteria, as well as advanced circumstances based on business specifics. However, despite the overwhelming demand for such information, no such general resource is readily available.

The purpose of this publication was to develop a document that would include evaluation criteria, project development specifics, sample cost-and-return analysis, and general operational guidelines for commercial food-processing facilities as value-added food enterprises in Tennessee. A strawberry preserves product is used as the primary example in this publication, but methods of modifying the example with other products are discussed. It was envisioned that the document would be relevant across the state and applicable not only as a business evaluation tool, but also as an aid in the success of commercial food-processing startups and prevention of failures.

Rob Holland
Project Principal Investigator
Center for Profitable Agriculture

[1]When the publication was originally developed in 2001-2002, the *Center* was known as the *Agricultural Development Center,* but has since been renamed the *Center for Profitable Agriculture.*

Preface

Ag-tag Grant

In March 2001, the Center submitted a proposal to the Tennessee Department of Agriculture requesting funds from the "Ag Tag" license plate fund to develop and publish a resource that would assist farmers, agri-entrepreneurs and home-based businesses in considering, planning, developing and evaluating value-added food enterprises. In essence, the project proposed to document the details of an analysis for a hypothetical commercial food-processing facility. Over the years, there has been an increased need for evaluation criteria, project development specifics, cost-and-return data and general operational guidelines for commercial food-processing facilities as value-added enterprises for fruits and vegetable markets in Tennessee. Specific requests for a "general guide to developing a commercial food-processing business" are commonplace in the Center.

The results of this project are relevant across the state and applicable to anyone considering a commercial value-added food business. The published results of this project will be useful as stand-alone resources for one-on-one farm planning, a base curriculum for group educational sessions, mass media releases, electronic distribution via the Internet, educational exhibits and the like. In addition to the obvious impact as a business evaluation tool, this project will aid in the success of commercial food-processing facility startups and prevention of failures.

The Project Team

The effectiveness and success of the Center programs can be attributed to the multidisciplinary team of specialists involved with each project. The team-approach is also a welcomed characteristic of the development of this publication. The unique and interactive forces of marketing, production and financial feasibility have been considered and applied by a team of writers and reviewers from the Center, UT's departments of Food Science and Technology, Biosystems Engineering and Soil Science and Agricultural Economics; and the Tennessee Department of Agriculture. The authors of the original publication in 2001-2002 included Anne Dalton, Mike Davidson, George Grandle, Rob Holland, Shasta Hubbs and Bill Morris. Publication layout and design was provided by Gary Dagnan and photos were provided by Tina Johnson. The advisory and preliminary review team included Alan Barefield, John Brooker, Dave Lockwood, Allen Straw and Stanley Trout. Outside reviewers were Sandra Baxter, Ron Boyle, Rich Heinrich and Rodney Simmons. The final peer review team included Kim Jensen, John Mount, Lester Pordesimo and Wanda Russell. Those involved with this publication's revisions in 2007 were Gary Dagnan, Anne Dalton, Mike Davidson, George Grandle, Rob Holland, Bill Morris and Wanda Russell.

Objectives And Intended Use

In addition to providing the Center project clients with the necessary overview of planning, evaluating, starting and operating a commercial, value-added food business, this publication has been developed to serve the interests of an even larger audience of farmers, agri- and home-based business entrepreneurs who are interested in a commercial food-processing business. One of the most important motivations for developing a value-added agricultural enterprise is to return profits to the farmer/entrepreneur who provides the investment. However, there are many obstacles that might be encountered as a business develops. Previous studies have

shown that not obtaining accurate and timely business and industry information, along with not completely evaluating and planning production, marketing and the financial details of a new business, are the leading factors associated with business failure.

This publication has been developed to document some of the essential concepts and principles for completely evaluating all phases and aspects of a legal, value-added food enterprise. While this document has been developed with a broad base of potential food commodities in mind, it cannot provide intricate detail for each and every potential commodity. Especially when it comes to regulatory concerns, this publication can not document every detail or concern. Rather, this publication is intended to provide a broad overview of concepts, limiting factors and common-place obstacles confronting average-type food businesses. The information in this publication will also be used in outreach training sessions conducted by the Center.

Value-added product ideas are limited only by one's imagination.

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1 Overview of Considerations for a Commercial Food-Processing Enterprise

Why Consider a Value-Added Food Business?

With a net farm income from 2003 - 2005 averaging $8,014 per farm, Tennessee farm families are motivated to consider value-added activities. That is, many farmers are now evaluating ways to add value to their commodities to capture some of the value that is being added beyond the farm gate. Adding value may be defined as anything done to further prepare a product/commodity for the consumer, such as processing, packaging or marketing. To remain competitive during the past 20 years, Tennessee farmers have implemented activities of production integration, expansion and diversification. However, to be profitable into the 21st century, other opportunities must now be considered. Adding value by processing, packaging and marketing has given farm families the opportunity to position their operations for the future by capturing more of the consumer dollar actually spent on their commodity or product.

Value-added agricultural activities require a new and different set of skills than those commonly associated with most farming enterprises. Therefore, agri-entrepreneurs must think and plan more like mainstream business managers than traditional farm managers. New, value-added enterprises are often classified as small businesses, and the success rate for many small businesses is not very high. While small business growth represents a positive contribution to the nation's continued economic expansion, entrepreneurs need to be aware that it takes more than a good idea for a small business to succeed. The failure rate for new businesses is approximately 70 to 80 percent in the first year, and only about half of those who survive the first year will remain in business over the next five years.[1]

While many farm operations find success with value-added enterprises that are not food-related (such as by-product and waste utilization, agri-tourism and agritainment), most value-added agriculture ideas actually are derived from food-based agricultural commodities. Although exceptions do exist, most new value-added food enterprises face multiple battles including, but not limited to, product development, regulations, marketing and profitability. Under most circumstances, it is not wise to expect a value-added enterprise to save a financially struggling or resource-stretched farm operation. In addition, most successful value-added agricultural enterprises have more than a single resource; they have several of the resources needed for the end product. That is, it tends to take more than a good crop of strawberries to make a successful value-added strawberry preserves product; it takes packaging, marketing skills, a top-quality product, patience, entrepreneurial skills and a thorough understanding of the pertinent laws and regulations. In other words, it takes more than a good idea and a single input to be successful.

Figure 1 shows the increasing difficulty of developing a value-added product/business and identifies pitfalls at each level of evaluation as "ideas" move through various levels of investigation, study, planning and implementation. The chart represents the general trend among aspiring entrepreneurs. As depicted in the chart, only 50 percent of the groups with good ideas survive the preliminary investigation and move on to do a feasibility study. Only half, 25 percent, of those doing a feasibility study can justify doing a business plan and equity drive. Of the 25 percent who complete the business plan, only 10 percent have the resources needed to launch a business. Thus, as seen in the chart,

Figure 1

"How Many Go Forward?"

Groups with Good Ideas

Preliminary Investigation or Pre-Feasibility Assessment

50%

Groups whose ideas probably will not work
- No market or market is too small
- Economics appear quite poor
- Cost of entry are prohibitive

50%

Groups with a good idea that appear to have a merit
- Supply cost advantage
- Growth markets
- Technology

Full Feasibility Study

25%

Groups with a good idea that upon further investigation cannot meet economics/market objectives or lack leadership to carry project through

25%

Groups with a good idea that appear to have attractive returns, interested marketplace and strong leadership to take project to the next level

Business Planning & Equity Drive

15%

Groups with a good idea, but lack commitment from the board of directors to go ahead, or lack qualified management to go ahead with the final steps

10%

Groups with a good Idea; dedicated, business-oriented Interim management; attractive returns after further scrutiny; and which complete a successful equity drive

only 10 percent of the original groups with good ideas actually start a business, while 90 percent of those groups, for justified reasons, never see the idea materialize.

Study of the Industry

Adding value to farm products can be accomplished with a variety of food products such as breads, cookies, cakes, pies, candies, drinks, sauces, jams, jellies, preserves, salsa, compotes, spreads and toppings. Value can also be added by packaging products in ways that extend their shelf-life and in ways that make them more attractive to consumers.

The focus of this publication concerns adding value to Tennessee agricultural enterprises by processing them into food products for commercial sales. In this publication, strawberry preserves is the food product that is used in the situational examples given to explain specific information or processes related to commercial food business.

In developing a food product of any type, it is important that some study be given to the overall food industry and food category in which the product will be classified. Therefore, because strawberry preserves is the identified food, the jams, jellies and preserves industry is the industry of focus in the publication. A study of the industry is discussed in the marketing chapter under "The Market Environment."

Up to this point, the information presented has been broadly related to how to start a business. The focus in the following sections will be more specific. The individual issues, such as construction, regulation, production, marketing, costs and pricing that must be addressed before/during starting a business are discussed and specific guidelines and additional information are given. No section is more important than another. Therefore, the order of an issue's presentation is not an indication of importance.

When developing a food product, a study of the overall food industry is important.

2 Requirements for Commercial Food Businesses

Regulatory Agencies and Their Responsibilities

After giving some thought to the overall food and product industry and deciding to proceed with a food-processing business, the next logical consideration may include a study of the regulations. All food products made for sale are subject to regulatory oversight of some type. Therefore, the starting point should be to determine which agency is responsible for regulating the business. Many laws and regulations govern food-processing establishments, including those involving the physical plant and grounds, equipment, processing, labeling and personnel. By first determining which governmental agency or agencies will be responsible for enforcing regulations for an establishment and then contacting and involving the agency, unnecessary loss of time and money may be prevented, as well as obtaining a better understanding of the governing laws.

Trying to sort through and understand all the details of commercial food-processing regulations is often frustrating for people wanting to develop a value-added food business. Rarely are the regulations for commercial food businesses simple, straightforward and static; they are often complex, overlapping and dynamic. Food regulations and regulators vary among food types, processing procedures and packaging. There are also different regulatory considerations for labeling, permits and training.

Despite potential initial confusion and difficulty, knowledge and implementation of food regulations is critical. Be sure to contact the proper food regulatory agencies in writing early in the evaluation and planning stage with specific details concerning the project. Make a specific request for information on regulations, rules and requirements. Keep a copy of all correspondence on file. If communication with the agency is by telephone, make notes and file them.

Four primary agencies are responsible for regulating food establishments in Tennessee:

- Tennessee Department of Agriculture (TDA)
- Tennessee Department of Health (TDH)
- United States Department of Agriculture (USDA)
- United States Food and Drug Administration (FDA)

Following is a brief summary of the responsibility of each of these agencies.

- TDA is responsible for regulating and enforcing food safety as it pertains to food processing, handling, storage and sale in Tennessee. This includes all food manufacturers preparing food for sale to consumers, distributors or retailers. TDA inspects retail food stores such as groceries, markets and delis. Many commercial food-manufacturing businesses in Tennessee operate as retail establishments, so a "Retail Food Store Permit" is often required by the TDA. A "Retail Food Store Permit"covers grocery stores, restaurants in grocery stores and establishments where food and food products are offered to the consumer and intended for off-premises consumption. Bakeries that sell both at the retail and wholesale levels are also regulated as retail stores by TDA. TDA inspects and regulates food manufacturing businesses that are not registered as retail stores (wholesale and manufacturing processing plants).

  TDA is charged with enforcing regulations allowing individuals using domestic food-processing facilities to prepare, manufacture and sell **non-potentially hazardous**

foods commercially, while ensuring that the public health is protected by compliance with these rules and inspections by the Department of Agriculture.

"Non-potentially hazardous foods" would include jam, jellies, candy and baked goods that do not meet the definition of "potentially hazardous foods." Potentially hazardous foods are defined as those foods that consist of meat, poultry, liquid eggs and partially cooked egg products, fish, milk and milk products, shellfish, partially cooked bakery products and/or other ingredients capable of supporting rapid and progressive growth of infectious or toxigenic micro-organisms when stored at temperatures in excess of 45 degrees F if a cold food or below 140 degrees F if a hot food. Also included as potentially hazardous foods are low-acid canned foods (vegetables, fish, meat, etc.) and acidified foods (pickled vegetables, fish, meat, eggs, etc.) Items not allowed for production under the domestic food-processing rules include, but are not limited to, canned vegetables of any type that are processed in a home canner, acidified foods such as pickled foods and salsa, processed dairy products in any form or products containing meat. For the purpose of the Domestic Food-processing Rules, the Tennessee Department of Agriculture reserves the right to determine if a specific food meets the definition of a "non-potentially hazardous food."

In addition to being restricted to these type products, all domestic food-processing facilities must obtain and maintain a current license (known as a "Regulatory Services Permit") from the Tennessee Department of Agriculture, Regulatory Services, Food and Dairy. Compliance with all other business license, permit and zoning requirements is the responsibility of the individual.

There is a requirement that all domestic food-processing facilities be available for inspection by the Tennessee Department of Agriculture between the weekday hours of 7 a.m. to 5 p.m. The department shall, if it is deemed advisable or necessary, inspect such premises on Saturdays, holidays or other times commercial foods are being processed, prepared, packaged or handled.

Another requirement placed on individuals wishing to comply with the domestic kitchen ruling is that they shall have adequate knowledge of safe food-handling practices and shall have successfully completed a Tennessee Food Safety Certification Course presented by the University of Tennessee Department of Food Science and Technology or the equivalent as determined by the Tennessee Department of Agriculture.

For further information on this program, see the entire law given in Appendix C and/or contact the Tennessee Department of Agriculture, Regulatory Services, Food and Dairy Section.

- TDH regulates food service establishments such as restaurants, schools, daycares, nursing homes and hospitals.

- USDA is responsible for regulating and enforcing laws for meat, poultry and fish and products that contain these foods as ingredients.

- FDA, an agency of the federal government's Department of Health and Human Services, enforces laws requiring all food for human or animal consumption (except meat and poultry) to be safe and appropriately labeled. Foods per se do not require FDA approval. However, food businesses are subject to compliance with FDA regulations.

  As a result of 09/11/01, Congress established the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 to minimize the risk that food might be subject to tampering or other malicious, criminal or terrorist actions. This act requires domestic and foreign facilities that manufacture, process, pack or

hold food for human or animal consumption in the United States to register with the U.S. Food and Drug Administration. Owners, operators or agents in charge of domestic or foreign facilities are required to register the facility with the FDA. Domestic facilities are required to register whether or not food from the facility enters interstate commerce.

Registration provides the FDA with information on the company, the products produced and the name(s) and contact information for the responsible person in the business. There is no fee for registering.

Registration may be accomplished via computer on-line by going to www.fda.gov and following the links to the forms for completing food registration. A system is also in place to register using printed forms available from the local FDA office.

The following firms are exempted from registration: farms; retail food establishments; restaurants; non-profit establishments that prepare food for, or serve food directly to, consumers; fishing vessels not engaged in processing [as defined in 21 CFR 123.3 (k)]; and facilities regulated exclusively throughout the entire facility by the U.S. Department of Agriculture.

Additional information on food security may be obtained by visiting the FDA Web site or requesting copies of food security documents from the local FDA office.

In the strawberry preserves example, a food-processing establishment manufacturing the preserves product will be regulated by the Tennessee Department of Agriculture. In most cases, the business will not be subject to regulation by TDH because it is not engaged in food service, and it will not be subject to USDA because there are no meat products. It will not be directly regulated by FDA, unless it is involved in interstate commerce, because a product that is manufactured, shipped and marketed within a state is not, in most cases, subject to FDA. Therefore, TDA will be responsible for regulating all facets of the business from developing the production facility (building or remodeling) to preparing the product.

Licenses, Zoning and Permits

Entrepreneurs and new business owners often inquire as to whether they should get a business license. As with most regulatory issues, it is better to be over-prepared than under-prepared, so is the case with a business license. The Tennessee state government authorizes Tennessee county governments to levy a privilege tax on businesses that operate within the county. Simply stated, a privilege tax is a tax charged for the privilege of operating a business. More than 95 percent of Tennessee counties have this tax (also referred to as a business license) and some incorporated cities also have the tax. Generally, all businesses (sole proprietorships, partnerships and corporations) are required to have a business license, although there are exemptions for manufacturers, businesses with less than $3,000 in annual sales and some professional service providers, such as physicians and lawyers. The business license can be obtained through the County Court Clerk's office. There is a one-time application fee, which, depending on the county, is approximately $25. There is also an annual fee and a variable tax, which is normally assessed in the amount of 1/10 of 1 percent of gross sales, but it dependent on gross sales and business classification.

