Robert M. Kerr Food & Agricultural Products Center

2007 Annual Report

Gooey. Creamy. Delicious. Spencer's Cinnamon Rolls

page 6

Table of Contents

Foundation Focus

An FAPC team was developed to support and enhance the programs that carry out the mission of the FAPC through the donations of individual and industry partners. The team's purpose is to guide development and recognition of private donations to the FAPC. The FAPC would like to recognize the following 2007 donors:

Roy and Judy Escoubas
Melton and Sandra Ezell
J-M Farms, Inc.
Peter and Kathleen Muriana
Oklahoma Refrigerated Services, LLC
Patricia Rayas-Duarte
Chuck and Susan Willoughby
Unitherm Food Systems, Inc.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Dean of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of $4,571.77 for 800 copies. 0108 MHG.

Adding Value to Oklahoma

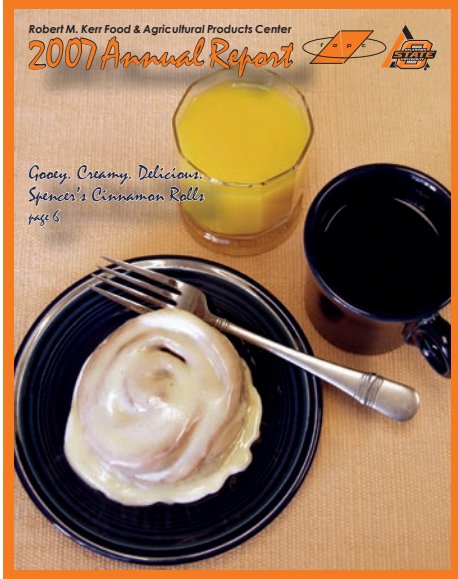
Contributors

FAPC Director
J. Roy Escoubas

Managing Editor
Graphic Designer
Mandy Gross

Editor
Ruth Bobbitt

Photographers
Ruth Bobbitt
Mandy Gross
Todd Johnson



About the cover...

Mike and Carol Spencer of Midwest City, Oklahoma, have been in the food business for 18 years and own Spencer's Bar-B-Q Restaurant. After attending FAPC's Basic Training, the Spencers decided to commercialize their unique, gourmet cinnamon rolls.

www.fapc.biz

Message to Our Stakeholders

The Robert M. Kerr Food & Agricultural Products Center (FAPC) is a research and development, business and marketing and technical assistance resource for the Oklahoma food and agricultural industries. This 96,000-square feet stand-alone facility has animal harvesting, food manufacturing, grain milling, sensory profiling, food microbiology, and analytical laboratory facilities. The FAPC has conference facilities and applications laboratories for demonstration and prototype testing. It truly is a state-of-the-art facility and is available to help you.

The FAPC recently has celebrated its 10-year anniversary and celebrated its renaming to honor the late Senator Robert M. Kerr. Senator Kerr was the legislative and agricultural leader who championed the establishment of the FAPC. The FAPC is a model for what can be accomplished when industry leaders, legislators, and academic leaders team behind a champion to accomplish a goal. The hard work accomplished during two decades by the late Senator Kerr, the State Legislature, the executive staff of the Governor, the food and agricultural industry leaders, and the leaders at Oklahoma State University has been demonstrated to be a very worthwhile investment into food and agricultural value-added growth.

A study was completed on the 10-year impacts of the FAPC on the Oklahoma economy. Results of this study recently were published and in short, the FAPC was shown to impact well more than $6 billion in economic activity and has impacted more than 52 million jobs in Oklahoma. Additionally, The Battelle Memorial Institute in Columbus, Ohio also completed a study that showed food processing in Oklahoma now accounts for the second largest agricultural bioscience manufacturing entity in Oklahoma, accounting for 16 percent of the total jobs available in that economic sector. According to the Battelle study, the food processing sector is a "star" performer for economic growth in Oklahoma, and the FAPC has been instrumental in moving food processing to this success.

In this reporting year, the FAPC operated with 9 faculty members, 11 professional staff members, 4 clerical staff members, and 5 technical staff members. It made significant contributions because of its faculty and staff in value-added processing in all food-processing sectors of Oklahoma, and this food processing was supported at the FAPC by food processing engineering, food microbiology, food sensory analysis, food harvest and processing technology, total quality management, communications and media support, and finally by marketing and business management.

Current trends in food processing and marketing being driven by the retail and food service consumer base include convenience, quality, safety, sustainability, and cost. These consumer demands continue to create opportunity for food processors and food ingredient and equipment suppliers in Oklahoma. Oklahoma is positioned well geographically, and the food industry is prepared for solid growth.

The FAPC also is prepared and ready to assist the Oklahoma food processing and agribusiness industries to realize the growth that is available to them. Contact us and allow us to help you grow your business.

Dr. J. Roy Escoubas
FAPC Director
roy.escoubas@okstate.edu

About the FAPC

The purpose of the FAPC is to help develop successful value-added enterprises in Oklahoma; to bring the products, the jobs, and the dollars back home. The FAPC will bridge the gap that sometimes exists between academics and the private sector by offering large and small businesses, producers, and entrepreneurs access to faculty and staff with expertise in business and technical disciplines. The FAPC also offers pilot processing facilities, research laboratories, and outstanding educational programs.

Vision

The FAPC has programs, projects, and activities that support innovation and growth of the food and agricultural business sectors of Oklahoma, increase food safety for consumers, assist in the development of students for careers in the Oklahoma food industry, and support and enhance the impact of the center on the state, region, and nation.

Mission

Discover, develop, and deliver technical and business information that will stimulate and support the growth of value-added food and agricultural products and processing in Oklahoma.

Industry Advisory Committee

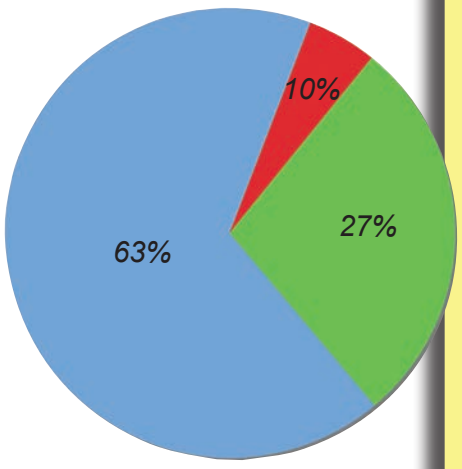
In Oklahoma Statute 2-5-60, the Oklahoma State Legislature established the Industry Advisory Committee to serve as an advisory board for the FAPC. The commitee is to assist, counsel, and give leadership to the FAPC in the discovery, development, and delivery of technical and business information that will stimulate and support the growth of value-added products and processing in Oklahoma.

