
Special Report 1041

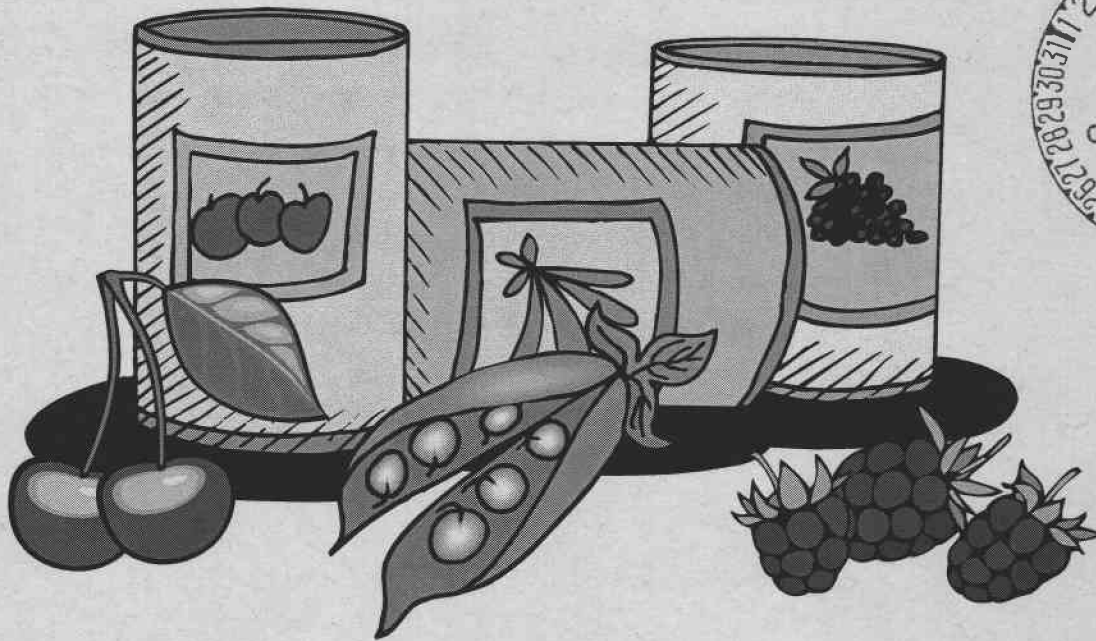
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Understanding the Research and Education Needs of the Oregon Fruit and Vegetable Industry

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Understanding the Oregon Fruit and Vegetable Industry

The fruit and vegetable processing industry provides great opportunities for Oregon's agriculture and economy, as well as for Oregon State University (OSU) with respect to research resources and undergraduate and graduate education. OSU Extension food science and technology faculty initiated a survey of the Oregon fruit and vegetable industry and visited several commodity commissions, fruit and vegetable processors, and county Extension agents during the summer and early fall of 2001. The goal was to understand the makeup and needs of the Oregon fruit and vegetable industry, to promote industry collaboration with OSU, and to identify potential food science Extension/outreach program needs in the state.

This special report summarizes the results of the survey and interviews. It is anticipated that information generated from this study will help Extension faculty develop

informational and educational programs that meet the specific needs and concerns of Oregon fruit and vegetable processors; build significant collaborations among OSU research and Extension specialists, fruit and vegetable processors, and county Extension agents; and promote OSU undergraduate and graduate education in food science.

The fruit and vegetable processing industry is one of the major food industries in Oregon. According to the Oregon Department of Agriculture database and member lists from Oregon commodity commissions, there are about 100 fruit and vegetable-related processors in the state.

The need for developing and enhancing the quality and safety of fruit and vegetable products, as well as increasing their value, has increased dramatically as a result of global competition and market demands. Food processors are seeking ideas, inputs, and

support for adding value to their products. Examples include technologies to enhance product quality, extend product shelf life, and improve food safety, as well as approaches to developing novel products that meet specific market needs.

Historically, the Oregon fruit and vegetable industry has worked with Oregon State University by providing research resources, enhancing students' learning experiences, and assisting technology transfer. University-industry collaboration is critical to enhancing Oregon's agricultural resources. The real challenge in developing such collaboration is communication, i.e., understanding each partner's interests and needs, promoting industry's willingness to collaborate, and ensuring that University research responds to specific industry problems. A clear understanding of the educational and economic needs of

agricultural industries is a primary goal of the OSU Extension Service.