When potential locations for a business are identified, check zoning ordinances to determine if the particular business activity may be carried out in the chosen geographic location(s). Local zoning regulations may restrict the kinds of home businesses allowed or prohibit home food businesses entirely. Do not make any plans until it is certain that the business falls within the bounds of the law.

Also during the planning stage, determine if you need a state food permit, and if so, from which of the regulatory agencies. The type of food business determines the type of permit required.

Good Manufacturing Practices

The Food and Drug Administration has established general good manufacturing practices for food products. These practices are often referred to as "GMPs," an acronym for Good Manufacturing Practices. The GMPs may be found in the *Code of Federal Regulations* Title 21, Part 110. GMPs have been developed to ensure the safety and wholesomeness of commercially processed food. GMPs address and prescribe general practices for the following areas:

- Plant and grounds
- Equipment and utensils
- Sanitary facilities and controls
- Sanitary operations
- Processes and control
- Personnel

GMPs provide general stipulations for building design, lighting, ventilation, restroom and washing facilities, cleaning of equipment, materials handling and vermin control. It is important to understand that while the FDA prepares and publishes the GMPs for food businesses, the inspection of food businesses and evaluation of the businesses' performance relative to the GMPs is normally not performed by the FDA. Rather, inspection is normally conducted by state or local agencies. Inspections in Tennessee are based on the GMPs, as the Tennessee Department of Agriculture has adopted the GMPs' stipulations.

Physical Plant Regulations

Tennessee regulations state that food prepared in home premises for commercial sale must meet the same requirements as any commercial food-processing plant. TDA regulations prohibit the operation of any food establishment (or retail store) in any room used as living or sleeping quarters. This means that a food-processing facility used for family cooking cannot be used to prepare food for sale. A food-processing facility for preparing food for sale may be located in a home, but it must be separated from the living area by a solid door and have its own outer entrance.

The steps involved in developing the physical facility are presented below.

1. Before the facility is constructed or remodeled, or if an existing structure will be used for a food-processing facility, a prepared set of plans and specifications (blueprints) must be submitted to the TDA Regulatory Services Division, Food and Dairy Section for review and approval. Upon approval of these plans by the state, construction may begin. If changes are made in the originally approved plans, these changes must be submitted and approved by the same office.
2. Once the facility is complete, the TDA Regulatory Services Division must inspect the commercial food-processing facility and the premises and determine that they comply with the approved plans and specifications. Only then will a copy of an approved "Inspection Report" be issued. This form must be issued before the manufacturing and processing of food can begin, including production of test market samples, if the samples are to be sold. (See Appendix A for a sample "Food Establishment Inspection" form.)

An option to a self-owned facility is to use a food-processing facility that is inspected by the TDH or the TDA, such as a restaurant, school, church or nursing home. Remember, however, even though a food-processing facility is approved by the TDH, it must also be approved by the TDA, if used for processing purposes. Such an arrangement might be long-term or short-term, whatever time span is needed to decide if a long-term investment is worthwhile. For instance, such a food-processing facility might be used while developing/refining a recipe or for processing the product for a test market. If a facility is used only for test products and the end product is not sold, it would not be subject to inspections.

Classification of Foods for Regulatory Purposes

Some types of processed foods have the potential to be highly hazardous if handled improperly by the food processor. Two such groups of foods are low-acid canned foods and acidified foods. If these products are not processed properly, consumers could be exposed to the lethal poisons produced by *Clostridium botulinum*. Therefore, foods regulated by FDA and USDA are differentiated based on the amount of acid and available water in the product (water activity).

Foods with high acidity (pH less than 4.6) do not carry as much health and safety risk for the consuming public as low-acid foods (pH greater than 4.6). Most foods naturally contain some level of acid. The amount of acid present, and therefore a food's ability to support the growth of food-poisoning bacteria, is measured by the pH level of the food. The pH scale extends from 0 to 14. A pH of 7 is neutral, a pH above 7 is alkaline and a pH below 7 is acid. The higher the pH, the lower the acidity level; the lower the pH, the higher the acidity level. Very few foods have a pH above 7. Most foods have a pH in the range 4.6 to 7.0. A pH of 4.6 is critical in food processing because below this pH, *Clostridium botulinum*, the most dangerous and one of the most heat-resistant of the food-poisoning bacteria, is unable to grow.

In Figure 2, foods with a pH value greater than 4.6 are termed "low-acid" and, if canned, require pressure cooking to make them shelf-stable.

Food regulations require that low-acid foods (high pH) in hermetic (air-tight) containers or canned foods prepared for sale be processed by steam under pressure (pressure cooker) and by a specially trained staff. Low-acid foods include vegetables, meats and fish. Persons who wish to produce such foods for sale must attend and pass an FDA-sponsored Better Process Control School. These schools are periodically offered by the Department of Food Science and Technology at The University of Tennessee at Knoxville.

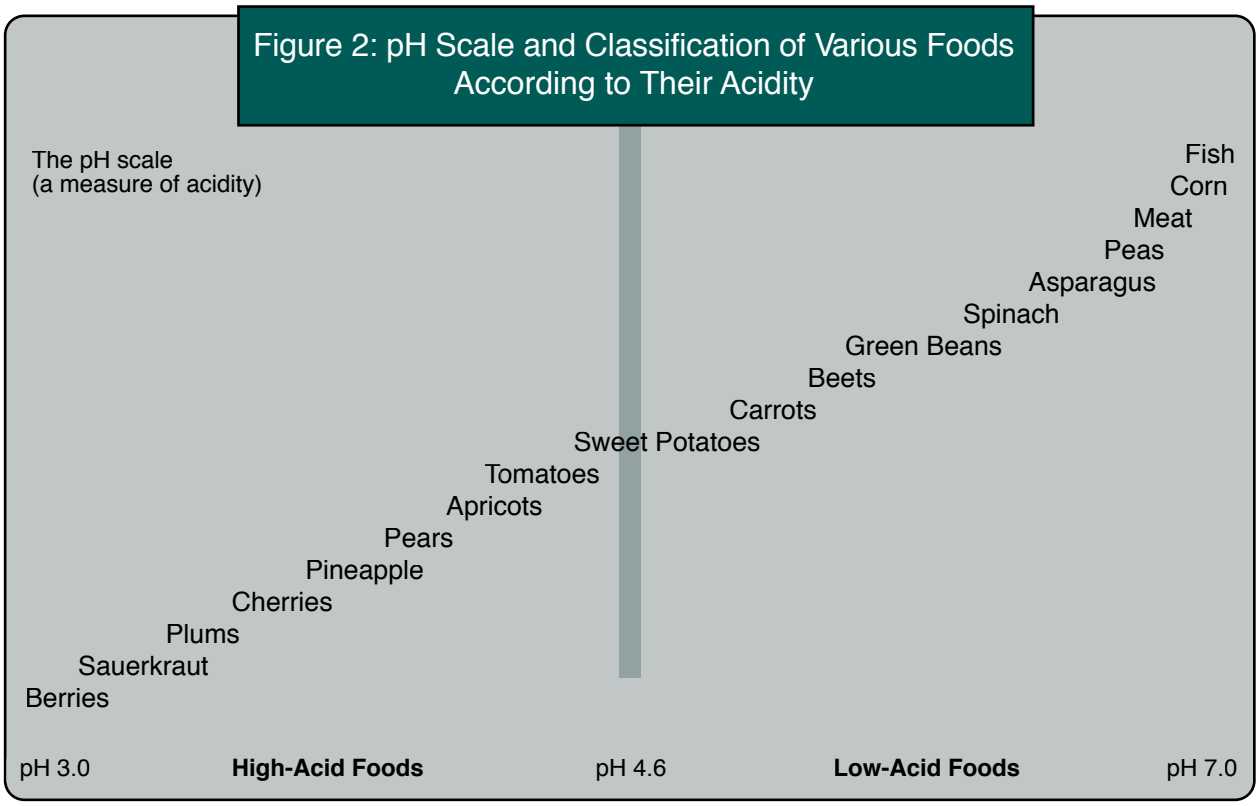


Figure 2 shows the pH scale and lists various foods that are classified in the high-acid and low-acid categories.

Shelf-stable acid foods, such as fermented foods like pickles and sauerkraut, and foods that are naturally low in pH (high-acid foods), such as fruit products, may be processed or canned in a boiling water bath (that is, no steam under pressure required). The pH of such foods is too low for the microorganism *Clostridium botulinum* to grow and produce its poison; therefore, these foods are considered to be less hazardous than low-acid foods. Processors that produce such products must only meet general good manufacturing practices and do not need to attend a Better Process Control School.

Another type of shelf-stable product that does not require special processing are those foods with a water activity below 0.85. Water activity is a measure of the available water in a food product. Food components such as salt and sugar actually tie up water and make it less available for use by microorganisms. By adding sugar and/or salt to food, the water is tied up and the water activity is reduced. Water activity is measured on a scale of 0.00 to 1.00, where 1.00 is pure water. In other words, the water is available for microbial growth. Most bacteria are inhibited at a water activity of 0.91, and 0.85 is considered the cutoff for growth of all food poisoning bacteria. Foods with a water activity below 0.85 include Parmesan cheese, fruitcake, prunes, sweetened condensed milk, molasses, jams, jellies, dried fruits, honey, pasta and flour. Just as with fermented and high-acid foods, these products are subject only to general good manufacturing practices.

A second type of shelf-stable acid foods is subject to more stringent regulations. These are low-acid foods to which sufficient food grade acids, like vinegar (acetic acid) or citric acid, have been added to make the food high-acid or have a pH below 4.6 . These are called "acidified foods." This type of products might include pickled vegetables (e.g., okra, onions, peppers). Because these products are high-pH or low-acid to begin with and are generally canned, a mistake in the addition of acid could lead to a product in which the deadly pathogen *Clostridium botulinum* could grow. For this reason, processors producing such products are also required to attend an FDA-sponsored Better Process Control School.

There are essentially five basic categories of foods, based on the level of processing required. These food categories are presented below, starting with the category that requires the most complicated processing to the category that requires the least processing.

1. Low-acid food (pH greater than 4.6), which are thermally (heat) processed in hermetically sealed containers (cans or jars).

2. Acidified foods—low-acid foods to which food-grade acids (e.g., vinegar) have been added to reduce the pH below 4.6. These products are generally in hermetically sealed containers (cans or jars).

3. Fermented foods and high-acid foods—foods with a pH below 4.6 that may be processed by canning (jars or cans) in a boiling water bath.

4. Low water-activity foods—foods that are naturally low in water content or to which sugar, salt or other food-grade humectant (compound that ties up water and thereby reduces water activity) has been added; the water activity must be below 0.85.

5. Other foods that are packaged and refrigerated, such as fresh products (meats, fish, fruits, vegetables) or shelf-stable and packaged items such as bakery items or confectionary (candies). These products are subject to good manufacturing practices.

Weights and Measures Regulations

State law defines net weight as the exact weight of a commodity in a package at the time it is offered for sale. Net weight is obtained by deducting the weight of a container

Regulations require that the product itself (not including container or packaging) must weigh at least as much as the label states at the time it is offered for sale.

or wrapper, referred to as the "tare" weight, from the gross weight. Net weight must allow for product shrinkage. In other words, the law requires that the commodity itself must weigh at least as much as the label declaration at the time it is offered for sale.

Product Labeling Regulations

The FDA is responsible for assuring that all food items are properly labeled. The laws governing food labeling are contained and detailed in *Federal Code of Regulations* Title 21, Part 101. The regulations for food labeling require all information on the label to be 1) in English, 2) conspicuously displayed, and 3) in terms that the ordinary consumer is likely to read and understand under ordinary conditions of purchase and use. The regulations specify information that must be on the label, where certain statements must be located on the label and the type and size of the print to use.

A variety of intricate label regulations apply to processed and packaged foods based on certain product conditions, including but not limited to product use, size of the manufacturing business, package size, product claims and package type. Although the compilation of labeling regulations that appear in the *Federal Code of Regulations* is very lengthy, the *Federal Code of Regulations* is the most appropriate source to follow when making certain that all labeling requirements are met. While some of the labeling regulations are mentioned in this publication for illustration purposes, only a few of the many specific requirements are included. Following only the descriptions of labeling regulations presented here may not represent complying with all the regulations that might apply.

Food labeling regulations can be segmented into four general requirements for all commercial foods and numerous other regulations for certain foods and circumstances. All food labels are required by law to provide information concerning the manufacturer, weight of the food, name of the food and ingredients in the foods. Some additional information for each of these four label requirements is presented below.

1. The name, street address, city, state and Zip code of either the manufacturer, packer or distributor.
   a. The street address of a firm may be omitted if the firm is listed in a current telephone directory.
   b. If the food is not manufactured by the person or company whose name appears on the label, the name must be qualified by "Manufactured for," "Distributed by" or a similar expression.

2. An accurate statement of the net weight of food in the package.
   a. The net weight of a product is the weight of the food in the package.

The weight of the container or wrap per is not included. For some products packed in liquids, such as mushrooms, the fluid is considered part of the packaging; therefore, the drained weight should be used. For most canned foods, liquid is considered part of the product.

b. The net weight must be expressed in both metric (grams, kilograms, milliliters, liters) and in U.S. Customary System (ounces, pounds, fluid ounces) An exception to this regulation is that dual labeling is not requirefor products that are random packed, i.e., similar items that do not weigh the same, such as produce and products in meat cases or delis.

c. The quantity of content declared must appear on the Principal Display Panel, the portion of the label most likely to be seen by the consumers, in lines generally parallel to the base of the package when displayed.

d. The information must appear in the lower 30 percent of the panel and should be a distinct item.

e. The type size used for the net weight statement is determined as a percentage of the size of the Principal Display Panel.

3. The common or usual name of the food.

a. The common or usual name of a food must appear on the Principal Display Panel, in bold type and in lines generally parallel to the base of the package as it is displayed.

b. The form of the product must also be included —"sliced," "whole" or "chopped" (or other style)—unless shown by a picture or unless the product is visible through the container.

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 260 Calories from Fat 120

	% Daily Value*
Total Fat 13g	**20%**
Saturated Fat 5g	**25%**
Trans Fat 2g	
Cholesterol 30mg	**10%**
Sodium 660mg	**28%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Protein 5g	

Vitamin A 4% • Vitamin C 2%
Calcium 15% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet, Your Daily Values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 * Carbohydrate 4 * Protein 4

Advisory labeling includes a statement that identifies the potential allergen contaminate.

4. The ingredients in the food.
   a. The ingredients in all processed, packaged food, including standardized food, must be listed by their common names and in the order of their predominance by weight.
   b. Ingredients are not the chemical composition, but rather a listing of the individual foods that come together to make the final product.
   c. If an ingredient is the characterizing element of the food, such as crab in crab meat, the percent of that ingredient may be required to be part of the name of that food on the label.

A common feature on the label of most food products is the nutrition label. It too is required on most food products, but not all. The nutrition label is not required for plain coffee and tea; some spices, flavorings and other food that contain no significant amounts of nutrients; ready-to-eat food prepared primarily on site, such as deli and bakery items; donated food items; vended food and bulk food that is not distributed to consumers in bulk form.

A nutritional label is also not required on foods produced by small businesses. Small businesses are defined by FDA as a food business with food sales of less than $50,000 a year or total sales of less than $500,000. To apply for a small business exemption, the business must employ less than 100 employees, produce less than 100,000 units and make no nutritional claims. However, if a product claims to have any nutrient content, or makes any health claims, nutritional labeling must be provided regardless of production size, number of employees or place of manufacturing. A small business exemption form can be obtained in Tennessee from the Nashville District Food and Drug Administration office. Alternate nutrition labeling regulations apply to the following products: foods for children less than 2 years of age; exported game meats; shell eggs; foods sold from bulk containers; unit containers in a multi-unit, retail package; packaged single-ingredient; and fish. (See Appendix B for a sample "Small Business Food Labeling Exemption Notice" application.)

Also exempted from nutritional labeling are foods in small packages (less than 12 square inches of total package area), unless they make a nutrition claim. However, FDA-regulated products must carry a telephone number or address that consumers can use to get required nutrition information.[2]

A properly worded and presented nutrition label is required on all other packaged foods. When required, the nutrition label panel is titled "Nutrition Facts" and must include mandatory nutrient information expressed as total amount per serving size and as a percent of the daily value (% DV). (Exception: no % DV for trans fat.) The percent of the daily value (% DV) must be footnoted on the label with the statement "Percent Daily Values are based on a 2,000-calorie diet."