Front Row: *John Griffin, Griffin Food Co. (vice chair); Jill Stichler, Redland Juice Co.; Jim Trapp, Oklahoma Cooperative Extension Service; David Howard, Unitherm Food Systems; John Williams, Chef's Requested Foods (secretary); Virgil Jurgensmeyer, J-M Farms; Gary Conkling, Producers Cooperative Oil Mill; Jay Cowart; Plains Cotton Cooperative Association*
Back Row: *David McLaughlin, Advance Food Co.; Dr. Charles Nichols; Davison & Sons Cattle Co.; Tommy Kramer, Durant Industrial Authority; Bill Wiley, Oklahoma Refrigerated Services (chair); Paul Schatte, Head Country Bar-B-Q; Gary Crane, Ralph's Packing Co.; Rodger Kerr, Southwest Technology Center; Dr. J. Roy Escoubas, FAPC*
Not pictured: *Danny Dupree, Bar-S Food Co.; Dr. Robert Whitson, OSU Division of Agricultural Sciences and Natural Resources (ex-officio)*

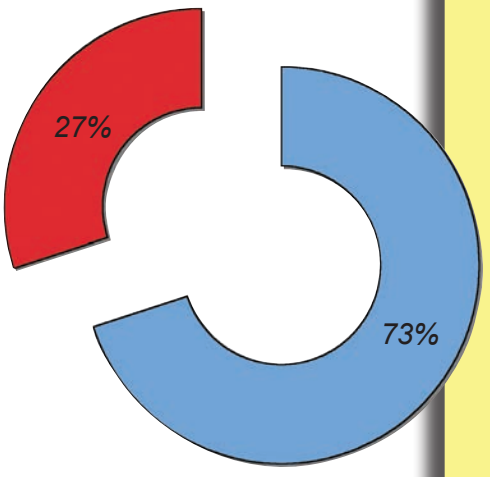
2006–2007 Financial Highlights

Total Working Funds	***$3,374,979***
State-Sourced	$2,932,758
Fee-Based Sourced	$442,221
Total State-Sourced Funds	**$2,932,758**
Research Funds, State of Oklahoma	$2,126,568
Extension Funds, State of Oklahoma	$806,190
Total Fee-Based Funds	**$442,221**
Conference Income	$72,143
Small Project Product Development Income	$134,179
Pilot Plant Processing Income	$235,899
Grants and Contract Research Funding	**$1,264,750**
Total Available Funds	**$4,639,729**
State-Sourced Funds	$2,932,758
Fee-Based Funds	$442,221
Grants and Contract Funds	$1,264,750
Description of Funds	
State-Sourced Funds	63%
Fee-Based Funds	10%
Grants and Contracts Funds	27%
Disposition of Funded Activities	
Research and Product Development Activities	73%
Outreach Activities	27%
Disposition of Budgeted Resources	
Salaries and Benefits	76%
Maintenance and Operational Funds	8%
Facility and Equipment Expense Funds	14%
Small Projects Development Funds	4%
Market Development Funds	1%
Description of Fee-Based Activities	
Conferences and Training Programs	16%
Pilot Plant Processing Programs	53%
Small Projects and Applied Development Projects	31%
Donations	***$417,901***
Endowed and Non-Endowed Cash Donations	$92,118
Gift-In-Kind Donations	$325,783

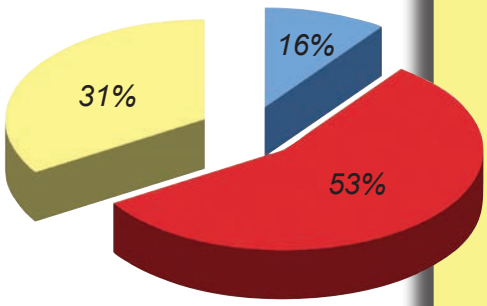
Description of Funds



Disposition of Funded Activities



Disposition of Fee-Based Activities



Gooey. Cream

Nearly 20 years ago, Mike and Carol Spencer were teaching school in Mabank, Texas, a small town in the northeast part of the state. Both Mike and Carol received master's degrees from North Texas State University located in Denton, Texas, and immediately started their teaching careers.

Mike's brother, Steve, and Steve's wife, Molly, both Oklahoma State University graduates, were living in Midwest City, Oklahoma, at that time. Steve was vice president of the First National Bank of Midwest City.

During family gatherings and holidays, the brothers would discuss starting some type of family business together, and those conversations continued for some time.

"Carol and I made a decision to move back to Oklahoma to be closer to our family members and to pursue a business opportunity with my brother and sister-in-law," Mike said. "As a result, we opened Spencer's Bar-B-Q Restaurant in Midwest City, Oklahoma, on June 15, 1989."

The restaurant has been very successful since its opening, and has established a reputation for having excellent quality of food, service, and generous portions, Mike said. Spencer's Restaurant has had a very loyal customer base for many years, which has led to expanding the business to offer catering and delivery service.

Mike and his family also acquired the building next to the restaurant to serve as a special events center that can accommodate up to 180 guests for reunions, birthday parties, business meetings, and wedding receptions. This venue offers a full-service menu, not just barbecue.

"We started developing our own signature barbecue sauce that was used exclusively at the restaurant, and it was so well received that we began to sell the sauce for our customers to take home," Mike said.

It was the barbecue sauce that brought Mike to the Robert M. Kerr Food & Agricultural Products Center, said Jim Brooks, FAPC manager of business and marketing services.

"One of Mike's customers suggested that he pursue selling the sauce commercially in grocery stores, and the FAPC offers a Basic Training Workshop that is specifically designed for assisting individuals on how to start and market new products," Brooks said.

In March of 2006, Mike and Carol attended the Basic Training Workshop, and he brought samples of his sauce along with his sweet yeast dinner rolls and cinnamon rolls with cream cheese icing.

Mike has been selling his dinner rolls for several years to many customers who dined at the restaurant. He normally makes between 4,000 and 5,000 rolls for Thanksgiving orders. The cinnamon rolls were not sold but were made for special occasions for family, friends, and employees.

"After attending the Basic Training Workshop, Mike immediately understood that there were numerous barbecue sauces already on grocery stores' shelves, and it would take considerable time and money to establish his product with the other brands," Brooks said. "Running a restaurant seven days a week would prevent Mike from having the amount of time required to market the barbecue sauce to the retail grocery sector, but he would continue to sell the sauce in the restaurant."

Brooks suggested Mike consider commercializing the gourmet cinna-

...y. Delicious.

mon rolls as a viable project because they are unique in quality, size, and texture.

"Everyone who tried the cinnamon rolls were very impressed and stated that there is nothing quite like them in the market at that time," Mike said. "I had not considered the cinnamon rolls at that time, but decided to visit with my family and decided I would contact the FAPC if we chose to move forward."

After discussing the project with his family, Mike decided to give it a try and see where the market might be for the cinnamon rolls.