This study was conducted to help OSU Extension faculty understand the specific needs of the Oregon fruit and vegetable industry with the intent of developing effective Extension educational programs to assist the industry to be more competitive in domestic and international markets. Furthermore, the industry survey asked for input on how best to develop effective research programs to respond to industry needs and concerns. Several major activities were involved in this effort, including a survey of the Oregon fruit and vegetable industry and visits to Oregon commodity commissions, OSU Extension county agents, and Oregon fruit and vegetable processors.

The survey included 14 questions with a focus on understanding the makeup of Oregon fruit and vegetable processors, their needs for Extension educational programs, and areas and interests where processors seek University assistance. Questionnaires were mailed to 200 recipients involved in the fruit and vegetable business, including processors, commissions, and trade organizations. Among them, about 100 are directly involved with processing of fruits and vegetables.

The questionnaire was developed by Dr. Yanyun Zhao, associate professor and value-added food product specialist in the Department of Food Science and Technology, Oregon State University. The survey was mailed during the middle of July, and a reminder postcard was sent in September to those who did not respond to the first mailing. Meanwhile, visits were made to five Oregon fruit and vegetable-related commissions, six county Extension offices with fruit and vegetable crop activities, and six major Oregon fruit and vegetable processors. Information generated from this effort is summarized in this report.

Profiles of Oregon fruit and vegetable processors

Thirty-eight fruit and vegetable processing companies responded to the survey, a 23 percent response rate. Of these companies, 52 percent are small business entities with fewer than 50 employees, 15 percent have 50 to 99 employees, 27 percent have 100 to 499 employees, and 6 percent have more than 500 employees (Figure 1).

Forty-six percent of the companies had total annual sales greater than \$10 million. Among these companies, 61 percent are in the business of processing, 32 percent are involved in product exporting,

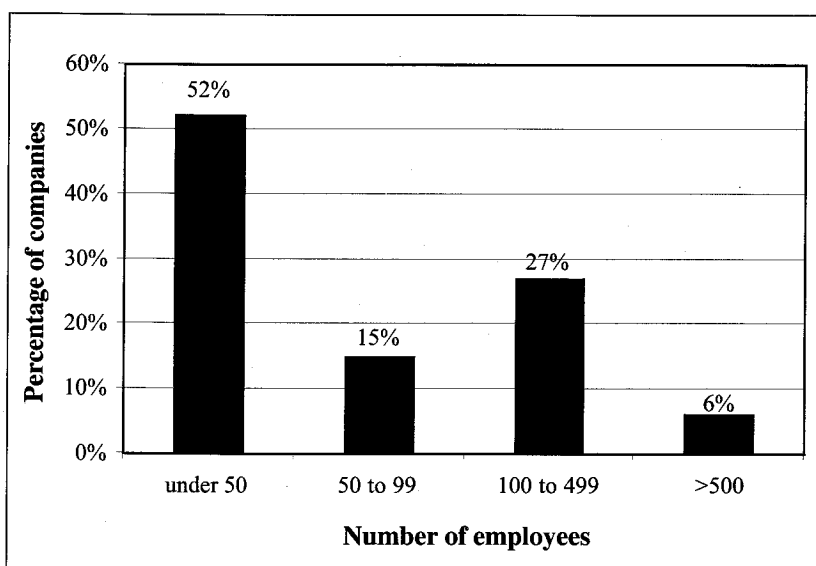


Figure 1.—Company size in the Oregon fruit and vegetable industry. (Total may be more or less than 100 percent due to multiple answers or no response.)

12 percent are distributor/broker/trading companies, and 30 percent are "others," including a retailer, an association, and a commission (Figure 2).

With respect to end markets, 71 percent of the respondents are involved in retail, 45 percent in food service/hospitality, and 42 percent in industrial/food ingredients (Figure 3). These companies manufacture a wide variety of food products. Based on the percentage of production for various types of fruit and vegetable products, the order of most to least important is fresh, frozen, dry, concentrate/juice, and puree.

Computer and Internet use is common among these companies. Sixty-five percent have their own Web site, and 68 percent use e-mail (Figure 4).

Position and status of the Oregon fruit and vegetable industry

Berries

It can't be emphasized enough how important the berry industry is to Oregon. Many of the best-known berry-packing firms in the U.S. are located in Oregon. Oregon-grown berries include red raspberries, black raspberries, marion blackberries, evergreen blackberries, boysenberries, and loganberries.