Some of the mandatory nutrient information includes:

- calories
- total fat
- cholesterol
- total carbohydrates
- dietary fiber
- sugars
- vitamin A
- calcium
- calories from fat
- saturated fat
- trans fat
- sodium
- protein
- vitamin C
- iron

Some of the nutrients that can be included on a voluntary basis are:

- polyunsaturated fat
- calories from saturated fat
- potassium
- insoluble fiber
- other carbohydrates
- stearic acid
- monounsaturate fat
- soluble fiber
- sugar alcohols
- percent of vitamin A present as beta-carotene

When listed on the nutrition panel, mandatory and voluntary nutrients must appear in a specified format and order. Serving size is the basis for reporting each nutrient's amount. Serving sizes for specific food cate-

gories are defined by FDA. Both U.S. Customary System and metric amount per serving size must be included on the nutrition label.

Laws regulate the use of nutrient descriptive terms. Terms such as free, low and lean and various health claims are specified in the regulations. The nutrition label format is designed to help the consumer make informed food choices. However, like the rest of the label, there are regulations governing type size, style, color and placement and the information box dimensions, color and appropriate background.

After the label has been written and designed, it is recommended that it be submitted for review to the Regulatory Services, Food and Dairy Section, Tennessee Department of Agriculture. This step is not required by law; however, this is a service that can be very helpful to the food business.

Food Allergens

Food allergies affect very few people in the population. True allergies are different than so-called food sensitivities. Sensitivities may include metabolic food disorders, such as lactose intolerance or "idiosyncratic reactions," in which the adverse reaction to a food or food component occurs through unknown mechanisms. Examples of the latter include chocolate-causing migraine headaches, sulfiting agents causing asthmatic reactions or monosodium glutamate causing various symptoms. In idiosyncratic reactions, some links are proven sensitivities (e.g., sulfiting agents and asthmatics), while others (e.g., MSG sensitivity) are not.

True food allergies are caused only by proteins in foods and are immunologically- based afflictions. Approximately 2 to 2.5 percent of the US population has food allergies. Symptoms of food allergies may include cutaneous (skin) reactions (e.g., urticaria or "hives"), gastrointestinal symptoms (e.g., nausea, vomiting, abdominal pain, diarrhea) or even life-threatening asthmatic reactions or anaphylactic shock. It is estimated that there are 150-200 deaths per year due to food-induced anaphylaxis.

Food allergens are naturally-occurring proteins. The most prevalent foods associated with food allergies include peanuts, tree nuts, milk, eggs, soy, fish, crustaceans and wheat. These are referred to as the "Big Eight." Individual management of a food allergy is to avoid the offending food, which involves diligent reading of food labels.

Processors should be aware of the allergenic potential of all their ingredients. Labeling foods with allergens is somewhat complicated. If an allergen protein is part of a food, then it will obviously be a part of the ingredient list. However, allergen proteins may accidentally be added to a product through contamination during processing (e.g., production changeovers, rework, improper sanitation) or human error. Beginning January 1, 2006, with the enactment of the Food Allergen Labeling and Consumer Protection Act, foods that contain or may be contaminated with an allergen are required to have advisory statements on the label. Advisory labeling would include a statement on the label that identifies the potential allergen contaminate, such as "May contain peanuts," "Made on shared equipment with fish," "Made in a facility that utilizes eggs." An alternative to advisory labeling would be to add the name of the offending protein as the last ingredient in an ingredient statement. Regulatory agencies do not consider advisory labeling a substitute for good manufacturing practices nor a means to cover sloppy practices. It should be used only when GMPs, including allergen control strategies, are not reliable in consistently eliminating risk of cross contamination.

3 Construction

Regulations

GMPs provide the general guidelines for construction requirements of food businesses, but do not specify such things as size and type of construction materials. Listed below are some of the key points of the GMPs that will need to be addressed in a new or remodeled food-processing facility.

1. Walls, floors and ceilings in food preparation, handling, storage, ware-washing areas and restrooms must be light-colored, smooth, non-absorbent and easily cleanable. If concrete floors are used, they must be sealed.

GMPs require that an adequate and effective hood and exhaust system be placed over all deep fryers, broilers, ranges and similar equipment.

2. All fixed equipment must be sealed to the wall, unless sufficient space is provided for cleaning between, behind and above each unit.

3. All wiring and plumbing must be installed in a way that does not obstruct or prevent cleaning (behind wall).

4. Floor-mounted equipment, unless easily moveable, shall be sealed to the floor or elevated to provide at least a 6-inch clearance between the floor and equipment for cleaning purposes.

5. Lights located over food-preparation, ware-washing and food-display areas must be shielded, coated or otherwise shatter-resistant.

6. Restrooms must be properly ventilated.

7. Condensation drain lines must be air-gapped going into the sewer system.

8. All threaded faucets with hoses attached must have a back-flow prevention device installed.

9. All outer doors and restroom doors must have self-closures.

10. A conveniently located hand-wash sink must be provided in each food preparation and ware-washing area. Hand-washing facilities shall also be located in or immediately adjacent to restrooms or their vestibules.

11. Grease traps, if used, shall be easily accessible for cleaning.

12. Except for properly trapped open sinks, there shall be no direct connection between the sewer system and drains originating from equipment in which food, equipment or utensils are placed.

13. An adequate and effective hood and exhaust system must be provided over all deep fat fryers, broilers, griddles, ranges, steam cookers and similar equipment that produce comparable amounts of steam. Local fire ordinances must be met.

14. Dumpsters and outside storage areas must be located on smooth, non-absorbent surfaces.

15. All food that may come into contact with the public during display or storage must be protected by an adequate and effective sneeze guard.

16. Ice shall not be provided for self service unless served through a sanitary ice dispenser.

17. Potable water sufficient to meet all needs shall be provided from a source approved by the Tennessee Department of Environment and Conservation.

18. All sewage, including liquid waste, shall be disposed of by a public sewer system or by a sewage disposal system approved by the TDA.

19. Ware-washing sinks with two or three compartments shall be provided and used according to regulations. These compartments shall be large enough to accommodate the immersion of equipment and utensils, and each compartment shall be supplied with hot and cold potable running water. Hand washing is prohibited in ware-washing sinks.

20. Refrigerated, frozen and hot-storage units shall be provided in such manner and of such capacity to assure the maintenance of potentially hazardous food at the required temperature during storage and display.

21. Equipment, including ice makers and ice storage equipment, shall not be located under exposed or unprotected sewer lines, water lines that are leaking or on which condensed water has accumulated, open stairwells or other sources of contamination.

22. At least one service sink or curbed cleaning facility with a floor drain shall be provided for the cleaning of mops and for the disposal of mop water or similar liquid wastes.

Floor Plans

The actual physical construction and layout of the commercial food-processing facility is a critical consideration in many ways,

A ware-washing sink should have two or three compartments that are large enough to accommodate the immersion of equipment and utensils.

When making construction decisions, consideration should be given to including a retail area at the processing site (i.e. direct purchase, snack bar or full-service restaurant).

including regulatory compliance, time and motion efficiency, production capacity/volume, product-line diversification possibilities and cost.

Regulatory Compliance: Although the actual size (dimension) and layout of commercial food-processing facilities are not generally regulated, many of the construction details have regulatory ties. The fine line between construction and regulatory issues is primarily prescribed by GMPs—floors, walls and ceiling; wiring and plumbing installation; cleanable surfaces; and special modifications for specialized equipment. In addition, some GMPs required safety precautions such as covered overhead lights, screened doors and windows and ventilated bathrooms need to be considered in the construction phase.

Time and Motion Efficiency: When designing a food-processing facility, regardless of size, efficiency should be a priority. Time and motion should be considered when studying floor plans. Distance between strategic points—the storage area to the outside door, the sink to the preparation table, the outside door to the loading dock/area—affects efficiency. Work areas should be identified and created. Regardless of the product being manufactured, specific work areas will be needed. Work areas may include a preparation/mixing area, cooking/baking area, packaging area and end-product storage area. Work areas help use time and motion more efficiently, as the specific equipment needed for each area will be grouped together. Once the work areas are identified and placed, utility outlets can be placed accordingly. Finally, floor plans should be evaluated as to how well processing procedures will be implemented—from raw ingredients, through prep/pre-processing, processing, post-processing, packaging and to end-product storage. If time and motion are used efficiently, excess back-and-forth movements will not be required.

Production Capacity/Volume: The overall design and size of the facility, the size and type of equipment and the amount and type of storage will need to be adjusted to the level of production. The amount of labor (number of people in the facility at one time) will also be related to the production volume. The adjustments that would be required in all areas mentioned, if production were 1,000 jars versus one million jars, should also be considered.

Product-line Diversification Possibilities: Different design possibilities should be considered, because it is impossible to predict what the future holds for a commercial food product. For example, the demand for the product might mushroom, and an increase in production would be needed. How would storage, equipment, floor space and preparation areas be impacted? What if the possibility for the production of another product becomes reality, such as producing not only preserves but also cookies, cakes, pies? Many production possibilities should

be considered during the initial building/designing of the facility so changes can be made to the facility at the least possible cost if the future so demands.

Construction Costs: Construction costs vary widely with location and prevailing cost of materials. As of this writing, building costs (labor and materials) were ranging from approximately $40-$60 per square foot—not including equipment and site preparation.

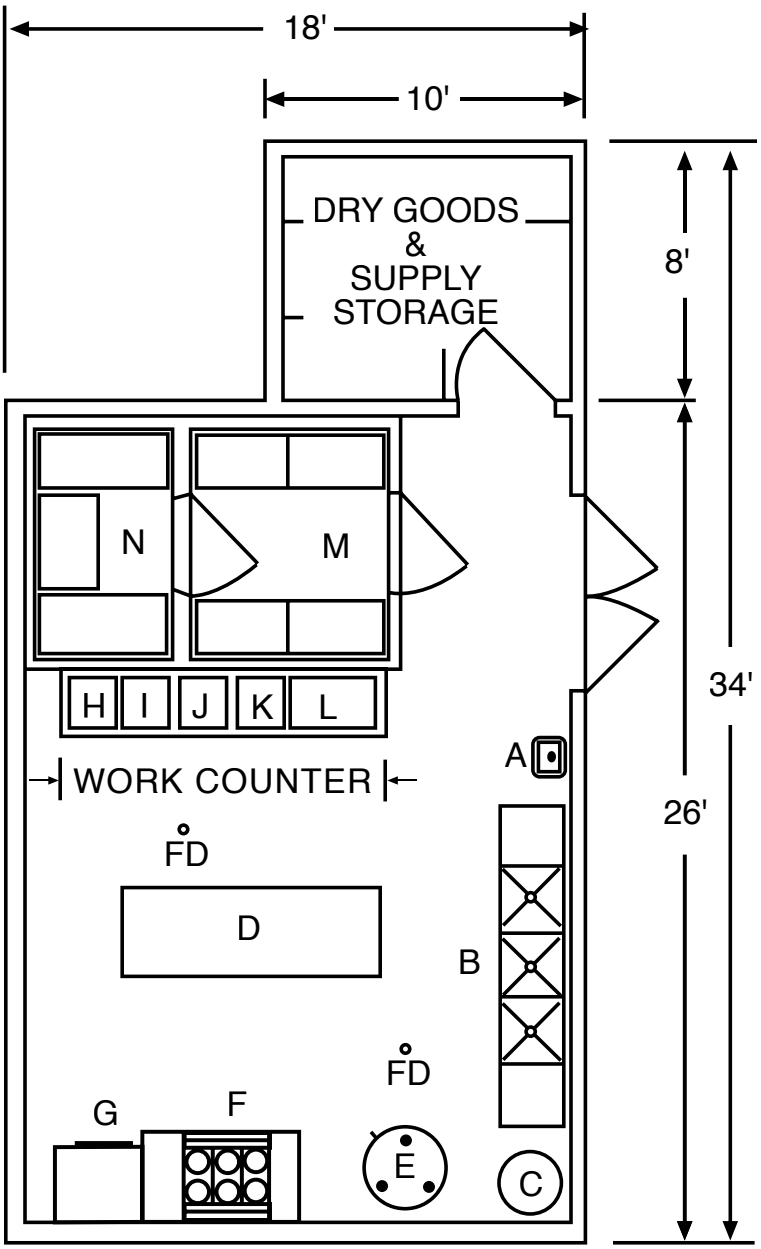
As already stated, the overall size of the facility should be determined by the type of product, the volume being handled, the finances available and the projected growth of the business. Although it may seem impossible, it is best to consider future expansion when the facility is first constructed. Case studies have shown that most successful value-added businesses grow as markets develop and as additional product lines are added. In addition to the processing considerations, the construction phase should also consider whether a retailing area will be needed at the processing site.

To graphically depict many of the construction considerations discussed in this section, two food-processing facility plans have been diagramed, including example equipment scenarios. The diagrams represent different-size facilities, referred to as small (Figure 3) and large (Figure 4). The small facility diagram is 548 square feet and approximately 26 feet by 18 feet with an 8-foot by 10-foot storage room. The large facility is 1,496 square feet, measuring 34 feet by 44 feet. While it is possible that the facility presented here could be expanded by 26 feet to develop the large facility, this is not the assumed transition. Rather, the features of both the large and small facility diagrams should be studied independently from each other. Thoughts of expanding from the small to the large facility are valid and should include considerations such as location of plumbing and electric outlets, walls, entrance and large equipment, such as walk-in coolers and freezers. It is important to remember that these are "example" plans and do not represent blanket construction recommendations.

The small facility plan is presented as Figure 3 and shows a 10-foot by 8-foot room for dry goods and supply storage, a 90-square foot walk-in cooler and freezer and a large open space (approximately 290 square feet) for food processing. The processing area includes appropriate sinks, preparation table, stove, convection oven, steam-kettle and 10-foot work counter to accommodate various processing equipment, such as a meat grinder, slicer, dicer, mixer and sheeter. The double-door entrance allows for efficient receiving, shipping and equipment involvement. The separate dry-goods storage room provides dedicated space for raw ingredients, package materials and finished products. A walk-in cooler and walk-in freezer are arranged with the cooler in front of the freezer. This arrangement is energy efficient, as the

Floor plans should include a dry storage area for storing supplies such as dry ingredients, containers, labels and packaging materials.