One of the considerations for Mike and his family was that the cinnamon rolls were made in the restaurant in three or four dozen quantities, and he was the individual who made them each time.

There were several meetings to evaluate if retail or foodservice had better potential to market the product. It was decided there were many more potential customers in the foodservice industry than the retail sector, so the decision was made to focus within that segment.

Mike and Carol have participated in three food tradeshows as a member of the FAPC's exhibitor booth, and each time the response has been overwhelmingly positive with requests about how to purchase the product, Brooks said.

"Mike devoted a great deal of time to the scale-up process for large production runs of the cinnamon rolls to confirm the texture, taste, and cream cheese icing were exact to the product he made in his restaurant and to ensure the quality and integrity," he said.

The foodservice packaging consists of 40 cinnamon rolls per case, eight per tray, and five trays per case, and the rolls are kept frozen after they are produced to retain the moisture and preserve shelf life.

Spencer's Restaurant is one of Ben E. Keith's largest foodservice customers. As a result, Mike contacted the category buyer to ask for a meeting to present his cinnamon rolls as a new item in Ben E. Keith's warehouse.

The buyer and his staff liked the product and placed an order for 100 cases. They even invited Mike to a sales meeting so their sales representatives could sample the product. Mike also was invited to the Tulsa sales meeting, so the representatives could sample and discuss the cinnamon rolls.

In addition, Spencer's gourmet cinnamon rolls were selected to be a menu item for an Oklahoma Centennial Celebration breakfast and lunch for the Stillwater School system.

"The Stillwater School system purchased 3,500 cinnamon rolls to feed students as part of the special event to educate the kids of where their food comes from and to show support for the Oklahoma companies who provide various food products to our children and adults," Brooks said.

Spencer's Cinnamon Rolls

- ***Analytical Chemistry***
- *Business Planning & Marketing*
- *Cereal Chemistry*
- *Communications*
- *Food Engineering*
- *Agribusiness Economics*
- *Horticulture Processing*
- *Food Microbiology*
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- *Quality Control & Assurance*
- *Value-Added Wood Products*

Fatty Acid Profile and Conjugated Linoleic Acid in Oklahoma-produced Dairy Products

Objective

The objective of this project was to study the fatty acid composition of some cow dairy products manufactured in Oklahoma and to compare these products with some non-Oklahoma cheeses and processed cheese products. Special attention was given to the content of the *cis*-9, *trans*-11 conjugated linoleic acid (CLA). CLAs are a group of dietary fatty acids that have been found to block all three stages of cancer growth, strengthen bones, reduce body fat, and increase muscle mass in some animals.

Approach

Fifteen cheeses, two fermented dairy products other than cheeses, and one sample of butter produced in Oklahoma, as well as four non-Oklahoma cheeses and two non-Oklahoma processed cheese products were included in the study. All products were manufactured from cow milk.

The Oklahoma dairy products were from six producers located in six counties. The Oklahoma cheeses included: Christian cheddar raw milk and Christian cowboy from Christian Cheeses; cheddar, mozzarella, and pepper jack from Hardesty Cheeses; caciocavallo from Lovera; mozzarella part skim milk, colby pasteurized milk, colby raw milk, sharp cheddar pasteurized milk, sharp cheddar raw milk, mild cheddar pasteurized milk, mild cheddar raw milk, and cheddar hot pepper pasteurized milk from Swan Brothers Dairy Inc.; and Watonga longhorn from Watonga Cheese Factory. The butter and the fermented dairy products (yogurt cheese and yogurt) were manufactured by Wagon Creek Creamery.

The non-Oklahoma analyzed products were commercially available at local stores and included: baby Swiss, colby jack, and Muenster from Amish Classics; and parmigiano reggiano (an imported Italian cheese) from Lovera. The processed cheese products included Velveeta and Kraft singles from Kraft Foods Inc.

FAPC researchers analyzed the total fat and CLA content of all the dairy products at the FAPC Analytical Chemistry Laboratory.

Benefits

The results of the study showed the content of CLA (4.1 – 11.0 mg/g lipid), as well as the percentages of ω-6 polyunsaturated acids (PUFA) (2.1 – 3.9 percent) and ω-3 PUFA (0.7 – 1.1 percent) of the Oklahoma dairy products are in the same range or even better than some of non-Oklahoma cheeses (1-8 mg/g lipid, 1.8 – 2.7 percent, and 0.9 – 1.3 percent, respectively, for CLA, ω-6 PUFA, and ω-3 PUFA). The identification of Oklahoma dairy products as an excellent source of CLA can be used to focus consumer attention on the nutritional value of these products.

Economic Impact

By increasing consumer awareness of the nutritional value of dairy products made in Oklahoma, this project can add value and help increase sales of Oklahoma-produced dairy products.

Continuing Work

The results from the Oklahoma products are a motivation to continue this study by evaluating the effect on CLA content of animal nutritional factors such as pasture or grain feeding. There also are plans to include more varieties of non-Oklahoma cheddar-type cheeses for comparison.

Publications

An FAPC fact sheet outlining this project is in preparation, and there are plans to publish an *FAPC Flash* and a scientific publication.

Funding

The FAPC and producers of the dairy samples provided funding.

Collaborators

Dr. Guadalupe Davila El-Rassi, FAPC analytical services manager, was the principal investigator for this project. Other collaborators included Dr. Veneta Banskalieva-Dobreva, FAPC research specialist, and Christopher Roy, undergraduate student.

- *Analytical Chemistry*
- ***Business Planning & Marketing***
- *Cereal Chemistry*
- *Communications*
- *Food Engineering*
- *Agribusiness Economics*
- *Horticulture Processing*
- *Food Microbiology*
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- *Quality Control & Assurance*
- *Value-Added Wood Products*

Williams Natural Waffles

Objective

The primary objective of the project was to produce a naturally sweetened waffle that requires no butter or syrup for school breakfast programs.

Approach

Lisha Williams has developed several recipe profiles to provide a naturally sweet waffle that provides nutritional advantages when compared with many items on existing school menus. Williams Natural Waffles are lower in calories, sodium, fat grams, cholesterol, sugar, trans fats, and carbohydrates, and they provide valuable fiber that is missing in the majority of school breakfast items.

Benefits

This project can benefit the educational system by allowing schools to expand breakfast food selections with a food that can help alleviate child obesity.

In addition, Williams Natural Waffles are affordable compared with breakfast items currently served in most schools. The waffles are natural sweetened, and there are up to 10 recipe varieties that would appeal to any student's taste. Students who have limited opportunity to consume a nutritional breakfast at home also could benefit from this project.

Economic Impact

In addition to Lisha Williams' company realizing financial returns, this project can have an economic impact for schools and the students they feed daily. The waffles are affordable for schools, and school service directors have suggested they may choose up to five varieties of the waffles for their schools – one flavor for each day of the week.