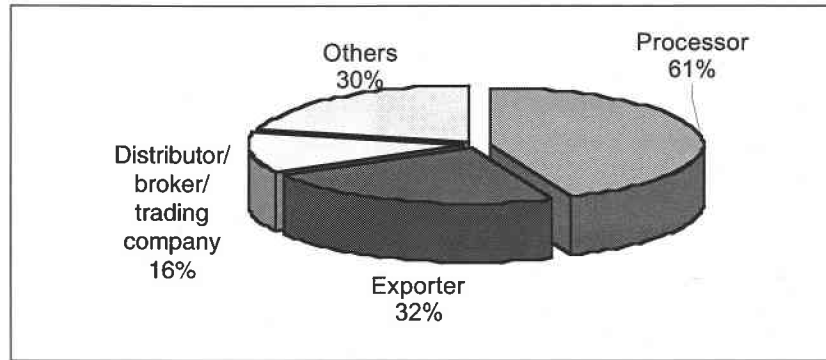


Figure 2.—Types of activities of Oregon fruit and vegetable processors. (Total may be more or less than 100 percent due to multiple answers or no response.)

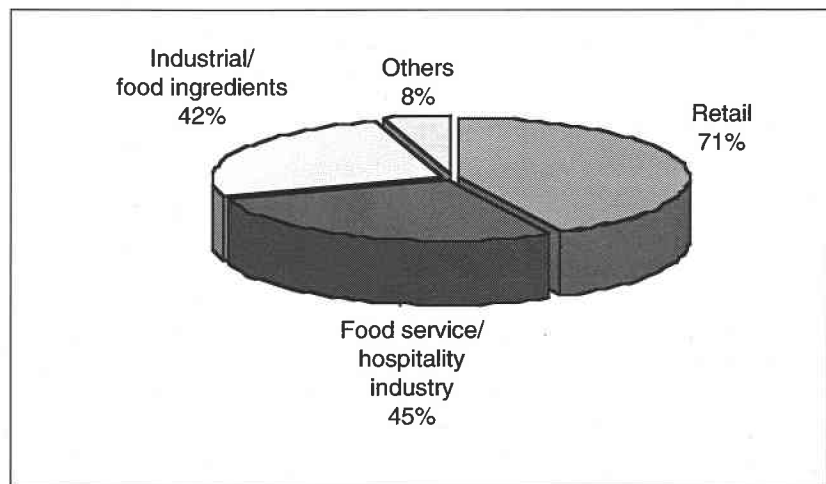


Figure 3.—Types of end markets of Oregon fruit and vegetable processors. (Total may be more or less than 100 percent due to multiple answers or no response.)

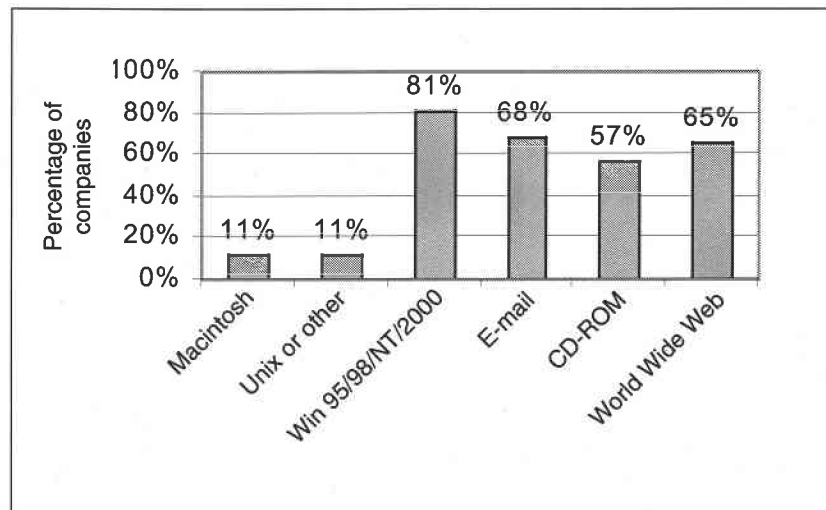


Figure 4.—Computer and Internet use by Oregon fruit and vegetable processors. (Total may be more or less than 100 percent due to multiple answers or no response.)