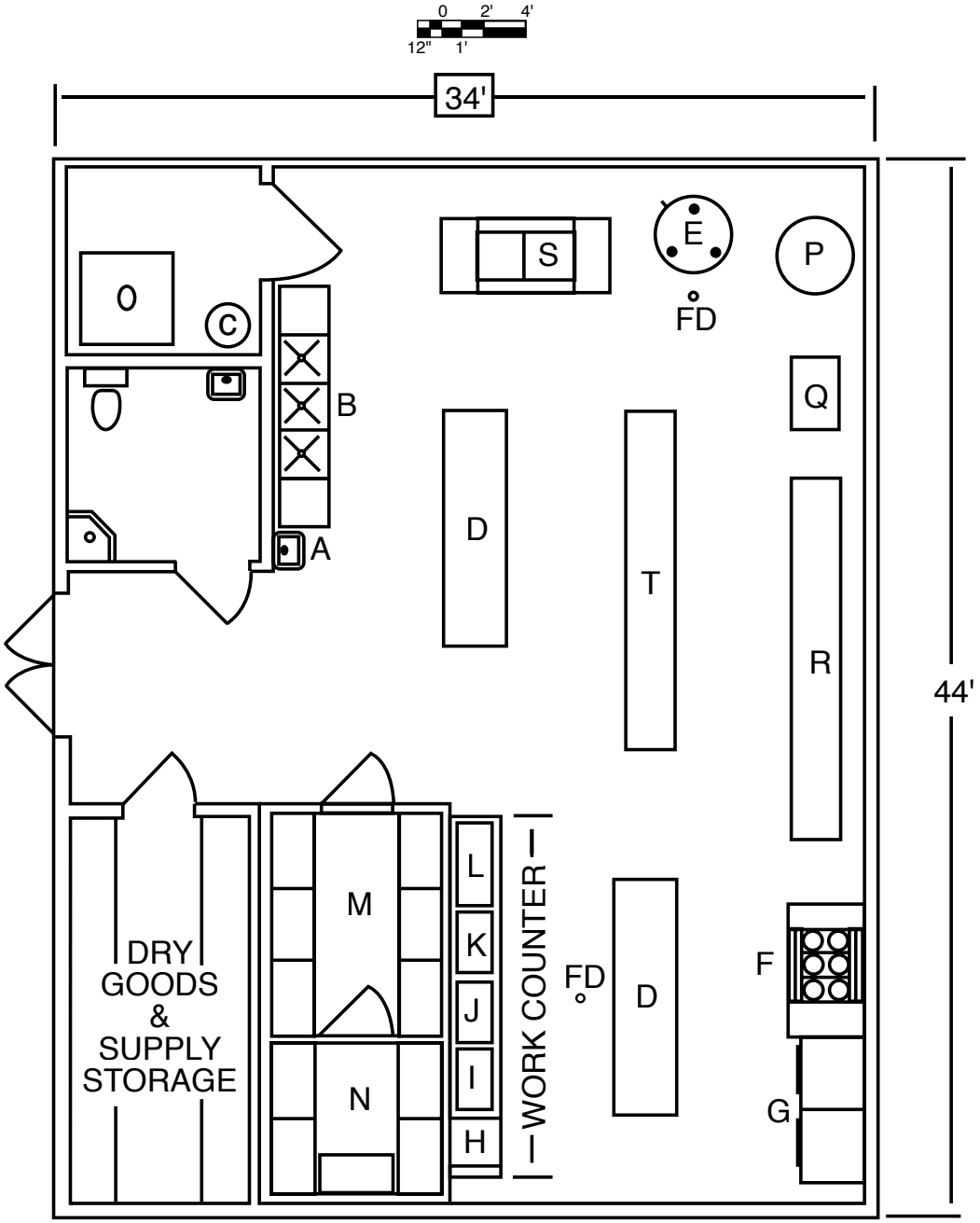
"SMALL" FACILITY PLAN



A HAND SINK
B 3-COMPARTMENT SINK
C WATER HEATER
D PREPARATION TABLE
E 20-GAL. STEAM KETTLE
F STOVE TOP
G CONVECTION OVEN
H TABLE TOP MEAT GRINDER
I TABLE TOP SLICER
J TABLE TOP DICER
K TABLE TOP MIXER
L TABLE TOP SHEETER
M WALK-IN COOLER
N WALK-IN FREEZER
FD FLOOR DRAIN

548 SQUARE FEET

"LARGE" FACILITY PLAN



A HAND SINK
B 3-COMPARTMENT SINK
C WATER HEATER
D PREPARATION TABLE
E 200-GAL. STEAM KETTLE
F STOVE TOP
G CONVECTION OVEN
H TABLE TOP MEAT GRINDER
I TABLE TOP SLICER
J TABLE TOP DICER
K TABLE TOP MIXER
L TABLE TOP SHEETER
M WALK-IN COOLER
N WALK-IN FREEZER
O BOILER
P RETORT
Q PUREE MACHINE
R TUNNEL **OR** PLATE PASTEURIZER
S VEGETABLE BLANCHER
T BOTTLING LINE
FD FLOOR DRAIN

1496 SQUARE FEET

freezer opens into an area with a temperature of 35 to 40 degrees Fahrenheit rather than opening into the main facility. The diagram does not include windows for a variety of reasons, including energy efficiency, security, safety and cost. In compliance with GMPs, a hand-washing sink and a three-compartment sink are included. Floor drains are strategically located to aid in facility clean-up and sanitization.

Specific equipment and its location within the facility are shown in the diagram for example purposes only. The actual equipment and placement will be dictated by the product(s) and volume being manufactured. Typical equipment used in a small food-processing facility and products that can be produced with the equipment are shown in Table 1.

The large facility in Figure 4 shows almost three times the square footage as the small facility. The large facility also includes more equipment and larger production capacity than the small facility. An enclosed bathroom is included because of the greater production capacity and the corresponding likelihood of hired labor. An enclosed utility room for the heat and air unit and water heater is also featured in the large facility. Although not shown in the floor plan, a second hand sink might be required, depending on the location of equipment and accessibility to existing sink(s). Other added features of the large facility include a bottling line, retort, vegetable blancher, tunnel pasteurizer, plate pasteurizer and puree machine. These pieces of equipment and products that might require them are listed in Table 2.

Table 1. Typical Equipment Used in Small Facilities and Products with Which They Are Used

Equipment	Food Products
steam-jacket kettle	jams, jellies, salsa
dicer	salsa, relish, chow-chow
sheeter	cookies, pizza, pastries
meat grinder	jerky, meat patties, sausage
vegetable slicer	salads, salsa, cole slaw
mixer	bakery items

Table 2. Additional Equipment Used in Large Facilities and Products with Which They Are Used

Equipment	Food Products
bottling line	beverages, jams, jellies, sauces, marinades
retort	canning low-acid foods such as meats, seafoods, vegetables
vegetable blancher	vegetables
tunnel pasteurizer	jams, jellies, pickled products
plate pasteurizer	juices and milk
puree machine	special dietary products (i.e., infant and geriatric foods)
vegetable slicer	salads, salsa, cole slaw

4 Quality Control

Commercial food-processing and manufacturing businesses should develop quality control systems that instill product quality and promote food safety. The goal of a food business's quality control system should include inspecting and monitoring hygiene processes with specific measures to limit microbial contamination. Sanitization and certain microbial analyses are the broadest areas of quality control in a food business. These areas include detailed applications in cleaning, sanitizing, personal hygiene, pest control and wastewater treatment, as well as analyses of raw products, environmental micro biological testing and end-product analysis.

Sanitation

A textbook definition generally describes sanitation as a formulation and application of measures designed to protect public health. In food-processing and food-handling operations, sanitation should include procedures that minimize and prevent the possibility of product contamination. Food contamination may result from microorganisms, chemicals (e.g., pesticides, PCBs), allergens and physical contaminants. Physical contaminants may include metal, glass, rocks, insects, rodents and hair. According to GMPs, sanitation includes cleanliness of equipment, buildings, people and raw materials. GMPs also specify that sanitary design of buildings and equipment include measures for pest control, operating procedures, water quality and wastewater treatment. Following is a brief explanation of these sanitation practices.

Cleaning: Cleaning is defined as the process of removing soil and preventing accumulation of food residues that may support the growth of microorganisms. In the case of food processing, soil is any material that is out of place, often including food particles. Cleaning in a commercial food-processing facility should be done using cleaners that are designed for use in the food industry, i.e., food-grade cleaners. The functions of cleaners include wetting, displacement of soil, dispersion of soil into water and prevention of re-deposition. A number of types of cleaners are used in the food industry, including alkaline cleaners (e.g., caustic soda (NaOH)) and phosphate acid detergents (phosphoric acid). The general process for cleaning is to first rinse, then wash with a cleaner, followed by another rinse and then drying.

Gloves should be worn at all times when working with a food product. They should be changed when soiled, torn or every four hours during continual use.

Sanitizing: Sanitizing is the use of an agent that reduces microbial contaminants to safe levels as determined by public health requirements. Sanitizers are used to inactivate microorganisms on cleaned food-processing and food-service equipment and contact surfaces and to inactivate microorganisms on raw food products, i.e., meat and poultry carcasses and fruits and vegetables. While heat and chemicals are the two types of sanitizers used in the food industry, chemicals are used far more extensively. The most popular traditional chemical sanitizers are chlorine, iodine derivatives and quaternary ammonium compounds (Quats). Modern sanitizers include ozone and peroxyacetic acid, both of which have been recently approved by regulatory agencies for certain sanitizing treatments in food processing.

The forms of chlorine most often used are the hypochlorites (HOCl) and chlorine dioxide. Hypochlorites must be used carefully, as they are inactivated by certain inorganic materials in water. Their activity is reduced significantly by organic matter. The advantage of the hypochlorites is that they are active against a wide range of microorganisms, are inexpensive and do not need to be rinsed. Disadvantages with hypochlorites include corrosiveness, somewhat unstable, toxic as a gas and may form toxic by-products such as trihalomethanes. Chlorine dioxide is broad spectrum, effective at high pH and low concentrations, less corrosive than chlorine, does not form chlorinated organic compounds and is less affected by organic matter than chlorine.

Iodine is used in the form of iodophors, which are iodine plus a surfactant. Quaternary ammonium compounds are not generally affected by organic matter and are non-toxic and stable. However, they are selective against specific types of bacteria. Quats are good for use on floors and walls, as they leave an antimicrobial film.

Ozone may be used in rinse water (e.g., fruits and vegetables) and poultry chill water. Ozone activity is decreased by organic matter and ozone gas is toxic to workers. Peroxyacetic acid ($CH_{3-}CO\text{-}OOH$) plus hydrogen peroxide has less reaction with organic matter and is effective in a wider pH range than chlorine.

Personal Hygiene: Personal hygiene refers to a person's health and the cleanliness of a person's body. It is important to understand that personal hygiene is important for all individuals working in all phases of a commercial food-processing business, not just hired workers. Employee sickness and hand-washing are two of the most important personal hygiene considerations in the food industry. Sick employees should not attempt to work in a food-processing area, because they can transmit disease microorganisms to foods. Improper hand-washing by employees often accounts for approximately 25 percent of food-borne illnesses. Both the proper technique of hand-washing and the frequency of washing contribute to reducing the risk of spreading food-borne illnesses. In addition to thoroughly washing hands before starting work, employees should wash their hands after the following:

- handling raw food
- touching their hair, faces or body
- sneezing or coughing
- smoking
- chewing tobacco or gum
- eating or drinking
- cleaning
- handling garbage
- touching anything that contaminates their hands (money, cash registers, credit cards)

Personal hygiene also includes keeping fingernails short and clean; covering all cuts and sores with bandages and plastic gloves; not touching clothes, nose, mouth and especially cuts; not wearing jewelry of any kind (rings, watches, earrings, body rings, bracelets, necklaces); and not putting items in a shirt pocket that may drop into food. Gloves are not a substitute for good and frequent

hand-washing. Hands should always be washed before putting on or changing gloves and gloves should be changed whenever hands are washed. Gloves should be changed when soiled, which includes any of the actions listed above, or torn, or at least every four hours during continual use.

Sanitary Design: Sanitary design refers to the appropriate design of buildings and food-handling equipment. All areas of a building in which food is processed must be cleanable and all areas of equipment with which food comes in contact must be cleanable. In the former, that means that floors and walls must be made of material that can withstand repeated cleaning and sanitizing. The junction between floors and walls should be curved or "coved" so that soil does not build up in the corners. Equipment in a commercial food-processing facility must be made of materials that allow adequate cleaning and sanitizing. That generally means all food-handling equipment is made of stainless steel. In addition, all areas of the equipment must be made accessible for cleaning. Even piping used to convey products must be made so that it can be taken apart for cleaning and inspection. Equipment must be designed to prevent sharp corners that cannot be cleaned.

Equipment in a commercial food-processing facility is generally made of stainless steel, which allows for adequate cleaning and sanitizing.

Pest Control: Pests in a food-processing operation may include insects, rodents, birds and pets. Pest control involves identification of potential pests, modifications to exclude pests and use of pest control operators to prevent and/or remove pests in the processing facility. The exterior of food-processing facilities should be kept neat and clean, since unkept exterior landscaping often harbors pests. Doors and windows should not allow pests to enter the processing facility. Air curtains are often used to prevent insects from entering the food-processing area. It is important that all necessary steps be taken to exclude pests before attempting to eradicate existing pests. Only very specialized pesticides may be used in a food-processing operation, and all pest control operators must be licensed for use of the specific pesticides.

Wastewater Treatment: Most food- processing operations generate significant amounts of wastewater. The development phase of a commercial food-processing business should include an investigation of the types and amount of wastewater that will be generated. Methods to treat the wastewater can then be determined. The level of contaminants in wastewater can be determined by using tests, such as the biochemical oxygen demand (BOD) or chemical oxygen demand (COD). These tests indicate the extent of contamination of the water. In some instances, food- processing operations may wish to use a municipal wastewater treatment facility for wastewater treatment. These facilities will usually charge a fee for large amounts of wastewater. The fees may be reduced by pre-treating wastewater with screening, skimming or aerobic lagoons to reduce waste materials in the water. Large food processors often have their own wastewater treatment facilities, because municipal facilities are not able to handle the amount of wastewater generated.

Quality Control Analyses

Raw Ingredients: All ingredients of a food product that are potential sources of pathogenic or spoilage microorganisms should be analyzed on a regular basis. Even if suppliers of the food ingredients are required to meet specifications, periodic tests (often referred to as audits) should still be done on these products. Even ingredients used in heat-processed foods could contain a high level of certain types of microorganisms, such as thermophilic sporeforming bacteria, that may survive and cause spoilage during storage.

Environmental Microbiological Testing: The effectiveness of cleaning and sanitizing procedures in a food-processing facility should always be evaluated. Such evaluation can be done with environmental microbiological analysis. Environmental microbiological analysis is done with swabs or sampling sponges on food-contact surfaces and other areas of the processing facility that could serve as sources of pathogenic or spoilage microorganisms. These analyses may pinpoint problem areas that need attention for future cleaning and sanitizing. A newer method of testing is the use of a bioluminescence analyzer. In this test, the operator swabs an area that has been cleaned and sanitized, places the swab in a specialized instrument and within a few seconds an indication of the cleanliness of a surface may be obtained.

End-product Analysis: End-product microbiological analysis has become somewhat outmoded in the past 10 years due to the introduction of the hazard analysis and critical control point (HACCP) concept. The objective of the HACCP system is to prevent hazardous situations. Therefore, testing end products does not necessarily provide any useful information. However, end-product testing is still used to a great extent in the food industry and, even with HACCP, occasional end-product audits are useful and recommended. Product audits are undertaken on a periodic basis and essentially involve examining a statistical sampling of the end product to determine that HACCP is working correctly.

For heat-processed products, one auditing method used to evaluate effectiveness of the process is to remove a statistical sample of containers from a batch of product that has been processed. These containers are then placed in a microbiological incubator at around 100 degrees Fahrenheit for a period of time to determine if any microorganisms may have survived the process. If the containers swell or bulge, there is a significant health hazard and the product should not be shipped.

Other Quality Control and Quality Assurance Analyses: Other quality control analyses that may be required on processed products or ingredients include pH (acidity-alkalinity), water activity (amount of available water) and water quality (e.g., water hardness). Certain products may require that analyses for pesticides, antibiotics, mycotoxins or metals be done. The type of analysis depends upon the product being made and the hazard classification of the product. Other analyses are needed to assure that the product is consistent, meets regulations and is of high quality. These might include pH, soluble solids (Brix analysis), product weight, package integrity, etc. As an example, strawberry preserves is a low-hazard product that does not need many quality-control analyses. However, the pH of the product may indicate product consistency. In addition, Brix analysis may give an indication of quality. Weight or volume of the product in packages needs to be determined. Package integrity of glass jars may be evaluated by visual inspection.

5 Marketing

Marketing is a broad concept and often a complex issue for commercial food-processing businesses to master. The overall objective of a food business's marketing activities should be to increase the number of products that are sold. The sale of products generates revenue for the business and the business's revenue is used to pay bills, produce additional products and return a profit to the stakeholders. All marketing efforts should ultimately be aimed at selling products and generating revenue.

The first step in marketing involves evaluating the general industry environment in which the product will be sold. Once the product environment has been evaluated, and it has been determined that there is a potential group of buyers for a product, that target group should be defined, a price for the product should be determined and sales at the determined price should be estimated. Techniques, efforts and activities that the food business should implement to compete in a specific food industry and generate revenue should be evaluated as part of the overall marketing process.

To evaluate these areas of marketing for a commercial food-processing enterprise, three broad areas should be investigated. Following is a discussion of these three areas and various, specific issues.

The Market Environment

***The Industry*:** Even with a thorough understanding of all the production and regulatory concerns for a commercial food business, it is not a good idea to jump into a new food business without a complete investigation of the marketing environment. While there are literally thousands of new food products that hit the market every year, many more new food product ideas do not make it to the market stage for various reasons. Many food products with the most unique characteristics sometimes do not make it to full-scale production because of specific market limitations.

In considering and developing a new food business, it is important to take a step back and look at the overall market being considered. Several areas should be explored to help determine how a value-added food product would fit into the overall market. The following questions should help in exploring the industry.