Continuing Work

Currently, the FAPC and Williams are working to determine the most cost-efficient method to produce the waffles. A decision must be made whether to purchase equipment and select a location for a local plant or to employ a co-packer who has additional capacity and is willing to adhere to the waffle recipe specifications.

Publications

No publications have resulted from the project at this time, but an *FAPC Flash* will be published when the product is in initial production.

Funding

The client has funded the project through the current status. However, several potential partners and investors have expressed interest in joining the project once a decision is made concerning the method of production and distribution.

Collaborators

Jim Brooks, FAPC business planning and marketing services manager, was the principal investigator for this project. Other collaborators included Darren Scott, FAPC food scientist/sensory specialist, and Dr. Patricia Rayas, FAPC cereal chemist.

Redland Juice: Expansion of Sales and Co-processing Opportunities

Objective

Redland Juice Company of Lexington sells juices to gift shop and gourmet food retailers, tourism shops, wineries, health food stores, farmers' markets, and grocery stores in Oklahoma and surrounding states. The company received a Value-Added Producers Working Capital Grant from the U.S. Department of Agriculture. The FAPC is a major collaborator, providing in-kind services valued at $30,000. The primary objective of this project was to expand market sales and co-processing arrangements for Redland Juice.

Approach

The FAPC's contributions to Redland Juice's efforts include feasibility analysis, a market distribution study, and the development of brochures, marketing materials, and other communication pieces. Additionally, the FAPC has advised the company about business and technical needs.

Benefits

There is an increased demand for locally produced foods and beverages among consumers, especially those who make purchases at the Oklahoma Food Cooperative, as well as shoppers of farmers' markets, health food stores, and gourmet food and gift shops. Redland Juice is well positioned to fill this market niche. Redland Juice winery customers benefit by having available a local source for non-alcoholic beverages, including juices that can be produced using the specific winery's own grapes. This has been reported by Oklahoma wineries as a favorable alternative to offering juices to their customers; their customers have expressed the appreciation in having the opportunity to taste and buy a locally raised/produced product. Finally, studies have demonstrated the consumption of antioxidants in grape juice provide health benefits. Redland Juice is a pure juice that is not reconstituted from concentrate, and therefore, it is a high-quality source of nutrition and flavor.

Economic Impact

Currently, Redland Juice employs two people on a full-time basis and hires part-time labor on a seasonal basis. Plans to hire an additional full-time employee are included in this grant project. Therefore, the total estimated full-time employment of Redland Juice is five jobs. Utilizing input-output analysis to estimate the employment-multiplier effect shows these five jobs contribute toward an additional 2.25 jobs in the local economy (multiplier of 1.45).

Thus, Redland Juice provides a total economic impact to the local economy of seven jobs. The estimated income multiplier is 2.19; therefore, for every $1,000 in sales Redland Juice achieves, the local economy experiences a total sales impact of $2,190.

Continuing Work

Already, increased co-processing contracts and sales to gourmet and gift shops are being realized. Completion of the distribution study will provide Redland Juice the information necessary to develop an aggressive and effective marketing campaign for the gourmet and gift shop segment.

Funding

A USDA Value-Added Producer Grant Program, the client, and in-kind services from the FAPC funded this project.

Collaborators

Chuck Willoughby, FAPC business and marketing relations manager, was the principal investigator for this project. Other collaborators included Mandy Gross, FAPC communications services manager; Ruth Bobbitt, FAPC communications graduate student; Keneshia Reed, graduate student; Kristi Bishop, undergraduate student; and Dr. Rodney Holcomb, FAPC agribusiness economics specialist.

YarBQ Sauce: Development of White and Spicy White Barbecue Sauce

Objective

The primary objective of this project was to use the FAPC Client Success Path to assist Jake and Shelly Yarbrough develop, commercialize, and market their family's white barbecue sauce for retail sale.

Approach

White barbecue sauce, which is native to the barbecue shacks of Alabama, is a unique addition to the current retail market of tomato-based red barbecue sauces. At barbecue competitions, Jake Yarbrough always seemed to receive rave reviews for his white and spicy white barbecue sauces, which are served with pork and chicken. Jake and his wife, Shelly, attended the FAPC Basic Training Workshop in July 2006, and in 2007, they decided to pursue options to take their sauce from the competition circuit to the retail shelf. The FAPC helped the Yarbroughs follow the FAPC Client Success Path, which helps clients reach goals through a route proven successful by several past clients. To date, the FAPC has helped the Yarbroughs develop a business plan and scale up their recipe for mass production.

Benefits

A unique, white barbecue sauce will be new to the region and the retail market. Therefore, consumers benefit from a choice between the standard tomato-based barbecue sauces that are currently seen on store shelves and this new product.

Economic Impact

As a result of this project, a new start-up company will be developed, which will eventually benefit Oklahoma's economy.

Continuing Work

This project is in its initial stages of development, and several steps are yet to be completed. These steps include co-packer identification, test market production in the FAPC Pilot Plant, and market development assistance through tradeshow participation.

Funding

The FAPC and the client funded this project.

Collaborators

Erin Early, FAPC business/marketing client coordinator, was the principal investigator of this project. Other collaborators include Darren Scott, FAPC food scientist/sensory specialist, and Dave Moe, FAPC pilot plant manager.

Augusto's Green Sauce

Objective

The primary objective if this project was to increase sales and production volume of Augusto's Green Sauce through a foodservice entity.

Approach

Tracey Schlupe of Tulsa has been selling Augusto's Green Sauce in many specialty stores around the state and nation through the Internet. Schlupe called the FAPC for ideas to increase sales, product line, and production volume. The FAPC approached Hideaway Pizza, a popular Oklahoma-owned restaurant located in Stillwater and eight other Oklahoma City and Tulsa metropolitan areas, to carry Augusto's Green Sauce. Hideaway and the FAPC marketing department developed sandwiches using the sauce, the sauce was offered as a dipping sauce for the restaurant's signature fried mushrooms. The FAPC communications department developed and designed a table tent to introduce and promote the new items. This special promotion was successful, and the new menu items are now included on Hideaway's menu as a permanent item.

Benefits

This project can help Augusto's Green Sauce reap the benefits of an increased production volume. Hideaway Pizza can benefit through an increase in sandwich sales and by being seen in a positive light by its customers for supporting Oklahoma companies.

Economic Impact

The addition of Augusto's Green Sauce at Hideaway Pizza, hopefully, will result in more consumers knowing about Augusto's products and an increase in sales, which in turn will help Oklahoma's economy.