At one time, there were about 500 growers and 20 berry processors in Oregon. However, the number of growers and processors has dropped significantly in recent years as a result of intense pricing competition and quality trade-offs, driven primarily by consolidation among grocery chains and food-processing companies. According to the Oregon Strawberry and Raspberry Commission, only about 10 strawberry and raspberry processors remain in Oregon.

Most Oregon berries are processed into value-added products such as individually quick-frozen (IQF) berries; straight or sugared frozen berries; canned berries; or juices, purees, and concentrates.

To help Oregon berry growers and processors, the Oregon Berry Commission has made major efforts to promote the health benefits of Northwest berries, primarily the antioxidant activities of berries, seeds, and seed oil. A very informative Web site has been developed by the Commission (<http://www.oregon-berries.com/>). Additional efforts that may help the industry include promoting fresh-market berries, especially strawberries and raspberries; development of value-added products such as smoothies and nutritional bars; development of better quality products through new technologies; and development of new markets.

Cherries

About 5,000 to 6,000 tons of cherries are produced annually in Oregon, and there are about 400 cherry growers and 15 processors or handlers. Oregon cherries are exported to many countries, including South Korea, China, Taiwan, India, Malaysia, and Australia. There is a lack of flavor acceptance in Japan, so very few cherries are exported to that country.

There is an oversupply of brined cherries. The economic situation of cherries destined for maraschino cherries is complicated. Processors need to diversify and develop new uses for brined cherries.

Waste management is a challenge for brined cherry processors. Waste-treatment facilities are very expensive, costing about \$2 to \$3 million for installation of equipment to separate sugars from inorganic components. Increased electricity costs (a 30 percent increase since October 1, 2001) add a significant cost to processing.

Efforts have been made to develop new cherry products through flavor modification, nutrient fortification, and packaging innovation. A good understanding of consumers' acceptance and demand for cherries and cherry-based products would help processors. A consumer survey would help industry develop strategies to attract more consumers.

Companies are moving toward using more natural ingredients in their products

and fortifying products with nutraceuticals (food ingredients that provide health benefits to humans). They also are open to the idea of producing organic products.

The immediate needs of the cherry industry are organic production and processing, nutritional fortification, flavor ingredients, new applications for brined cherries, a consumer survey to understand market needs (the most recent survey was done 20 years ago), and package improvements.

Processed vegetables

The major processed vegetable crops in Oregon are green beans, carrots, broccoli, cauliflower, sweet corn, and table beans. The principal finished products are frozen, canned, and microwavable mixed vegetables. The Oregon Processed Vegetable Commission includes eight growers and three processors. The commission provides funds to farmers for product-oriented projects and hosts an annual meeting for growers at the end of January.

Production of canned vegetables has dropped significantly. Global competition has become a major issue for Oregon vegetable processors. As a result of this competition, the price of green beans has fallen sharply and was \$89 to \$110/ton in 2001. Fewer than 10 percent of vegetables are exported because of a lack of marketing strategies and contacts.

Two major funded breeding research projects are ongoing. One is for developing mechanically harvestable broccoli cultivars, and the other is for developing vegetables with increased nutritional value. Little has been done with organic production or processing at this time.

History of industry–University relations

According to the industry survey, Oregon fruit and vegetable companies use University resources to a limited extent. Food companies primarily use their own resources (>35 percent) or hire private consultants (about 15 to 30 percent, depending on specific areas) for product development, processing system and packaging design, market research, microbial safety/sanitation, and sensory testing (Figure 5). The most effective University assistance is for new product development (about 21 percent) and for microbial safety/sanitation and sensory tests (about 13 percent for both).

When asked how useful University research has been to their company's needs over the past 5 years, 41 percent responded "sometimes useful," and 34 percent indicated "useful" or "extremely useful" (Figure 6).