- Is the industry in a state of growth or decline?
- Are businesses forming or leaving?
- Have prices increased or decreased? Why?
- Are there companies already producing for the target market? Where are they located? What are the attributes of their products?
- What type of price structure is being used?
- Does the product fit with the current eating trends? (healthy, low-calorie, fat, fat-free)
- Does packaging fit the desires of target consumers? (convenience, size, recyclable)

It is important to study industry trends, including sales figures, the size of existing firms and products currently available. This information can help a new business better understand the current market situation and assess unmet customer needs. Using the jams, jellies and preserves industry as an example, the marketing information presented in Example 1 is helpful in an evaluation of the overall market environment.

This information helps paint a clearer picture of the jam, jelly and preserve market. The same type of information can be found for other value-added food products, including beef jerky, pickled vegetables and bakery products. It is important to become well-informed about the industry before making a blind leap into a new market.

Example 1

- The U.S. market for jams, jellies and preserves accounts for roughly 2 percent of all U.S. retail food sales. Retail sales increased from an estimated $834 million in 1993 to an estimated $902 million in 1997.
- Strawberry has been reported as the most popular jam, jelly and preserve flavor in the U.S. Strawberry is estimated to comprise approximately 24 percent of the jam, jelly and preserve market.
- A customer profile shows that the typical jam, jelly and preserve consumer is married, between the ages of 35-44, with children between the ages of 6-17 years, with an annual household income in excess of $40,000. On average, households spend $21.03 annually on products that fall into the jams, jellies and preserves category.
- The overall jams, jellies and preserves industry is dominated by a few large companies. Seven companies account for 69 percent of the retail sales of jams, jellies and preserves. The three most recognized companies are Kraft®, Smuckers® and Welch's®.

Information pertaining to sales, consumption and trends for preserves is scarce. When such information is obtainable, the category is defined as "jams, jellies and preserves" with no specific product break-out. So, there is a challenge from the outset with drawing lines between these three products within the industry (in terms of having specific information). There is also difficulty in separating the characteristics of sales by the largest retail sales products and the niche products.

Within the preserves market, products are differentiated on characteristics such as price, quality, taste, nostalgia and general product appeal. It is safe to assume that competition by small, value-added niche products with the established suppliers (Bama®, Kraft®, Smuckers®, Welch's®) is not worthwhile. Over the years, the established suppliers have introduced a variety of new products that cannibalize their existing market share. The result is more products competing for the same consumer dollar. The established suppliers have a huge and efficient infrastructure, are intensely integrated and have an extreme advantage on price, volume and profit margin. Therefore, a new jam, jelly and preserve producer must consider a superior and differentiated product aimed at a well-defined and probably diversified niche market.

The Competition: In every market there are competitors. Even if the exact product is not being produced, competition still exists. It is extremely important to take a close look at all products that could be considered a competitor now or in the future. The first thing to do is make a list detailing who the competitors are, where they are located and any other information that can be collected about them. Information such as the competition's number of employees, number of product lines offered and product prices should be carefully examined. In addition, the competition's strengths and weaknesses should also be identified. This will help assess how a new company can compete with existing companies.

Next, determine if the product being considered would be new to the market, sometimes called a break-through product.

If so, this could greatly reduce the number of competitors. Or is the product a replacement for similar existing products? For example, if the product is strawberry preserves, there are already a number of existing strawberry preserves in the market. Or is the product a substitute for existing products? If the product is strawberry-raspberry preserves, then consumers can purchase strawberry-raspberry preserves instead of strawberry preserves. If this is the case, the scope of competitors broadens even more. Now those producing strawberry preserves and raspberry preserves are competitors. Realistically, all fruit preserves producers are competitors.

Market Segmentation: Contrary to what many people believe, the entire world is not one product's market. Even if the entire world can use a certain product, everyone will not. A market segment is a specific group with a like need or desire for the benefits that a certain product will offer them. The trick is finding that segment of the market and developing and implementing marketing efforts that will result in sales and revenue from that segment.

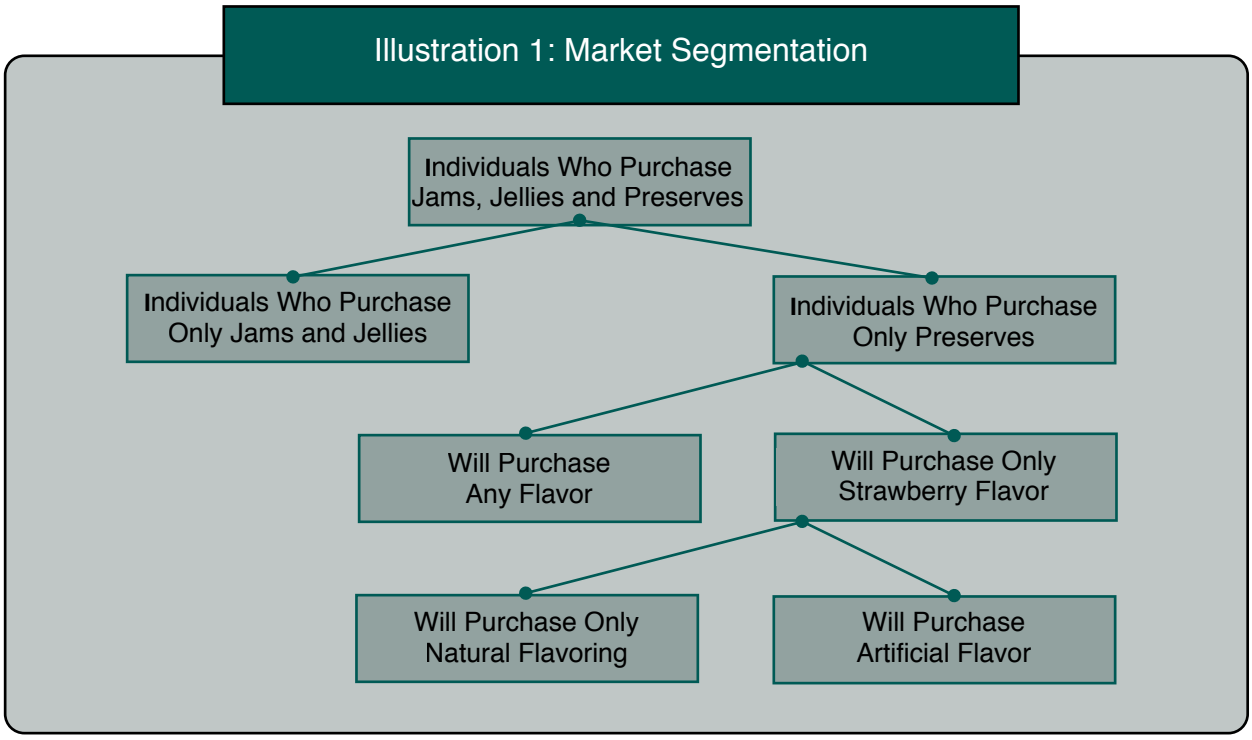
Market segmentation can be defined as dividing the larger market into several smaller markets or segments. Market segmentation can be done based upon a variety of different factors, depending upon the type of product or service that will be offered. These factors could include, but are not limited to, age, gender, location, geography, demographics, marital status and hobbies. Each market segment has a specific set of wants and needs for specific products. Once the market has been divided, each market segment must be analyzed to determine the wants and needs of those specific consumers. How are they different? Maybe they live in different areas, have different age ranges, income levels, social classes and wanted benefits.

The best fit between what the product offers and what specific market segments desire should be determined. The market segment(s) whose wants and needs most closely match the benefits offered by a product are called target markets. For example, consider a business that sells jams, jellies and preserves. Several factors can be used to segment the market for these items. Individuals who do not eat jams, jellies and preserves will not be likely consumers. People who do eat jams, jellies and preserves can be segmented based on which they prefer—jams and jellies or preserves. If the choice is preserves, this segment can be further broken down into the flavor of preserves the segment prefers, which can them be broken down into whether they prefer all natural or artificial flavoring (see Illustration 1).

Target Market: A target market[3] is the group of individuals whose needs and wants a business wishes to satisfy. A target market should be easily accessible to the business and also large enough to provide a solid customer base. While customers from any market segment would readily be welcomed, it is always better to have a focus for marketing activities. Promotions, advertising and all other marketing activities should focus on obtaining customers from the target group. It would not be wise to advertise a line of homemade jams and jellies in a magazine read mainly by high school students between the ages of 15 and 18. They are not as likely to be consumers as are women between the ages of 35 and 44 who are married and have children. Advertisements and promotions are much more effective when directed toward the target market.

Niche Market: Niche marketing refers to targeting a product or service to a limited segment of the mainstream market. In agriculture, a "niche" may be best described as a specialized product in a normal market (homemade, all-natural strawberry preserves) or as a normal product in a specialized market (carrots as healthy dog treats).

When starting a new business, the following activities can help determine possible niche markets.[4]



- List all benefits offered by the product, service or business. Be sure to list benefits and not features. Knowing the difference between benefits and features is essential to marketing success. A feature is what something has. A benefit is what it does. For example, some donuts are now delivered in a resealable box. The resealable box is a feature. The donuts stay fresh for a week after the box is opened. That the donuts stay fresh for a week is the benefit. Understanding this difference is important. Consumers do not buy to get a feature. They buy to get the benefit produced by the feature.
- After listing all the benefits, list some of the characteristics of potential customers whose current situation would be dramatically improved by those benefits. A definable group should begin to emerge as the niche market.

Next, determine if the identified niche can be reached and developed. If the niche should be considered, the answer to **ALL** of the following questions will be yes.

1) Can specific individuals within the group be identified and can the information needed to contact them be obtained?
2) Do individuals in this group have a strong need for (or a strong desire to have) the product or service?
3) Do the individuals in this group have the money to pay for the product?
4) Can the sales message be delivered to these individuals under favorable circumstances?
5) Is this group large enough to produce the sales volume needed to generate a profit?

Sales Channels: Once a product's target market has been identified, it is important to take a look at the available alternatives to get the product to the consumer.

Wholesale versus retail: The first decision that must be made is whether to sell a product on the wholesale market, the retail market or both. This decision affects future actions regarding the marketing of the product. The term **retail** means that the producer sells the

products directly to the consumer. Instead of selling in bulk to buyers for retail stores, a producer sells products in much smaller quantities to individual customers. Retail purchases are almost always made at a price higher than the wholesale price. The producer has now become the retailer. The increase in price reflects the fact that the producer must now perform such tasks as advertising, customer service and order processing.

The term **wholesale** means that retail store buyers purchase the products from the producer – usually in bulk – with the intent to resell the products to the consumer. Wholesale purchases are usually made at a price lower than the retail price. Generally, a wholesale price is 50 percent less than the retail price. This discount is due to the fact that the retailer is expected to add value to the product before it is purchased. The product's retail price includes things such as the cost of advertising and representing it to customers. It also covers many other hidden services, such as a return policy, an 800 number, electronic communication and business-level recourse in the case of fraudulent activity. Many producers decide to use a combination of wholesale and retail sales to sell products. This way, a producer can sell in bulk to retail store buyers at a discounted price and to individual customers at the full retail price. Wholesale selling can be accomplished one of three ways. A producer can sell to a retail store buyer, use a broker or use a distributor.

Brokers and Distributors: A **broker** acts as an independent sales person whose responsibility lies in promoting and selling products and relaying the orders to the producer. The services of a food broker are usually retained by a commission fee. When working with a broker, the producer loses some control over the business and/or products. It is important to understand that brokers do not get paid unless they sell the products. Therefore, it is in the broker's best interest to negotiate with retailers to get them to purchase a product. This negotiation may take the form of discounted prices, free items and product take back or trade out if products are difficult to sell.

Distributors are different from brokers in that distributors are typically responsible for warehousing, delivering, taking orders and invoicing and are not primarily responsible for the actual selling and promotion of products. Food producers must often take significant initiative to promote and market their products to retailers and other potential purchasers who will in turn purchase the products from the distributor. It is important to remember that while a distributor provides many essential services involved in channeling food products from the production to the retail stages, the food producer often gives up some control of the product, because the producer cannot ensure the quality or appearance of each product that leaves the distributor's warehouse.

The Product Market

Positioning a Product in the Marketplace: What is product positioning? In the 1950s, Ted Bates called it the USP—the Unique Selling Proposition.[5] A product's USP is the one aspect that makes it different from all other products. The USP becomes the rationale that people use to defend their choice of buying a product instead of the competitors. The USP can be something real, which one product has over all others, such as the "curiously strong" taste of Altoids® mints. If anyone has tried this product, they know this USP is true. It can be a parity claim, a claim that other products can also make but one product makes before others have the chance. For example, Dawn® dishwashing liquid "takes grease out of your way." In reality, most all dishwashing liquids will cut through grease. But Dawn® said it first, which means they now own the claim. It can also be a statement that cannot be measured and is not based on a product's tangible benefits, as with Owens Corning Fiberglass Insulation®, whose USP

is that it's "pink." What does being pink have to do with insulating a wall? Yet this USP is what sticks in a customer's mind, and validates the purchase. "Why do I buy this brand of insulation? Because it's pink!"

To develop a USP for a product, the following three-step process will help in getting started.

Step 1: Make a list of all significant competitors and write a sentence defining their product's position in the market. What makes them different from everyone else?

Step 2: Next define the current position of your product as it really exists in the minds of consumers. What makes the product different from others on the market?

Step 3: Now identify a specific attribute about your product that can differentiate it from the competition in a way that consumers will find it desirable. Don't write just one; come up with several and then pick the best.

Remember, the USP must be **simple**. A word or two is great and a sentence or two should be the maximum. The USP can be an obvious attribute. For example, if the product sold more than any of the competitors last year, say so. People like to go with number one, thinking it must be the best value. Genius is in *simplicity* and *specificity*. Success is in *consistency*. "Jelly produced on the farm by a third-generation farm family with only fresh ingredients using an old family recipe" could be a product's USP, but it is not very likely to stick in anyone's mind. It is too long and has too many concepts on which to focus and remember. Instead try, "Made on the farm." Always remember to present

An important first step in selling a product is making it stand out among the competition and to catch the consumer's eye. Often this is done through the use of creative, colorful and attractive packaging and labeling.

the same position for the product in every advertisement. The most successful USPs are simple to understand and repeated year after year after year.

Once the perfect USP has been developed for a product, see if it passes this checklist:[6]

- ❏ Is it true?
- ❏ Is it easy to understand?
- ❏ Does it differentiate the product in an attractive manner from the competition?
- ❏ Is it expressed the way people will express it in their own minds, their own words?

Packaging and Labeling as Marketing Tools: Everyone has heard the old saying, "don't judge a book by its cover," but that is exactly how most people judge products they are considering for purchase. It is important to realize that packaging is more than just the container that holds the product. The package is an extremely important marketing tool. Package features such as the name of the product, the design of the container and the product label have a substantial impact on product sales. It will be tempting to stick with a standard-shaped package. This option will probably take less time to design and have a lower cost, but may not provide the great first impression that a product needs.

When walking through a retail store, packages that are odd-shaped and brightly colored stand out and catch the attention of customers. This is extremely important because all products are being compared to competing products, especially on a retail shelf. Getting a product noticed is the goal! The first product a consumer picks up is more likely to be purchased than any other products examined by the consumer. "When in doubt on packaging ... go bright and brassy rather than light and sassy!"[7]

New food-business entrepreneurs often find it difficult to design great packaging. If it were easy, retail store shelves would look more like a work of art than just more of the same. Many times the difficulty in designing a package is a result of producers spending so much time working with the product that they form a bias toward it. It is difficult for them to know if the packaging is good or not. Therefore, it is extremely important to solicit input and advice from several different, unbiased sources, such as potential customers. Ideas from potential costumers should help stimulate the creative process associated with creating a great package. Below are ideas for developing packaging for strawberry preserves that might stimulate attention:

- Use containers with unusual shapes (taller, wider, more angular, colored)
- Use plastic, squeeze bottles instead of glass containers
- Use brightly colored graphics and fonts
- Use reusable packaging—containers that can be used as a beverage glass, bowl or vase

Remember, a package is more than just a container; it provides potential customers with their first impression of the product. While straying from standard packaging may have added costs (i.e., time and money) these costs may provide added benefits, such as increased sales.