Continuing Work

Augusto's is continuing to expand into other Hideaway Pizza franchises in Oklahoma. Schlupe also has been approached by Wild Oats grocery stores to provide an all-natural version of Augusto's Green Sauce. Schlupe is exploring this idea and may collaborate with another FAPC client, Wagon Creek Creamery of Helena, to generate some of the ingredients for this new recipe.

Funding

The client and the FAPC provided funding for this project.

Collaborators

Andrea Graves, FAPC business planning and marketing specialist, was the primary investigator for this project. Other collaborators include Mandy Gross, FAPC communications services manager, and Ruth Bobbitt, FAPC communications graduate student.

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

Effect of Water Stress on the Storage and Membrane Proteins of Wheat

Objective

The primary objective was to study the environmental changes on the protein expression in wheat by comparing wheat grown under normal and water-stressed conditions.

Approach

To achieve these objectives, wheat was grown in a greenhouse under both optimal and water-stressed conditions and grain harvested during the grain-filling period at 14, 34, and 60 days after flowering. Biochemical methods were used to extract and separate proteins. Storage and membrane proteins were analyzed by one- and two-dimensional electrophoresis and the mass finger printing analysis of each protein was obtained by MALDI-TOF Mass Spectrometry. Public databases were used to identify the proteins expressed during the grain-filling periods. Significant proteins were matched on the database search. The spectra of each protein will continue to be analyzed as the databases are updated to further expand the identification of proteins.

Benefits

The scope of this project has direct potential benefits to wheat growers by enhancing basic knowledge of the biochemical controls that take place in grain proteins as they are formed in the plant. Basic knowledge of the mechanisms controlling the expression of wheat proteins will translate in a better understanding of how proteins are affected during periods of drought. In the long term, this knowledge will be incorporated into other OSU programs, such as the winter wheat breeding program, for the production of more efficient cultivars.

Economic Impact

By helping to improve hard winter wheat cultivars, this project can play an essential role in maintaining and increasing the competitiveness of U.S. winter wheat production in the world market.

Continuing Work

The identification of the proteins in this project depends on the development of public databases containing identified wheat proteins and closely related plants. At the present time, the wheat proteins database is limited, but it is growing at a steady rate. As an example, the identification rate of storage protein averaged 65 percent, which is quite good. This means that 35 percent of the proteins expressed in the wheat endosperm did not match the public database of wheat. As more proteins from wheat and other related plants are identified by researchers around the world, the success of identifying the proteins found in this project will continue to expand.

Publications

Two academic poster presentations have been completed as a result of this project.

Funding

The FAPC, the Oklahoma Wheat Research Foundation, and the Oklahoma Agricultural Experiment Station provided funding for this project.

Collaborators

Dr. Patricia Rayas Duarte, FAPC cereal chemist, was the primary investigator for this project. Other collaborators included Fadi Al Jorf, FAPC graduate student; Palgunan Kalyanaraman, FAPC research specialist; Dr. Patricia Ayoubi, assistant professor of biochemistry and molecular biology; and Dr. Steve Hartson, biochemistry and molecular biology assistant research professional.

Oklahoma Living Benefit Bake-Off

Objective

The primary objective of this project was to raise money for Oklahoma charities. The beneficiaries were three therapeutic riding centers: Angel Fire Equestrian Center in Coyle, Harvest Farms Therapeutic Riding Center in Shawnee, and The Right Path Therapeutic Riding Academy in Drumright.

Approach

Each year, *Oklahoma Living* magazine and the FAPC work together to sponsor a recipe contest for the magazine readership. The recipe contest and bake-off benefit local charities. FAPC faculty and staff worked together to coordinate and provided expertise for recipe evaluation, baking, and judging.

Benefits

The FAPC and *Oklahoma Living* hope to entice consumers to home bake. Baking at home may entail the consumer visiting the grocery store to purchase new, rarely used, or Made in Oklahoma ingredients.

Economic Impact

This year, *Oklahoma Living* encouraged entrants to use Made in Oklahoma products or ingredients in its entered recipes. As a result, consumers were provided an opportunity to support locally grown and produced food products and ingredients.

Publications

The results of the contest were published in the December 2007 issue of *Oklahoma Living.*

Funding

Oklahoma Living and the FAPC funded this project.

Collaborators

Renée Albers-Nelson, FAPC milling and baking specialist, was the primary investigator for this project. Other collaborators included: Emily Boldrin, undergraduate student; Dr. Tim Bowser, FAPC food process engineer; Barbara Brown, extension food specialist; Erin Early, FAPCbusiness/marketing client coordinator; Mandy Gross, FAPC communications services manager; Dr. William McGlynn, FAPC horticultural products processing specialist; David Moe, FAPC pilot plant manager; Betty Rothermel, FAPC administrative assistant; Darren Scott, FAPC food scientist/sensory specialist; Mary Selk, retired extension educator; Karen Smith; FAPC administrative support specialist I/workshop coordinator; Connie Walker, animal science administrative assistant; Chuck Willoughby, FAPC business planning and marketing relations manager; and Jason Young, FAPC quality management specialist.

Photo Provided by Oklahoma Living

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

Developing a Brand Identity for an Oklahoma Company

Objective

The purpose of this project was to develop a new brand identity for Lazy i Farms. This new brand identity included indentifying a new name for the company, developing a logo, and desiging product labels, brochure, and letterhead.

Approach

Lazy i Farms produces 100 percent all natural soaps and lotions. The company began its soap-making venture as a way to combine its love of goats and find a product that would be a natural alternative to medication for eczema and dry skin.

Lazy i Farms came in contact with a company that the FAPC had previously assisted, and the Lazy i Farms owners expressed their desire to develop a new branding scheme for their products. The FAPC client recommended Lazy i Farms contact the FAPC for help in developing its new brand identity.

The FAPC met with Lazy i Farms several times to discuss ideas for its new name, logo, labels, and brochure. Once a new name for the company was agreed upon (Lost Creek), the FAPC provided information about getting the name trademarked.

The FAPC then proceeded to design a new logo for the company incorporating its new name, as well as product labels, brochure, and letterhead.

Benefits

This project allows Lazy i Farms (Lost Creek) to have a consistent message throughout all of its products and promotional material. Having a consistent brand is a sign of promise and mark of trust to the consumer.

Economic Impacts

Developing a consistent brand for Lazy i Farms (Lost Creek), hopefully, will cause consumers to be more aware of the company's products and increase sales, which will eventually benefit Oklahoma's economy.

Continuing Work

The FAPC will continue to work on this project through 2008 until it is completed.

Publications

As a result of this project, a news release and *FAPC Flash* will be published highlighting the communications assistance for an Oklahoma company.

Funding

Lazy i Farms (Lost Creek) provided funding for this project.

Collaborators

Mandy Gross, FAPC communications services manager, was the principal investigator for this project. Other collaborators included Erin Early, FAPC business and marketing client coordinator, and Ruth Bobbitt, FAPC communications graduate assistant.