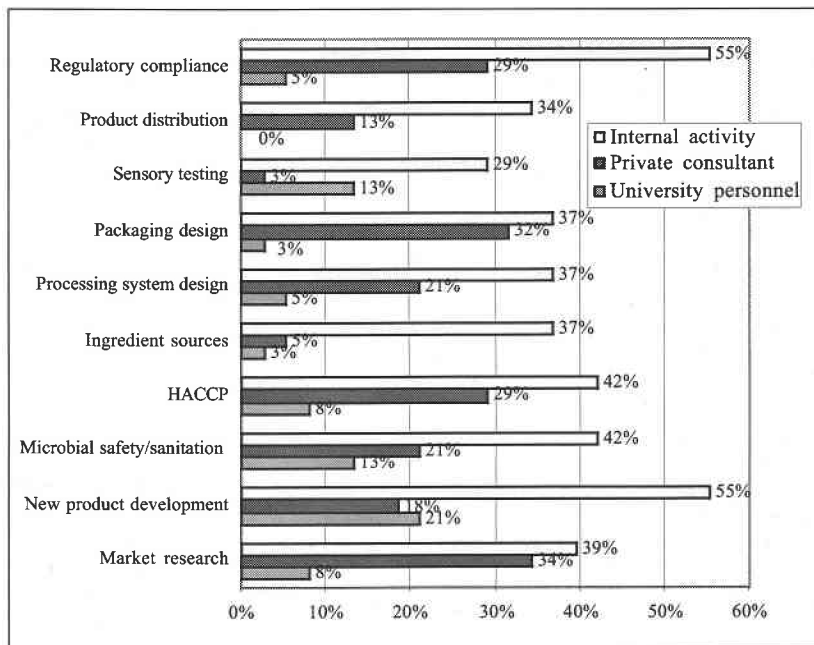


Figure 5.—Resources used by Oregon fruit and vegetable processors in different activity areas. (Total may be more or less than 100 percent due to multiple answers or no response.)

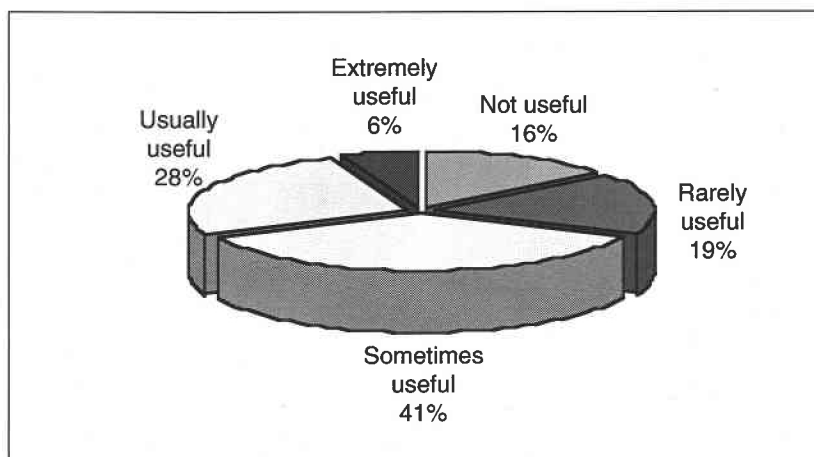


Figure 6.—Usefulness of University research to meet fruit and vegetable processors' needs over the past 5 years. (Total may be more or less than 100 percent due to multiple answers or no response.)

The need for Extension educational activities

One of the major goals of this study was to identify the needs, interests, and expectations of the Oregon fruit and vegetable industry for future Extension educational programs and University assistance. The survey asked which of a list of Extension activities companies would be most likely to participate in. Workshops and short courses were the participants' first choice. Eighty-one percent of participants indicated they are willing to participate in informative workshops and/or short courses. Other favorable Extension activities were one-on-one consultation (69 percent), Extension publications (47 percent), and plant visits to provide help with solving specific problems (47 percent). Thirty-six percent of participants also selected Internet information exchange as a potential tool of Extension education (Figure 7).

Food processors were given a list of potential topics for workshops and/or short courses, and they were asked which topics would best meet their needs and interests. The first two choices were new value-added product development (68 percent) and new technologies in fruit/vegetable processing and preservation (63 percent). Forty-two percent of participants were interested

in functional foods and nutraceuticals, 39 percent in food packaging design, 37 percent in food export markets, and 37 percent in food safety and Hazard Analysis Critical Control Points (HACCP) training (Figure 8).