When giving thought to the label that will adorn a package, it is important to consider more than just the verbiage that is required. It is important to remember that a product's label is also a marketing tool. Many times a product label is all the packaging that is used. It is a space that is oftentimes overlooked and wasted by producers. The product label should help tell a story or portray an image associated with the product. This can be done through the use of color, shape and graphic images. It is important to think outside the box when considering the label that the product will carry. Remember, a lasting color impression is made in the first 90 seconds of visible contact. This impression accounts for 60 percent of the acceptance or rejection of an object, place, individual or circumstance.[8] According to studies, there is a definite relationship between color and food. Brown and white are the most effective colors in relation to foods. Brown is particularly effective in the packaging of food, as it conjures up images of things such

as charbroiled steaks and chocolate cakes. White is a great choice for restaurant décor because it appears clean and tidy. Red is the greatest appetite enhancer, followed by green and then pink. Blue and black are the worst colors to associate with food. People eat less food when it is served on a blue plate (making blue a great choice for china color in all-you-can-eat restaurants).

Consumer preference studies have found definite relationships between basic colors and consumer's visibility (level of attraction), retention (ability to remember), preference (desirability) and associations (mental connection).[9] For example, females were found to have low visibility, low retention and low preference for the color blue and associate blue as being depressing, being business-like and with leadership. Other implications of these studies are given in Table 3.

Consumer preference studies have also found a definite relationship between the use

Table 3: Reactions by Consumer Gender to Basic Colors

Color	Consumer Gender	Visibility	Retention	Preference	Association
Blue	Female	Low	Low	Low	Depressing, Business-Like, Leadership
Blue	Male	Low	Low	High	Reliable, Intelligent, Secure
Pink	Female	Low	Low	High	Therapeutic, Feminine
Pink	Male	Low	Low	Low	Calm, Relaxing, Feminine
Black	Male & Female	Low	Low	High	Male = Rich Female = Sensuous
White	Male & Female	High	Low	Low	Pure, Clean
Red	Male & Female	High	High	High	Male = Danger, Bargain, Excitement Female = Warm, Intimate
Yellow	Male & Female	High	High	Low	Sun, Outdoors
Brown	Male & Female	Low	Low	High	Rich, Earthy
Green	Male & Female	Low	Low	Low	Money, Leisure
Gray	Male & Female	Low	Low	High	Security

of shapes and their visibility and customer retention, preference and associations.[10] As indicated in Table 4, males consider circles as having high visibility and high retention, but they have a low preference for that shape. The latter is likely due to their association of traits such as being feminine, soft and weak to circles. Other findings are given in Table 4.

Advertising, Promotion and Product Image: The purpose of advertising is to communicate product information to consumers. This can be accomplished using a description or presentation of a product to entice individuals to buy it. Advertising becomes difficult and less efficient if market outlets are not concentrated. However, advertising costs could be shared with a complementary product to make it less expensive. For example, advertising strawberry preserves with a biscuit/cracker product of another manufacturer would allow the cost of the advertisement to be shared.

Promotion is defined as any special effort to increase sales of a product. There are a number of ways to promote specialty food products–sweepstakes, contests and advertising programs. Before a promotional or advertising campaign is developed, preparing a list of product features and benefits that might be used is recommended.

Businesses have found that a variety of promotional and marketing techniques can be used to build product sales. Some of the more common promotional and marketing techniques used by small business individuals are listed below.

- Build a customer mailing list.
- Build an image with a well-designed product label and promotional display.
- Design a brochure that best explains the benefits of your services.
- Design a point-of-purchase display.
- Explore cross-promotion (using one product to advertise a non-competing product).

Table 4: Reactions By Consumer Gender to Basic Geometric Shapes

Shape	Consumer Gender	Visibility	Retention	Preference	Association
Circle	Male	High	High	Low	Feminine, Soft, Weak
Circle	Female	High	High	High	Tender, Loving, Warm
Square	Male	Low	Low	High	Sure, Solid, Predictable
Square	Female	Low	Low	Low	Brittle, Hard, Abrasive
Triangle	Male	High	High	Low	Mysterious, Exciting
Triangle	Female	High	High	Low	Powerful, Forceful, Threatening, Danger, Feminine
Oval	Male & Female	High	High	High	Deep-Seated Associations of Secure, Pleasurable, Experiences

- Explore ways to share advertising costs.
- Hold a promotional contest.
- Include promotional material with your invoices.
- Provide free samples of your product or service whenever possible.
- Provide public tours of your operation.
- Donate the product to fundraising and charity events.
- Sponsor an amateur or Little League® sports team.
- Provide local radio personalities with free product samples to give away to their listeners as a small token of their appreciation or a prize for on-air contests.

A product image is "the set of beliefs, ideas, and impressions a person holds regarding an object."[11] All products have or develop an image over time. Another way to think of a product's image is as its reputation. It can be good or bad. It can be created or it can create itself. Some examples of product images include:

- A gourmet product
- An average-quality product
- A cheaply-made product
- An over-priced product
- A low-cost product
- The best value
- A specialty item
- A generic item

A product's image is often created in one of the following ways:

1) packaging—if strawberry preserves are packaged in a jar with a gold cap and all other preserves are packaged in jars with white caps, the gold caps may create the image of being gourmet or upscale.
2) where the product is sold—if the preserves are sold only in speciality stores, it may create the image of being special, unusual or hard to find.
3) price—if a jar of preserves is priced above the average market price, the product's image may become "over-priced."

A product's image is created by the producer, either intentionally or unintentionally. While producers make conscious decisions that affect a product's image, producers may neglect to consider specific items and an unintentional image can be created. Be sure to give thought to the intended image of a product before taking major steps toward packaging, selling venues and price. This will help to ensure that a product has and maintains a positive image.

It is important to understand that the Federal Trade Commission (FTC) enforces a variety of federal antitrust and consumer laws. The FTC prohibits unfair or deceptive marketing and advertising acts or practices and prohibits false and misleading advertisements. While the FDA is responsible for nutritional and health claims that are part of a food product's label (e.g., low fat, high bran), the FTC oversees nutrient and health claims that are not part of the food label, but are used in food advertising (e.g., an ad that states "less fat than brand X"). In general, if an advertisement omits or contains information that would mislead consumers, the FTC would consider the advertisement deceptive. In addition, the FTC provides oversight and enforcement of specific advertising issues/claims such as: advertising and marketing on the Internet, "free" and "low-cost" claims, "green" advertising claims, environmental marketing claims, use of endorsements and testimonials and comparative advertising.

Sales

Marketing Budget: A marketing budget accounts for all expenditures related to a company's marketing efforts. The marketing budget should include items in several different categories. These categories can include but are not limited to:

- ***Marketing Personnel***—salaries associated with those employed for the sole purpose of planning and executing marketing activities.
- ***Marketing Training***—fees and costs associated with attending seminars, workshops, classes and other activities pertaining to marketing topics for the business owner or employees.
- ***Market Research***—the costs associated with conducting surveys, interviews and other methods used to gather data regarding the market opportunities that are available.
- ***Market Development***—the costs associated with visits to retail outlets, product sampling, giving away promotional items and other means to stimulate demand for a product.
- ***Advertising and Promotion***—the costs associated with developing and placing advertisements in different types of media, sponsoring promotional activities, attending trade shows, etc.

The allocation of planned expenditures in a marketing budget is usually based on at least one of the following items:

- A company's future marketing goals
- A percentage of the previous year's gross sales
- An average of funds spent toward marketing activities by other firms in the industry
- A percentage of forecasted gross sales for the upcoming year

The most common basis for the marketing budget is a percentage of the previous year's gross sales. When this is the case, a business will usually budget between 1 and 10 percent of the previous year's gross sales on marketing activities for the upcoming year.

It is important to remember that a marketing budget is intended to serve as a guide, and is not set in stone. It should be developed at the beginning of each year and updated and adjusted regularly. It is also important to remember that the dollar amounts contained in the marketing budget must be based upon accurate information, whether from the company's data or industry data. Therefore, the budgeted amounts should be relatively close to the actual amounts spent. However, if a specific category needs additional funding, it is possible to shift funds among the different categories.

Developing a marketing budget forces a company to plan, focus on and prioritize its future marketing activities. Oftentimes when this process is omitted, a company will not spend an adequate amount on marketing activities or spend extravagantly on marketing activities. Both of these situations can lead to an inefficient use of company funds. On the following page is a sample budget showing how money that has been designated for marketing might be allocated.

Price Analysis: Product pricing is an important part of marketing because of its direct effect on revenue. Conducting a price analysis helps determine:

- general price trends in the market—the increase or decrease of price over a given time period
- the average price for the competing products—sum of competing products' prices divided by the number of competing products
- what price the market will most likely support—price range that the majority of consumers are willing to pay for the product

How a product is priced affects the product's image and the consumer's perception. If a product is priced above all competitors, the product may be perceived as a gourmet or up-scale product. If the product is priced well below competitors, the product may be perceived as inferior or as a good value.

There are many channels (supermarkets, online markets, speciality stores) from which to obtain information for a price analysis. Obviously, it is best to study those channels that will be targeted. The factors

Sample Marketing Budget

Expected Gross Revenue $100,000
Percent of Gross Revenue Allocated to Marketing..... 10 percent
TOTAL FUNDS ALLOCATED TO MARKETING..... $10,000

Marketing Activities	Cost	Balance
Funds Allocated to Marketing		$10,000
Marketing Personnel	$1,500	8,500
Marketing Training	200	8,300
Market Research	1,500	6,800
Market Development	1,800	5,000
Advertising and Promotions	5,000	0

to be studied should be determined by what is considered important information to the business. For example, will jams and jellies, all flavors of jams and jellies and different types and varying sizes of containers be included in the study?

The price analysis shown in Table 5 was conducted for the example strawberry preserve products sold through specialty, gourmet shops.

Prices were obtained from competing products in the same target market and market channel as the example. The price analysis includes a conversion to price per ounce for analysis and application, because the container size varied. The analysis shows that in the specialty, gourmet shops, the average price for strawberry preserves was $0.40 per ounce, or approximately $3.20 per eight-ounce jar.

Estimating Sales: New food products are often introduced because someone perceives that there is a sales potential for the product. While a sales potential is certainly necessary, a level of sales great enough to generate a profit is the most important. An estimate of the sales potential of a new food product will help determine whether there will be sufficient sales potential to generate a profit.

Three important factors used to estimate sales are an area's population, average individual spending of consumers in the area and the income level of people in the area. The most important is the area's population. The base rule is that the bigger the population, the larger the potential sales. Per capita expenditure is another factor to consider. By determining how much the average individual spends in a certain locale, in a certain type of store or on a given product, a fairly accurate estimate of sales can be made. The third factor used in determining sales estimate is the average income level of people in the area. Generally, it can be assumed that in an area where incomes are high, average

Table 5: Price Analysis for Various Strawberry Preserve Products

Product Name	Price ($)	Size (oz)	$/ounce
Heavenly Preserves	5.99	12	0.49
Unlimited Sweetness	3.79	8	0.47
Flavor Abounds	4.96	16	0.31
Captured Freshness	2.64	8	0.33
Average Retail Price for an Ounce - $0.40			

expenditures will also be high.[12] Example 2 explains how sales can be estimated using these factors.

Often precise sales data do not exist for new food businesses. Following are three alternative approaches to estimate sales:

1) **Common-sense Approach:**
Determine the most likely customers (e.g., teenagers, adult females, retirees). How many of the target market live in the designated area? What percent of this number might purchase the product and how often might it be purchased?

2) **Survey of Customers:**
If knowledge of business potential in the area is limited, a survey of the trade area could be helpful. A personal survey should not be done by the prospective owner, but by an unbiased party.

3) **Average Number of Businesses:**
Become familiar with feasibility studies to see how many businesses of various types that different-sized towns can support. Apply this information to your town and the businesses located there.[13]

Often the term "survey" is used to describe a method of obtaining information from a sample of individuals within the target market. A sample is a portion of the market from which information is gathered. Surveys can be conducted in a variety of ways, including direct mailings, via the

Example 2

A store selling speciality preserves would like to estimate its potential sales in the town of Anywhere, USA. They consider their target market to be females in their town and the surrounding communities.

Determine population:
The population of Anywhere is 3,500 people, plus an additional 500 people living in surrounding communities. Approximately one-half of these people, or 2,000 people, are female. You estimate that 50 percent of these females purchase preserves, giving you a population of approximately 1000 females as potential customers.

Determine per capita expenditures:
According to state sales tax reports, the average amount spent per family per capita for preserves in 2001 was $35.

Determine income level:
The average income per family in your town is estimated to be $35,000 - 50,000. Based upon this income range for your town, you feel comfortable that females would indeed spend approximately $35 per year on preserves purchases.

Estimate sales:
1000 females x $35 per capita expenditure on preserves = $35,000 estimated sales

Internet, in person or over the telephone. It is important to remember that the development of a survey, along with the analysis of the data that it generates, is not an easy task. If surveying the target market is the method chosen to aid in estimating sales, the expertise of someone knowledgeable in survey development and data manipulation should be located and used.

Marketing Conclusions: Steps that should be taken to obtain the overall marketing objective of generating sales have already been presented. Awareness of these steps is only the first part of the marketing process. Applying them to develop a marketing plan is the second and most important part. In Example 3 below, these steps are used to quantify marketing assumptions that can be used in a marketing plan.

Example 3

For example purposes, it may be assumed that an entrepreneur has decided to evaluate the market potential for a preserves product. The entrepreneur's market study may reveal that strawberry is the flavor most often purchased and that the number one purchaser of strawberry preserves is young homemakers with children 5 to12 years old as the primary consumer. The study may also reveal that supermarkets are the number one channel for marketing the product, as they account for approximately 70 percent of all strawberry preserves sales, but that very few speciality stores target products for children. Therefore, it is a great opportunity for a niche market. Based on these findings, the entrepreneur may then decide to produce strawberry preserves, target children and to use speciality stores as the sales channel.

Positioning the product is a big concern because many brands of strawberry preserves exist on the market. The target consumer audience is young children. Therefore, it is decided to position the preserves as the "best part of the PBJ sandwich" and to package it in a child-friendly, squeezable, plastic container. Because red is a color with high visibility for both males and females, the container will be clear so that the red preserves will be visible and shaped like a strawberry. The label will be shaped like a strawberry because this shape is similar to an oval, which has a high retention by both males and females. The product package will be used to create a "for children" product image. The product will be packaged in only eight-ounce containers with the statement "Smart kids know it's good" on the label. Product promotion will be done through in-store sampling and cents-off coupons.

If the results of a price analysis for comparable eight-ounce strawberry preserve products revealed an average wholesale price per ounce of $0.38, to support the product image of "a speciality product," the entrepreneur's wholesale price may be set at $0.40 per ounce, or $3.20 per eight-ounce jar. Based on this pricing structure and the results of a thorough estimate of sales, the entrepreneur may estimate that approximately 1400 jars per week will be sold. Therefore, annual sales are estimated at $232,960 (1400 jars per week x 52 weeks x 3.20 price per jar).

6 Costs

Planning and developing a commercial food business is not complete without a thorough review and consideration of costs. It is certainly important to fully understand the production, regulatory and marketing environment of the business, but the costs associated with production and operation must be compared to the revenues generated from the sale of products to evaluate the overall goals of the business. Appropriate production and marketing costs should be evaluated by classifying them as start-up, fixed and variable. (Refer to Example 4.)

Start-up costs are the funds needed to get the business off the ground. The estimate of start-up costs includes the expenditures needed to get the food business ready to produce products. The total start-up cost can also be used as an indication of the amount of money initially needed. While identifying start-up costs is helpful, it is often even more helpful to know the impact that these costs will have as these costs are re-paid over the life of the business. Often most of the start-up costs will have to be borrowed (either from an outside lender or from savings) and repaid as revenues are generated from the sale of products produced in the food-processing facility.

To account for repaying the start-up loan in the years after the start-up phase, be sure to include the amount of money that will be paid each year toward the start-up loan as part of the annual operating costs. That is, if a commercial food business plans to repay the total start-up costs over a five-year term with 7 percent interest, this annual payment will be considered along with the other annual costs of the business. These costs include overhead-type expenses such as taxes, cleaning, advertising, repairs, managerial labor and insurance. In the financial analysis for a commercial food business, these costs will be classified as operating costs. It is important to understand that operating costs associated with running a commercial food business will be incurred regardless of the volume produced.