- *Analytical Chemistry*
- *Business Planning & Marketing*
- *Cereal Chemistry*
- *Communications*
- ***Food Engineering***
- *Agribusiness Economics*
- *Horticulture Processing*
- *Food Microbiology*
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- *Quality Control & Assurance*
- *Value-Added Wood Products*

Continuous Riboflavin Production by Candida Flareri Immobilized in Calcium Alginate Capsules

Objective

The purpose of this project was to develop an immobilization technique for continuous production of riboflavin for comparison to suspended growth systems.

Approach

Calcium alginate capsules were prepared using various nonionic surfactants, and the effect of the various surfactants on the diffusion of glucose and riboflavin through hollow capsules was investigated. Using the optimum capsule formulation, the yeast *Candida Flareri* was immobilized in the capsules.

The performance of three immobilized yeast bioreactors producing riboflavin using hollow calcium alginate capsules was investigated. Capsules were prepared with and without the addition of nonionic surfactants, and a suspended growth system also was included. Both riboflavin production and glucose consumption were monitored to compare fermentation efficiencies of the various systems. Increasing dilution rate in continuous bioreactors generally increases production rate. However, the dilution rate is limited either by maximum specific growth rate in a suspended system, or by diffusion rates in an immobilized system.

The effect of increasing dilution rates on reactor performance was studied as well, comparing productivity in traditional suspended growth systems versus the newly developed immobilized cell system.

Benefits

Riboflavin is an important B vitamin, and much of its production occurs via biological fermentation. Results from this work show that the use of an immobilized encapsulation system could result in a more efficient fermentation process. This technology could be applied to numerous other fermentation processes as well.

Economic Impacts

As the fermentation process becomes more productive and more efficient, this results in lower production costs, less waste generation, and ultimately lower costs to processors who use riboflavin as a vitamin ingredient.

Publications

As a result of this research, a doctoral dissertation has been published, and two journal articles are in development.

Funding

A grant from the U.S. Department of Energy for a Bio-based Products Graduate Program provided funding for this study.

Collaborators

Dr. Dani Bellmer, FAPC food process engineer, was the principal investigator for this project. Other collaborators included Houssam Alosta, FAPC graduate student; Dr. William Clarkson, OSU–Tulsa associate professor of civil and environmental engineering; and Dr. Mark Wilkins, assistant professor of biosystems engineering.

Encapsulation of Confidential Products Used in Oil and Gas Recovery

Objective

The primary objective of this project was to determine important factors in the manufacturing process of encapsulated products used to enhance recovery of oil and gas from wells.

Approach

This project began with a designed experiment to determine the most important factors of an encapsulation process. Encapsulation is the process of coating of a product with a given substance. M&Ms is an example of an encapsulated chocolate.

Two types of dehydration equipment were used and factors such as level of mixing, product pH, and raw materials suppliers were varied at different levels. The experiment, or screening study, allowed FAPC researchers to perform a relatively small number of tests to determine the most important parameters and their interactions.

Results of the designed experiment clearly indicated the optimum manufacturing process. A subsequent designed experiment focused on a single dehydration device and a fixed pH; the purpose was to learn more about critical interactions that were discovered between the factors of mixing and the raw materials source.

Benefits

This project may result in increased yield of oil and natural gas from wells. Subsequently, oilfield suppliers may gain new business.

Economic Impact

The project resulted in a new product and manufacturing process for CESI Chemical of Marlow. In addition, there is potential for the creation of three to five new jobs and $2 million in new business.

Continuing Work

The next steps in this project are to refine experimental results, research different dehydration techniques or equipment as requested by the client, and design a full-scale production process if requested by the client.

Publications

No publications will result from this confidential project except internal documents for the owner.

Funding

The client funded this project.

Collaborators

Dr. Tim Bowser, FAPC food process engineer, was the principal investigator for this project. Other collaborators included Dr. Patricia Rayas, FAPC cereal chemist; Dr. Christina DeWitt, assistant professor of food science; Stacy Kowalski, undergraduate student; and Ben Smith, undergraduate student.

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

ECONOMIC IMPACT

Robert M. Kerr Food & Ag

Objective

The primary objective of this project was to determine the statewide economic impact of the FAPC through its contributions to the food and fiber processing industries of Oklahoma.

Approach

During January and February of 2007, the Oklahoma State University Bureau for Social Research performed a survey of FAPC clients using a list of phone numbers for 898 non-duplicate potential respondents from the FAPC's client database. In the end, 343 surveys were completed (including partial completions), accounting for 38.2 percent of the population.

Respondents provided information about their business operations, the level and types of assistance received from the FAPC, when assistance was received, and the value they attributed to the assistance received from the FAPC. Results of the survey showed that regardless of when they first received assistance from the FAPC, more than 70 percent of respondents had received some level of assistance from the FAPC within the past three years. Fifty-six percent of the respondents were classified as start-up businesses, which means they did not exist prior to the 1997 opening of FAPC and utilized the FAPC resources and personnel to start their operations.

As part of the survey, respondents were asked to provide both their 2006 annual sales and employment data and the changes in annual sales and in employment they attributed to assistance received from the FAPC. These values represent the direct economic impacts of the firms and the direct economic impacts attributed to the FAPC, respectively. To determine the full "ripple effect" of these business activities on the state's economy, the indirect and induced impacts of these firms were estimated using the input-output model IMPLAN. IMPLAN uses geography-specific industry data, down to the county level if desired, to assess the level of economic "ripples" created by business activity. IMPLAN assumes production functions for each industry segment down to the four-digit North American Industry Classification System (NAICS) code; each industry segment utilizes certain services and inputs that are purchased from other firms, hence the indirect and induced economic impacts.

To determine the value of the FAPC itself, dichotomous choice contingent valuation questions were used in the survey to determine the value respondents associated with specific FAPC services. Four services provided by the FAPC were chosen to be valued in the survey: Basic Training, the monthly entrepreneurial workshop; laboratory services; technical assistance provided on-site at the client's business location; and technical assistance provided at the FAPC. To prevent harming the relationship between the clients and the FAPC and to prevent nay-saying responses, before each contingent valuation question, the respondent was assured that his or her response would not affect the cost of the services provided by the FAPC. Also,

T AND VALUE OF THE
ricultural Products Center

to prevent the tendency of a respondent to answer yes to any bid presented regardless of his or her true values, an additional question was used to find if the time and expenses he or she personally invested in the service was valued higher or lower than the value he or she perceived from the service.

Benefits

The techniques used during this survey could serve as a model for other value-added centers in states wanting to assess its statewide impacts.

Economic Impact

Table 1 illustrates the estimated and employment and sales impacts generated by responding FAPC clients. In total, these firms account for more than 52,000 jobs and more than $6.3 billion in economic activity in Oklahoma.