Respondents recognized the importance of training to develop an informed and competent work force. They are willing to utilize outside help when needed skills are not inherent to their work force. Specific needs and concerns for

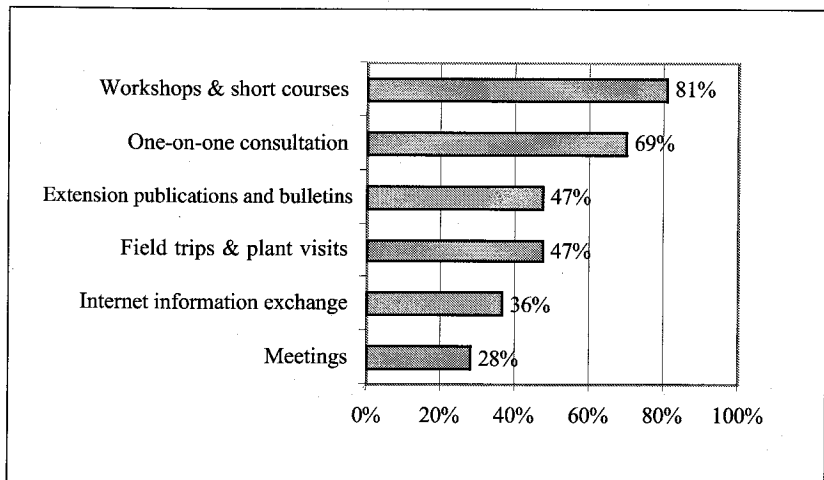


Figure 7.—Extension/outreach activities of greatest interest to fruit and vegetable processors. (Total may be more or less than 100 percent due to multiple answers or no response.)

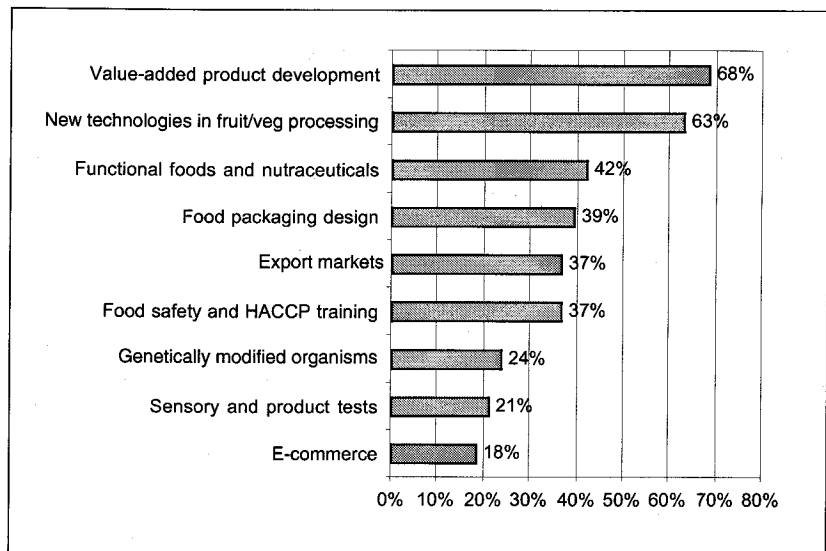


Figure 8.—Workshop/short course topics viewed as needed to meet fruit and vegetable processors' needs. (Total may be more or less than 100 percent due to multiple answers or no response.)

training, consulting, or other assistance were identified through this survey and summarized as:

- Employee training in food safety and technical projects, especially for non-English speakers and in operations with high turnover
- E-commerce positioning/ Internet sales
- Food safety issues, including:
 - Identifying potential food pathogen problems
 - Training HACCP instructors and sanitation personnel
 - Training for correct food handling, good agricultural practices, and good manufacturing practices
 - Consulting
- Packaging efficiency and new packaging technologies to replace traditional steel and glass containers
- Value-added products made from cherries, plums, and apples
- Process development
- Quality standards for vegetables

The need for University research programs

In general, the greatest need is to make University research relevant to food plant processing operations. The ability of food processors to utilize University research

requires significant adaptation unless the research is done in conjunction with an industry partner on a commercial scale. Food companies commented that OSU's approach to training food technologists and scientists lacks a food manufacturing/processing perspective. Specifically, potential job candidates lack an understanding of the realities of the manufacturing environment, especially regarding processing quality assurance and research and development. This shortcoming contributes to the lack of confidence that manufacturing personnel have in their in-house technical departments. Furthermore, new graduates often are disillusioned when the real world does not meet their expectations. Thus, some University food science courses should contain more practical training.