Costs that tend to vary as output changes are referred to as variable costs. Variable costs are normally evaluated on a per-unit basis. That is, a commercial food business making apple jelly and apple pies would have variable costs per jar of jelly and per pie. The variable cost for an apple jelly product might be $1.50. The variable cost per jar would include the cost of the items in each jar, such as 50 cents for apples, 10 cents for sugar, 8 cents for pectin, 12 cents for cinnamon, 7 cents for lemon juice, 35 cents for the jar, 7 cents for the labels and 21 cents for production labor.

Start-up Costs

One of the best ways to evaluate the start-up costs for a commercial food business is to evaluate the expenditures needed to produce and acquire the actual facility and equipment needed for production.

Example 4

Construction

If a small facility consisting of 548 square feet is designed and constructed at a total cost of $50 per square foot, $27,400 must be allocated in the start-up phase. The cost per square foot can vary and may be as much as double this figure, because it is affected by many factors such as area, location and labor cost. Additional costs may also be incurred in the start-up phase for utilities, site preparation, engineering and design. If funds are estimated for these items at a rate of 25 percent of the construction estimate, another $6,850 should be allocated.

Land

A two-acre lot is assumed necessary for the processing facility. At a purchase price of $5,000 per acre, $10,000 is assumed necessary for land purchase.

Lot Improvements

Assuming that a half-acre of pavement is needed for driveway and parking lot construction at a cost of $2.00 per square foot (21,780 sq. ft x $2.00), $43,560 will be needed for pavement. Landscaping cost of $6,000 is also assumed for a total of ($6,000 + $43,560) $49,560 for lot improvements.

Food-processing Area Equipment

Hand-washing Sink	$200
Three-compartment Sink	1,200
Stainless-steel Preparation Table	800
20-Gallon Steam Kettle	4,500
Range Top	1,200
Convection Oven	3,500
Stainless-steel Slicer/Dicer Table	500
Slicer	400
Dicer	500
Mixer	800
Sheeter	900
Walk-in Cooler/Refrigerator	8,000
Walk-in Freezer	12,000
Wire Shelves for Dry Storage	800
Cold-storage Shelves	1,200
Thermometers, Knives, Utensils, Scales, Pans, Bowls and Other Small Equipment	560
Cleaning Supplies	500
Clothes Locker	250
Floor Matting	500
TOTAL	**$38,310**

Office Expenses

Desk and Chairs	$800
Computer and Copier	4,600
Adding Machine and Fax Machine	350
Filing Cabinets and Supply Cabinet	700
Vault	1,000
Other Office Supplies	800
TOTAL	**$8,250**

Example 4 continued

Other Start-up Expenses

Labor	$4,000
Legal Fees	800
Licenses & Permits	300
Supplies	300
Accounting	500
Utilities	200
Marketing	5,000
TOTAL	**$11,100**

Summary of Start-Up Costs

Total Construction	$27,400
Total Additional Construction Costs	6,850
Total Land	10,000
Total Lot Improvements	49,560
Total Food-processing Area Equipment	38,310
Total Office Equipment	8,250
Total Other Start-Up Expenses	11,100
TOTAL START-UP COSTS	**$151,470**
Annualized payment on start-up costs—7 percent for 5 years	**$32,992**

Operating Expenses

An evaluation of a commercial food-processing facility's operating costs should be done on an annual basis, where the overall costs to operate the business are considered.

Annual Payment on Start-up costs (5 years)	$32,992
Utilities	
Gas	4,000
Electric	13,000
Water	4,000
Telephone	3,000
Hired Labor	10,000
Cleaning Supplies	2,000
Advertising	5,000
Bookkeeping	3,000
Insurance	4,000
Repairs	4,000
Marketing & Promotion	10,000
Automobile	5,500
Total	**$100,492**

Variable Costs

Evaluating the variable costs of a commercial food business is one of the most important aspects of business planning. Variable costs should be evaluated for each food product in the business's product mix. A sample calculation of variable costs is described below using a jar of strawberry preserves as an example.

***Strawberries*:** The exact per-unit input requirements will vary with (among other things) the precise production process, level of productivity and unit size (ounce, pint jar or quart). If a preserves recipe converts one quart of fresh strawberries into three jars (8 ounces each) of preserves, at a fresh value of $1.50 per quart, **the cost of strawberries in each finished jar of preserves will be 50 cents.**

Sugar: Assume 105 cups (49.35 pounds) of sugar will be needed for each 35-quart batch of berries. Therefore, 105 cups of sugar should yield approximately 848 oz. of preserves. Bulk granulated sugar purchased in 50 pound bags at an average cost of 40 cents per pound will yield **a sugar cost of 12.3 cents per 8-ounce jar.**

Glass Jar: Containers are an essential aspect of a commercial preserves product. As a matter of fact, for the very special niche markets, it is often theorized that the jar and label are more important than the product itself. Therefore, jar design should be carefully considered and its cost should be closely monitored. However, it is difficult to directly correlate sales with various container styles. It is also difficult to determine how much can be spent on jars without increasing or decreasing sales. Lids for glass jars do not tend to be "included" when jars are purchased from the manufacturer and must be purchased separately. As a general rule, lids are sold in much larger quantities than jars. For instance, lids are commonly packaged by the thousand and tend to cost from three cents to 12 cents each, with an average of **eight cents each**. The cost of jars varies greatly among style, size and quantity ordered. As a general rule, an eight-ounce glass jar will cost between 25 and 45 cents, with an average of **35 cents each**.

Packaging Accessories: A number of packaging accessories may be used to enhance the appearance of food products. Examples of packaging accessories include shipping boxes, gift crates, tie-on tags, cap bonnets, stretch tie-ons and shipping filler. The information below was gathered from a number of different sources, conversations and assumptions. Oftentimes, additional packaging accessories increase the per-jar cost by 10 to 30 cents according to the following costs:

- Shipping Boxes (depending on printing and quantity). . . $0.25 - $1.25 ea.
- Gift Crates (wood, cardboard, corrugated, size, volume) . . . $0.25 - $3.00 ea.
- Tie-on Tags (volume, color, printing, size, type paper). . . $0.01 - $0.05 ea.
- Cap Bonnets (color, size, type paper, volume, specialty) . . . $0.001 - $0.02 ea.
- Stretch Tie-Ons (volume, shipping) . . . $0.05 - $0.15 ea.
- Shipping Filler (Styrofoam peanuts) . . . $0.75 - $1.50 per cubic foot

Approximate cost for packaging accessories for the example eight-ounce jar = $0.16

Labels: Numerous businesses can custom design and print labels. Costs vary greatly among label makers, so be sure to obtain estimates from several suppliers. To provide a cost estimate or quote, suppliers will need to know the quantity of labels needed, the size of the label, color scheme desired, an example drawing of the label and the type of paper (i.e. semi-gloss, permanent adhesive). **The example used here assumes a label cost per jar of 4 cents** and is based on an estimate for a 4" x 6," two-color, self-stick label, with UV protection purchased in a quantity of 20,000, with a set-up fee of $90. Indications of label costs range from $0.06 to $0.12 each. The cost

to "design" the label using a graphic designer or artist is not included in this per-label cost. Design costs may range from $50 to $250.

Labor: Labor costs can be a very difficult aspect of production to estimate for a new operation. A t**ime and labor cost estimate of 71 cents per eight-ounce jar of preserves** is based on the following time trials in a demonstration food-processing facility**:**

- Operate in 10 hour shifts—3 workers per shift—total labor hours per shift = 30
- Approximately 15 minutes needed to get one batch of berries from the freezer to the kettle and heated.
- Approximately 35 minutes needed to separate the berries and the juice (if only one kettle is used).
- Approximately 100 minutes needed to boil the juice.
- Approximately 10 minutes needed to combine juice and berries.
- Approximately 90 minutes needed to cook the juice and berries.
- Approximately four hours and 10 minutes needed for total cook time (from frozen berries to completion).
- Approximately 45 minutes (per batch) to empty the kettle by hot-filling jars by hand. Clean jars would be filled directly from the kettle with hot preserves, capped, turned upside down for five minutes, inverted by hand and packaged. One person is needed to cook and fill. Two people are needed to label and pack in cases.
- A three-person crew should be able to set-up, cook, fill and label one batch of preserves (but not that day's batch) and clean-up in a 10-hour shift. Therefore, each 10-hour shift (30 hours of labor) should yield 388, eight-ounce jars of finished product.
- Average wage rate per hour = $8.00 . . . average wages per shift = $240.
- Approximate labor cost per eight-ounce jar = $0.619
- Approximate payroll tax & benefit cost at 15 percent of labor cost = $0.093

Summary of Variable Costs Per 8-Ounce Jar

Strawberries	$0.50
Sugar	0.12
Jar Lid	0.08
Glass Jar	0.35
Packaging Accessories	0.16
Label	0.04
Labor	0.71
Total variable cost per jar	**$1.96**

Determining labor cost is important when calculating the variable cost of production.

7 Other Considerations

Other issues that should be considered by the entrepreneur are discussed below. The importance placed on these may vary according to the overall business plan, the product and the marketing plan.

Insurance

Food product liability insurance coverage is given special emphasis here because the focus of this publication is on a commercial food-processing facility. Food product liability insurance should definitely be evaluated by food product manufacturers and processors. The liability insurance should provide some protection should an insured food product cause injury to a user. Most major retail outlets require that a food product have a minimum level (normally $1 to $2 million) of product liability coverage before they will carry it. Many local insurance agencies do not routinely provide food product liability insurance. Therefore, the cost for food product liability coverage is not easy to estimate. "Rule-of-thumb" estimates for the annual premium of a $1M policy is around $1,000; however, this rule can be a long way from reality. There are no "standard rates" for liability coverage for food products, as the premium depends on the specific characteristics of the product, the manufacturing process and marketing plan. To get an actual quote, most companies require a complete application and the submission of the business's production, distribution and marketing plans.

Packaging

As discussed earlier, a product's packaging is important as a marketing tool. However, this is not the only role of packaging. The additional roles of packaging must be considered when selecting the type of container—size, shape and material—so that the most serviceable/appropriate package will be chosen. Additional roles of packaging include:

- protecting
- preserving
- transporting
- containment
- storing
- displaying
- ease of use—easy to open, reseal and tamper-proof

Other issues that should be considered when selecting packaging are:

- filling process/system—hand or automation
- product—bakery, frozen, gelled, etc.
- labeling process—hand or automation
- fill temperature
- product image/perception
- material cost
- availability of materials
- effect of material on the environment

Bar Code

Bar code is actually the common name for Universal Product Code (UPC). Although a bar code is not government regulated, some retail outlets may require it before agreeing to carry a product. A bar code is specific to an individual product. If the same product is packaged in two size packages, each package requires its own bar code. Bar codes are issued through the Uniform Code Council (UCC), which is a membership organization—not a government agency. The cost associated with getting a bar code is covered in the UCC membership fee. For more information about the code, visit the UCC Website <http://www.uc-council.org>.

Internet Presence

In today's computer-savvy society, if consumers cannot find a business or product on the Web, they believe that it does not exist. This is due to the common misconception that all businesses have a Website or Webpage. And while many do, it is not necessarily a requirement for success. Some types of businesses and products are a better fit with the Internet than others. For instance, individuals are more likely to access the Internet looking for information and products in the electronics industry than they are a carton of milk. However, it is important to remember that this fact could change in the blink of an eye as consumers' tastes and preferences change.

It is important to understand that Websites can have several different purposes. Most fall into one of these three categories:

- Educational—provide facts, statistics, studies, literature, etc.
- Informative—provide product information, customer information, warranty guidelines, etc.
- E-commerce—provide a place where online consumers can purchase products.

A Website is not a "build it and they will come" type of tool. If a Website is to have positive impact, effort must be put toward its marketing and promotion. Time and money must be spent making current and potential customers aware of its existence. If this doesn't happen, then it is not an effective marketing tool.

Before deciding to dedicate effort and funds toward creating a Website, it is important to be well informed and knowledgeable in the area so that the Website can be a positive and important part of the business. This could take the form of reading books, talking with professionals or attending seminars and workshops. Just as a new retail store would not be built without doing extensive research, a virtual store should not be built without giving it the same amount of consideration.

8 Assessing the Feasibility

After a thorough evaluation of all the regulations, production, quality control, cost and marketing issues of a commercial food-processing business, one final assessment should be made that attempts to tie everything together. It is difficult to find a single tool or analysis that evaluates all the intricate details of a new business idea together. However, a feasibility study is often used to describe the overall and all-inclusive evaluation of a business idea.

A feasibility study may be defined as a documented determination or assessment of the likelihood of something being accomplished, brought about, used or dealt with successfully. Feasibility studies may involve any portion or segment of a lengthy process that includes preliminary studies into the technical possibilities of a project, financial analysis, technical evaluation and market potential and development inquiry. Some people stick to a very narrow definition of feasibility that concentrates only on financial capability. That is, a project will be touted as "FEASIBLE" if it is projected to return a positive cash flow. Others take a broader approach and include production and marketing concerns in the determination of a project's feasibility. Evaluating the feasibility of a commercial food business should include an assessment of many different items, primarily the items discussed throughout this publication.

The cost and revenue portion of this final report is often considered by some as the true or only feasibility portion. However, with the belief that more than financial concerns can make a project feasible or infeasible, all of the components listed above are essential elements of a final "go/no-go" conclusion and therefore should be included in the final report. All references to revenues and costs should be respected as **estimates** in these analyses. A feasibility study for a commercial food-processing business should include documentation of most all of the issues mentioned in this publication. While an investigation into all of the concepts in this publication should help the potential commercial food-processing entrepreneur decide whether the business should be pursued or not, it is helpful to have a strong method to compare and contrast all the information in a way that makes the decision about the future more valid. A break-even analysis is often used in a feasibility study to evaluate various interactions of production, regulations, cost, marketing and revenue. Results of the analysis can then be used to evaluate the financial returns of the business with regard to goals and objectives and the manager's attitude toward risk.

An example break-even analysis will be used here to draw some conclusions and evaluate the interactions of the concepts and details presented in this publication. An estimate of the gross sales volume that must be achieved to cover all the operating costs of the business (break-even) is a good way to evaluate the feasibility of the overall business idea. With the financial information presented in the cost chapter and the conclusions section of the marketing chapter, the number of jars of strawberry preserves that must be sold to cover all the operating costs of the business can be calculated. The assumptions needed to calculate and determine the break-even are shown below.

Break-even Calculation

Operating cost = $100,492
Variable cost per jar = $1.96
Estimated average sales price per jar = $3.20
$100,492 ÷ ($3.20 - $1.96)
$100,492 ÷ ($1.24) = 81,042 jars

In this case, one question of the overall feasibility is whether or not 81,042 jars of strawberry preserves can be sold. If an estimate of the sales (in the marketing chapter) indicated far less sales potential than the break-even analysis calls for, adjustments to the marketing budget may need to be made to increase sales potential or the facilities may need to be used in additional ways to generate additional revenue. For example, an additional product promotion might be planned for the Valentine season and an additional product line for strawberry ice cream topping, blueberry jam and raspberry preserves may be added. Other complementary product lines for the commercial food-processing facility may include breads, cakes, pies, relishes, pastries, cookies, jams, jellies, preserves, dry mixes and sauces.

9 Conclusions

A commercial food business can be a means of adding value to a farm enterprise. However, building a successful commercial food business takes much more than having a "delicious recipe" or a field of strawberries. Very few ideas materialize into businesses, and of those that do become businesses, only a small percentage are still in business after a five year period. Issues that must be included in a feasibility study and that contribute to the success of a commercial food business have been addressed in this publication. These issues are:

- Facility construction
- Regulations
- Quality control
- Marketing
- Budgeting
- Cost analysis

Remember, all of these issues are important to the success of a commercial food business. There is no specific order in which these issues should be addressed. Collectively, these issues have overlapping concerns which make it difficult to address any single unit without addressing parts of another unit. The overlap also makes it difficult to determine where to start planning and developing a business idea. In most cases, it does not matter which issue is addressed first or second; it is most important to address all of these issues and to understand the uniqueness of how the issues are related.