The levels of economic activity directly attributed to the FAPC totaled 157 full-time jobs and almost $93 million in sales. Of special emphasis is the fact the $93 million represents an impact on annual sales, not cumulative sales since the firm first received FAPC assistance. Once again using IMPLAN to estimate the full economic impact generated by the FAPC through assisting these firms, the total direct, indirect, and induced impacts were estimated at 800 jobs and more than $308 million in economic activity for 2006 (Table 2).

Respondents also were asked to rate the value of the services as either far more valuable than the expenses incurred, slightly more valuable, about the same value, slightly less valuable than the expenses incurred, or not valuable at all. Willingness-to-pay estimates had varying ranges for each service category. For brevity, only the responses of far more valuable than the expenses incurred and mean willingness-to-pay figures are listed in Table 3.

Continuing Work

The project was completed in the summer of 2007.

Publications

Output from this project includes a master's thesis, a special 10th anniversary economic impact report prepared for the FAPC stakeholders and the media, and a forthcoming manuscript to be submitted to a peer-reviewed journal.

Funding

The Charles B. Browning Endowed Professorship for Food Science funded the project.

Collaborators

Dr. Rodney Holcomb, FAPC agricultural economist and Charles B. Browning endowed chair, was the principal investigator for this project. Other collaborators included Justin McConaghy, graduate student in agricultural economics; Dr. Mike Woods, agricultural economics professor and head; Dr. Brian Briggeman, assistant professor of agricultural economics; and Chuck Willoughby, FAPC business planning and marketing relations manager.

Table 1: Impacts of Responding FAPC Clients on Oklahoma's Economy*

	Direct	Indirect and Induced	Total
Employment**	8,863	43,627	52,490
Sales/Income for 2006	$1,949,016,382	$4,417,399,316	$6,366,415,698

*Impacts by four-digit NAICS category are available upon request.
**Part-time employment figures were converted to appropriate full-time equivalents and included in these impacts.

Table 2: Economic Impacts Directly Attributed to FAPC by Respondents*

	Direct	Indirect and Induced	Total
Employment	157	643	800
Sales/Income for 2006	$92,866,841	$215,629,039	$308,495,880

*Impacts by four-digit NAICS category are available upon request.

Table 3: Selected Results from Survey Questions Related to the Value of FAPC Services

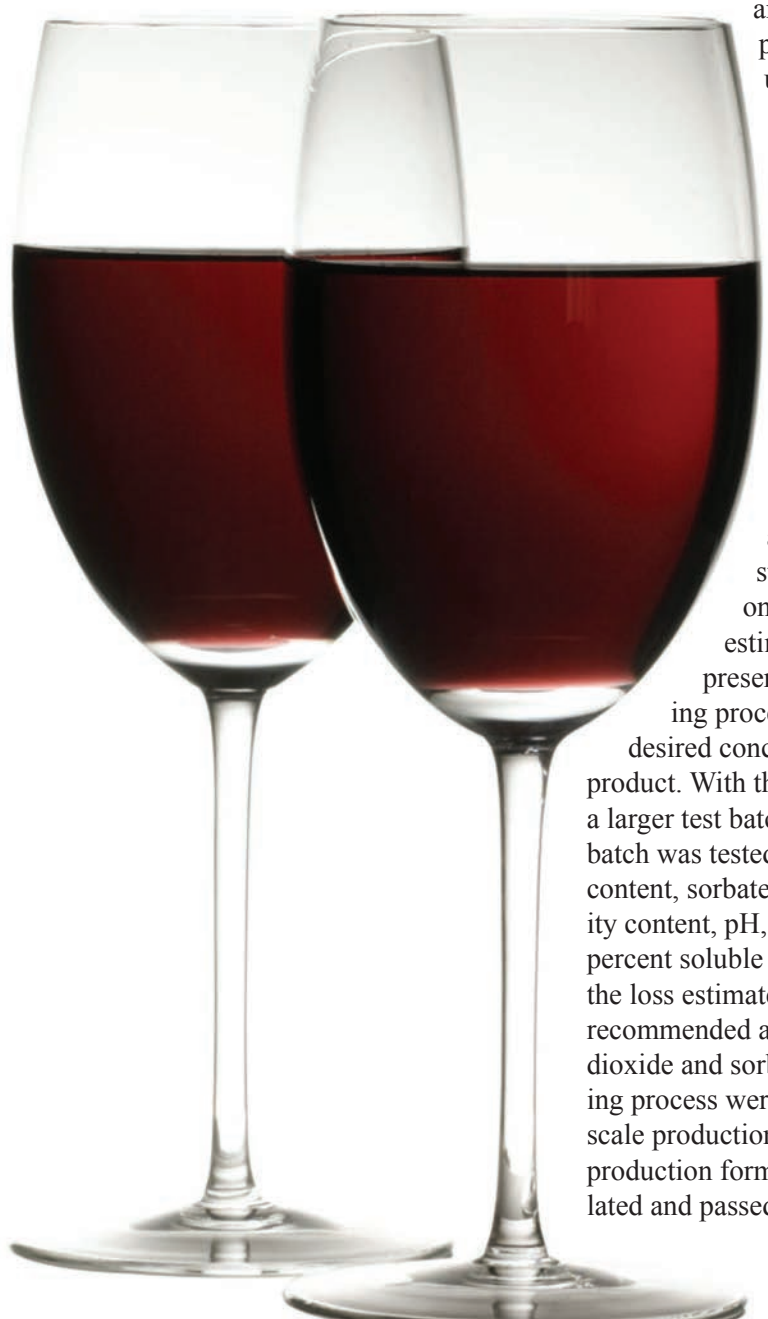
FAPC Services	Rated FAPC Service Value Far Greater than Actual Cost	Mean Willingness-To-Pay for FAPC Services
Basic Training workshop	59.83%	$267.72 per workshop
Laboratory services	64.86%	$531.92 per day
On-site technical assistance	65.52%	$653.69 per day
FAPC technical services	78.13%	$511.62 per day

- *Analytical Chemistry*
- *Business Planning & Marketing*
- *Cereal Chemistry*
- *Communications*
- *Food Engineering*
- *Agribusiness Economics*
- ***Horticulture Processing***
- *Food Microbiology*
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- *Quality Control & Assurance*
- *Value-Added Wood Products*

Wine-based Beverage Stabilization Project

Objective

The goal of this project was to determine what levels of preservative addition would be required to ensure product stability of a wine-based beverage while maintaining acceptable sensory characteristics and remaining within regulatory limits.