In addition, there are some specific research needs:

- New technology in fruit processing and preservation, including value-added product development
 - New technologies for fruit and vegetable puree pasteurization as an alternative to aseptic packaging
 - Improvements in fresh cherry fruit quality
 - New applications for brined cherries
 - Potential for fresh, sliced pears
 - Fruit desserts
- Improved packaging design
 - Convenient, low-cost, and attractive to consumers
 - Optimal product quality
 - More efficient packaging line design
 - Packaging to improve quality during product distribution and transportation
 - Packaging materials for fresh produce
 - Packaging innovation for frozen fruits and vegetables
 - Biodegradable films to protect the environment
- Understanding naturally occurring enzyme inactivation during fruit and vegetable processing, as well as enzyme-induced softening in fermented vegetables
- Better understanding about the health benefits of fruits, as well as techniques for preserving nutrients during processing and storage
- Postharvest disease control
- Market issues
 - New markets for Oregon berries and other fruit/vegetable crops
 - Sanitary treatment to access export markets
 - New markets for prunes

How can the OSU Extension Service help?

This study generated significant information for the planning of future Extension programs for assisting the Oregon fruit and vegetable industry. Several potential activities are summarized below.

Use an Advisory Committee to help plan and develop Extension educational programs

A Fruit and Vegetable Processing Advisory Committee partnering with the OSU Department of Food Science and Technology has been formed. The committee members include fruit and vegetable processors; administrators from the Oregon Department of Agriculture, commodity commissions, and OSU Department of Food Science and Technology; and food science research and Extension faculty. Our goal is to strengthen communication and working relationships between Oregon fruit and vegetable processors and Oregon State University. The committee will assist in developing content for short courses, workshops, and seminars, allowing us to address "hot" topics. It also will provide newsletters and scientific updates and will help our faculty prioritize research activities.

Provide the most effective Extension programs and services

Through the knowledge obtained from the survey, workshops and short courses will be developed to address the most important issues for processors. Two workshops were conducted recently to address emerging issues and meet immediate industry needs. One addressed the Food and Drug Administration's new rules for organic food production and processing; another focused on packaging innovation to add more value to fruit and vegetable products. Both workshops received very positive responses from the participants. Other workshops on enzyme functionality in fruit and vegetable processing, microbial safety in Northwest berry production and processing, and packaging design have been scheduled.

Increase information exchange

Information exchange can occur through newsletters, Extension publications, and a Web site to update processors on the most recent government regulations, new technologies, and Extension services and activities. A Web site is being developed to provide comprehensive information and resources about the development of value-added fruit and vegetable products (<http://www.orst.edu/dept/foodsci/foodweb/main.htm>). The Web

site is linked to the Department of Food Science and Technology Extension Web site.

Increase awareness of the OSU Extension Service among processors

Many fruit and vegetable processors are not well aware of the assistance available to them from the OSU Extension Service. Better communication could provide processors with timely information. We recently invited growers and processors to campus to visit research labs and service facilities and to introduce our faculty to them.

Collaborate with other partners

Collaboration with county Extension agents, commodity commissions, the Oregon Department of Agriculture, the Northwest Food Processors' Association, and the Food Innovation Center will be emphasized in future programs.

Program impact

Understanding the features, interests, and needs of the Oregon fruit and vegetable industry is one of the initial program activities of the OSU Extension food science and technology fruit and vegetable program. Survey-generated information can assist us to identify barriers to collaboration between industry and the University and can greatly strengthen research and outreach opportunities. The liaison

with Oregon fruit and vegetable processors developed through this effort will lead to cooperative initiatives between OSU food science faculty and Oregon fruit and vegetable processors.

Conclusions

Key industry needs identified by this study include the following.

- *Organic food production.* Many processors have explored organic processing techniques by using organic ingredients, although most can't label their products as organic foods at this time. Processors are interested in knowing about organic production and processing, and they believe there may

be a significant market for organic products in the future. As some processors commented, "There is always room for organic processing."

- *Environmental and energy issues.* Processors are facing challenges from increased energy costs and environmental protection. Outreach and education programs are important to address these issues.
- *Waste management.* There are great needs for improved waste management technology, but cost is a major concern.
- *Health benefits of fruits and vegetables, especially Northwest berries.* Understanding specific health benefits, increasing public

knowledge, and developing new products to increase consumer purchasing are important issues.

- *Increased export markets.* Although global competition is here to stay, there still is room for increased exports as a result of high-quality, unique Oregon products. However, a better understanding of international markets is needed to develop specific strategies.

Acknowledgments

We sincerely thank those who responded to our survey as well as the Extension county agents and processors who hosted our visits and spent time sharing and discussing various issues with us.

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