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Appendix A — Food Establishment Inspection Form

PURPOSE (MARK ONE)

- REGULAR ◯
- FOLLOW-UP ◯
- COMPLAINT ◯
- CONSULTATION ◯
- TRAINING/AUDIT ◯
- OTHER ◯
- CHANGE ◯
- NEW ◯
- OOB ◯
- MFG/WH/GD ◯

TENNESSEE DEPARTMENT OF AGRICULTURE

Regulatory Service
Food and Dairy Section
P.O. Box 40627 Melrose Station
Nashville, Tennessee 37204
Phone #: 615-837-5193 Fax #: 615-837-5335

FOOD ESTABLISHMENT INSPECTION

	Y	N
PERMIT POSTED	◯	◯
CORRECT FEE	◯	◯
PUBLIC WATER	◯	◯
PUBLIC SEWER	◯	◯
GAS PUMPS	◯	◯
SCALES	◯	◯
PLANTS	◯	◯
PLANT LICENSE	◯	◯
CRITICAL LETTER	◯	◯
INSP RPT AVAIL	◯	◯

NAME	OWNER	FOLLOW-UP DATE

ADDRESS	CITY	ZIP	LID	SQ. FT.

MAIL ADDRESS	CITY	ZIP	PHONE

INSP. NO.	ESTAB. NO.	INSP. DATE	INSP. TIME	CO.#	TYPE	SEIZE / CONDEMN	DOLLARS	SM	TOB Y N	MISC

Items cited identify violations of State Statute which must be corrected by the next routine inspection or such shorter period of time as may be specified by the regulating authority. Failure to comply with any time limits for corrections specified in this NOTICE may result in cessation of your operations, and/or civil penalties. TCA 53-1-103; 53-8-217; 4-3-204.

SCORE

The most current inspection report must be kept available at the facility for public disclosure to any person who requests to review it.

ITEM	DESCRIPTION	WT.
	FOOD	
◯ *01	Source: sound condition	5
◯ 02	Original container, properly labeled	1
	FOOD PROTECTION	
◯ *03	Potentially hazardous food meets temperature requirements during storage, preparation, display, transportation	5
◯ *04	Facilities to maintain product temperature	4
◯ 05	Thermometers provided and conspicuous, accurate	1
◯ 06	Potentially hazardous food properly thawed	2
◯ *07	Cross-contamination prevented: damaged/detained food segregated	4
◯ 08	Food protection during storage, preparation, display, dispensing, packaging, transportation	2
◯ 09	Handling of food (ice) minimized	2
◯ 10	In use, food dispensing utensils properly stored	1
	PERSONNEL	
◯ *11	Personnel with infections restricted	5
◯ *12	Hands washed and clean, good hygienic practices	5
◯ 13	Clean clothes, hair restraints	1
	FOOD EQUIPMENT & UTENSILS	
◯ 14	Food contact surfaces: designed, constructed, maintained, installed, located	2
◯ 15	Non-food, contact surfaces: designed, constructed, maintained, installed, located	1
◯ 16	Warewashing facilities: designed, constructed, maintained, installed, located, operated	2
◯ 17	Accurate thermometers, and chemical test kits provided	1
◯ 18	Pre-flushed, scraped, soaked	1
◯ 19	Wash, rinse water: clean, proper temperature	2
◯ *20	Sanitization rinse: clean, temperature, concentration, time. Equipment, utensils sanitized	4
◯ 21	Wiping cloths: clean, use restricted, stored	1
◯ 22	Food-contact surfaces of equipment and utensils clean, free of abrasives, detergents	2
◯ 23	Non-food contact surfaces of equipment and utensils clean	1
◯ 24	Clean equipment/utensils: storage, handling	1
◯ 25	Single-service articles, storage, handling	1
◯ 26	No re-use of single articles	2
	WATER	
◯ *27	Source: sufficient supply; hot & cold; under pressure	5

ITEM	DESCRIPTION	WT.
	SEWAGE	
◯ *28	Sewage and waste water disposal	4
	PLUMBING	
◯ 29	Installed, maintained	1
◯ *30	Cross-connection, back siphonage, backflow	5
	TOILET & HANDWASHING FACILITIES	
◯ *31	Number, convenient, accessible, designed, installed	4
◯ 32	Toilet rooms: enclosed, self-closing doors. Fixtures: good repair, clean. Tissue, hand cleanser, sanitary towels/hand-drying devices and proper waste receptacles provided	2
	GARBAGE & REFUSE DISPOSAL	
◯ 33	Containers or receptacles: covered, adequate number, insect/rodent resistant, pick-up frequency, clean	2
◯ 34	Outside storage area and enclosures: properly constructed, clean; controlled incineration	1
	INSECTS, RODENT, ANIMAL CONTROL	
◯ *35	Presence of insects/rodents-outer openings protected, no animals	4
	FLOORS, WALLS & CEILINGS	
◯ 36	Floors: constructed, drained, clean, good repair, covering installation, dustless methods	1
◯ 37	Walls, ceilings: attached equipment, constructed, clean, good repair, surfaces, installation, dustless methods	1
	LIGHTING	
◯ 38	Lighting provided as required. Fixtures shielded	1
	VENTILATION	
◯ 39	Rooms and equipment-vented as required	1
	DRESSING ROOMS	
◯ 40	Rooms, area, lockers: provided, located, used	1
	OTHER OPERATIONS	
◯ *41	Toxic items: necessary; properly stored, labeled, used	5
◯ 42	Premises maintained free of litter, unnecessary articles, cleaning, maintenance equipment properly stored	1
◯ 43	Complete separation from living/sleeping quarters, laundry	1
◯ 44	Clean, soiled linen properly stored	1

CRITICAL ITEMS MUST BE CORRECTED AS SOON AS POSSIBLE AND NO LATER THAN TEN (10) DAYS. COMMISSIONER MUST BE NOTIFIED WITHIN FIFTEEN (15) DAYS OF SUCH.

INSPECTOR	RECEIVED BY	TIME	DATE

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P# 1588-999-0.4.3.2

OFFICE COPY

Appendix B — Model Small Business Food Labeling Exemption Notice

(Please type or clearly print in blank spaces; make any necessary changes to the typed firm name/address)

1. Name of Firm _____

2. Address of Firm

Street Address_____

City _____ State_____ Zip/Postal code_____

Country _____

Telephone _____ Fax _____

E-mail _____

3. Type of Firm (Check all that apply)

Manufacturer _____ Packer/Repacker _____

Retailer _____ Distributor _____ Importer _____

4. Twelve-month time period for which you are claiming exemption

From: 05 / 08 / 2007 To: 05 / 07 / 2008
MM DD YY MM DD YY

5. Average number of full-time equivalent employees for 12 month period _____

6. Report of units sold (Use continuation sheet if necessary)

Product	No. of Units	Manufacturer

7. Name and address of manufacturer(s) or distributor(s) of product(s) in item 6 if different from firm claiming exemption. (Use continuation sheet if necessary.)

B. Name of manufacturer or distributor _____
Address _____

C. Name of manufacturer or distributor _____
Address _____

8. Contact Person _____

9. The undersigned certifies that the above information is a true and accurate representation of the operations of

_____
(Name of Firm)

The undersigned will notify the Office of Nutritional Products, Labeling and Dietary Supplements of the date on which the average number of full-time equivalent employees or the number of units food products sold in the United States the applicable number for exemption which is being claimed herein.

Signature _____

Name (Type or clearly print) _____

Title _____

Date _____

Appendix C — Domestic Kitchen Facilities Regulations

CHAPTER 0080-4-11
REGULATIONS FOR ESTABLISHMENTS UTILIZING DOMESTIC KITCHEN FACILITIES FOR BAKERY AND OTHER NON-POTENTIALLY HAZARDOUS FOODS INTENDED FOR SALE

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0080-4-11-.01 PURPOSE. The purpose of these rules is to allow individuals using domestic kitchens to prepare, manufacture and sell non-potentially hazardous foods to the public, while ensuring that the public health is protected by compliance with these rules and inspections by the Department of Agriculture.

Authority: Tenn. Code Ann. § 53-1-207.

0080-4-11-.02 DEFINITIONS.

(1) "Domestic Kitchen" is a home based kitchen that meets the established requirements herein in order to process non-potentially hazardous foods for sale to the general public.
(2) "Non-potentially hazardous foods" are jam, jellies, candy and baked goods that do not meet the definition of potentially hazardous foods.
(3) "Potentially hazardous food" are those foods which consist of meat, poultry, liquid eggs and partially cooked egg products, fish, milk and milk products, shellfish, partially cooked bakery products and/or other ingredients capable of supporting rapid and progressive growth of infectious or toxigenic microorganisms when stored at temperatures in excess of 45 degrees F, if a cold food or below 140 degrees F, if a hot food. Also included as potentially hazardous food, are low acid canned foods (vegetables, fish, meat, etc.) and acidified foods (pickled vegetables, fish, meat, eggs, etc.).
(4) "Unit of sale" is the form of packaging in which the product is normally offered for sale to the consumer (e.g., 1 loaf of bread, 1 dozen cookies, 1 pie [or piece thereof, as applicable], 1 container of jelly, etc.)

Authority: Tenn. Code Ann. § 53-1-207.

0080-4-11-.03 LIMITATIONS OF SALE. A domestic kitchen shall not exceed 100 units of sale per week.

Authority: Tenn. Code Ann. § 53-1-207.

0080-4-11-.04 PERMIT REQUIREMENTS.

(1) All facilities in which foods are manufactured, processed, packed or held for introduction into commerce must obtain and maintain a current license (known as a "Regulatory Services Permit") from the Tennessee Department of Agriculture, Regulatory Services, Food and Dairy Section in accordance with Tenn. Code Ann. § 53-1-208. Compliance with all other business license, permit and zoning requirements is the responsibility of the applicant.
(2) All domestic kitchens shall be available for inspection by the Tennessee Department of Agriculture between the week-day hours of 7:00 a.m. to 5:00 p.m., and the department shall, if it deems it advisable or necessary, inspect such premises on Saturdays, holidays or other times foods are being processed, prepared, packaged or handled.
(3) An individual who wants to process non-potentially hazardous foods in a domestic kitchen shall have adequate knowledge of safe food handling practices and shall have successfully completed the Tennessee Food Safety Certification Course presented by the University of Tennessee Department of Food Science and Technology or equivalent as determined by the Tennessee Department of Agriculture.

Authority: Tenn. Code Ann. § 53-1-207 and § 53-1-208.

0080-4-11-.05 GENERAL PROVISIONS.

(1) A food-processing establishment in an area that is part of a domestic kitchen shall comply with all provisions of this policy.
   (a) All domestic kitchen doors, if doors are provided, openings to other rooms of the dwelling or structure, such as bathrooms and all openings to the outside shall be kept closed during the processing, preparing, packaging or handling of commercial foods Windows, which are open when processing, shall be effectively screened to prevent the entrance of insects.
   (b) No person, other than the food establishment licensee or someone under the direct supervision of such licensee, shall directly engage in the processing, preparing, packaging or handling of commercial foods and no other person shall be allowed in the domestic kitchen during such periods of operation.
   (c) No pets shall be allowed at any time in the dwelling or structure in which the domestic kitchen is located.
   (d) No processing, preparing, packaging or handling of foods for sale shall be carried on in a domestic kitchen while other domestic activities are being carried on in such domestic kitchen, including, but not limited to; family meal preparation, serving, eating, dishwashing, clothes washing and ironing, cleaning of floors, walls, cabinets and appliances or when entertaining guests.
   (e) Use of tobacco products is prohibited in the dwelling or structure housing the domestic kitchen during preparing, processing, packaging or handling of commercial foods.
   (f) Employee Health – No food handler shall work in food processing while infected with a disease in a communicable form that can be transmitted by foods or who is a carrier of organisms that cause such a disease. No food handler shall work in food processing while affected with a boil, an infected wound or an acute respiratory infection.
   (g) Hair restraints and clean outer garments must be worn by all persons in the domestic kitchen during processing, preparing, packaging, or handling of foods. The use of loose or dangling jewelry, nail polish and chewing gum is prohibited by persons in the domestic kitchen during processing, preparing, packaging, or handling of commercial foods.

Authority: Tenn. Code Ann. § 53-1-207.

0080-4-11-.06 FACILITY REQUIREMENTS.

(1) Each domestic kitchen shall include and be provided with the following:
   (a) An adequate safe water supply derived from:
      1. a municipal service or
      2. a private water supply deemed to be safe as determined by inspection and annual microbiological analysis for coliform conducted at a laboratory deemed acceptable by the Tennessee Department of Agriculture. Current documentation of the laboratory analysis must be kept at the facility for review at the time of inspection.
   (b) Storage space for ingredients, including partially filled ingredient containers that have been properly sealed and labeled, finished product containers and labels for commercial foods that provide effective separation from household cleaning materials, other chemicals or toxic substances.
   (c) A separate refrigerated unit equipped with an accurate thermometer located in the same structure as the domestic kitchen for storage of perishable products or ingredients utilized in the preparing, processing, or handling of commercial foods.
   (d) Adequate facilities including a sink for the cleaning and sanitization of all utensils and equipment and adequate space for the draining or air-drying of all utensils and equipment that are or may become food product contact surfaces.
   (e) Adequate hand washing facilities separate from the utensil cleaning facilities, which include hot and cold water, single service paper towels and hand soap. Properly supplied hand washing facilities provided in toilet facilities located within the structure containing the domestic kitchen may suffice for this provision. Hands shall be washed and dried: after restroom use, and immediately prior to food preparation, processing and/or packaging as often thereafter as is necessary to properly protect the food.

(f) A properly functioning toilet facility supplied with single service paper towels, hand soap, toilet tissue and a covered waste receptacle.
(g) Utensils and equipment that are made of smooth, nonabsorbent, corrosion-resistant, non-toxic material so constructed as to be easily cleaned.
(h) Food packaging materials, containers and closures that are safe for their intended use Written verification relative to food safety from the manufacturer of the packaging materials, containers or closures may be required.
(i) Shielded or shatter resistant lighting in the processing area.

(2) Operation of the facility shall be conducted in such a manner as to protect the food from contamination during preparing, processing, packaging, storage and distribution. Where applicable, containers may require sanitization prior to use. Suitable dispensing/measuring utensils stored in a manner so as to preclude contamination shall be used to avoid unnecessary manual contact with food.

(3) Medical supplies or equipment shall not be stored or allowed in the domestic kitchen unless stored in such a manner that does not permit contamination of food or food product contact surfaces.

(4) There shall be no evidence of insect or rodent activity. Chemical pest control application shall be conducted in a manner consistent with manufacturer's directions so as to not contaminate food products or food product contact surfaces. A person shall not apply a pesticide within a dwelling or structure used for the preparation or serving of food except under the direct supervision of a person licensed to apply pesticides in accordance with General Provision 62-21-124(a)(4), Chapter 21 of the Tennessee Application of Pesticides Act of 1978.

(5) Waste, including food waste, shall be disposed of in a manner that does not attract rodents, insects or birds.

Authority: Tenn. Code Ann. § 53-1-207.

0080-4-11-.07 LABELING OF PRODUCTS.

(1) All food items packaged at the facility must be properly labeled prior to sale. The following, at a minimum, must be present on all food items:
(a) The name, street address, city, state and zip code of the manufacturer, packer or distributor.
(b) An accurate statement of the net amount of food in the package.
(c) The common or usual name of the food.
(d) The ingredients in the food.
(e) Lot dates or numbers shall be evident on each package or container of food.

(2) All labeling shall comply with the applicable provisions of the Code of Federal Regulations, Chapter 21, Part 101 - Food Labeling. The licensed facility may apply for a Small Business Nutritional Labeling Exemption, if applicable.

(3) Lot dates or numbers shall be evident on each package or container of food for traceability purposes in the event an issue occurs which may require a market withdrawal of the food. A current distribution list including quantities sold may also be of assistance should an incident occur.

Authority: Tenn. Code Ann. § 53-1-105 and § 53-1-207.

0080-4-11-.08 Exemptions. Establishments that process non-potentially hazardous foods prepared solely with the intent to sale at a single day public event no more that six times per year on non-sequential days on behalf of a nonprofit institution or charity are exempt from the requirements of these rules.

Authority: Tenn. Code Ann. § 53-1-207.

Additional information on agriculture can be obtained from
your local
UT Extension office.

Additional information on feasibility studies and marketing
of value-added enterprises and products can be obtained by contacting the

Center for Profitable Agriculture
University of Tennessee Extension
E-mail: cpa@.utk.edu
Web site: <http://cpa.utk.edu/>

and

the Tennessee Department of Agriculture's
promotional website:<http://www.picktenproducts.org

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