Approach

The base ingredients in the beverage were analyzed for certain basic chemical characteristics and for preservative content. The preservatives used, sulfur dioxide and potassium sorbate, are somewhat volatile and subject to losses during processing. Their use also is limited by federal regulations, and they are capable of producing off-flavors if used in excess. Therefore, FAPC researchers needed to know how much of each preservative might be lost in the production of this specific product. Researchers first added a fixed amount of each preservative to a small test batch and measured preservative content before and after blending and sterile filtering. Based on this information, they estimated the amounts of preservatives to add during processing to achieve the desired concentration in the final product. With that information in hand, a larger test batch was prepared. This batch was tested for sulfur dioxide content, sorbate content, volatile acidity content, pH, titratable acidity, and percent soluble solids. Having verified the loss estimates for the test batch, recommended addition rates for sulfur dioxide and sorbate during the blending process were calculated for large-scale production batches. Scaled-up production formulas also were calculated and passed along to the client.

Benefits

This project benefited consumers by producing a safe, stable, high-quality product. The clients were able to access analytical equipment and technical expertise they could not have obtained in-house. This assistance allowed the clients to produce their product more efficiently in bulk while maintaining confidence in the product's stability during storage. They also were assured they could produce a beverage that complied with applicable federal regulations relating to product definitions and maximum permitted levels of preservatives.

Economic Impact

As a result of this project, the clients were able to save money and maximize product consistency and quality.

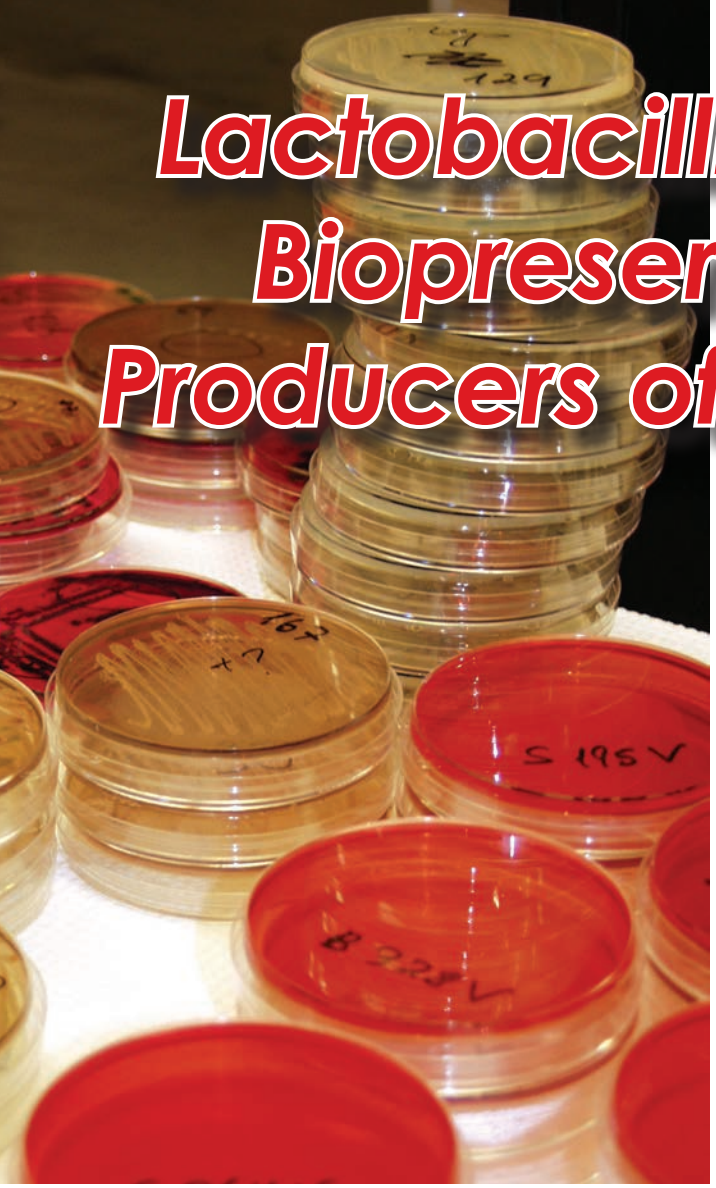
Funding

FAPC maintenance funding and client-paid fees funded this project.

Collaborators

Dr. William McGlynn, FAPC horticultural products processing specialist, was the principal investigator for this project. Other collaborators included Dr. Guadalupe Davila El-Rassi, FAPC analytical services manager; Richelle Stafne, FAPC horticultural processing research specialist; Darren Scott, FAPC food scientist/sensory specialist; and Yannis Oikonomakos, graduate student.

- *Analytical Chemistry*
- *Business Planning & Marketing*
- *Cereal Chemistry*
- *Communications*
- *Food Engineering*
- *Agribusiness Economics*
- *Horticulture Processing*
- ***Food Microbiology***
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- *Quality Control & Assurance*
- *Value-Added Wood Products*



Lactobacilli as Probiotics, Biopreservatives, and Producers of Nutraceuticals

Objective

This report focuses on a portion of an Oklahoma Agricultural Experiment Station project. The primary objective of this part of the project was to identify and select cultures of lactobacilli that have the best potential for exerting control of food borne pathogens in livestock. Such control can minimize the incidences of entrance of these pathogens into meat processing facilities. One criterion for such selection is to select one that has the greatest impact on the immune system of the animal, which has been identified as the primary mechanism these probiotics use to help control intestinal pathogens.

Approach

The project involved measuring the effect of feeding a culture of *Lactobacillus acidophilus* to weaning-age pigs on the immune response (immunoglobulin levels) of the animals. There was a trend toward an increased response in IgA amd IgG following a challenge with lipopolysaccaride from a gram-negative bacterium in the animals that had been fed the lactobacilli compared to the control animals. This is an indication that the animals being fed the probiotics could respond faster to an intestinal infection by producing more immunoglobulins faster than animals not fed the probiotics.

A feeding trial is currently being done to compare different strains of lactobacilli to determine if there is variation among strains of the organism with respect to causing a beneficial response in immunoglobulins using the pig as an animal model.

Benefits

While this type of research can benefit livestock producers, this project also has beneficial implications for consumers. By controlling the intestinal pathogens in the animals during production, the incidence of the pathogens introduced into meat processing plants and ultimately passed on to the consumer can be reduced.

It also has implications with respect to the selection of probiotics cultures for human consumption since it may lead to yet another characteristic important in selecting those probiotics cultures.

Economic Impact

This research could result in increased intellectual property revenue for Oklahoma State University, which would provide increased research funding and financial support for graduate students.

Continuing Work

Work will continue to successfully complete the feeding trial that is underway.

Publications

A master's thesis and four articles in peer-reviewed journals have been published as a result of this study.

Funding

The Oklahoma Agricultural Experiment Station and the Sitlington Chair Endowment and Royalty Funds provided funding for this project.

Collaborators

Dr. Stan Gilliland, FAPC food microbiologist and Sitlington Endowed Chair in food microbiology, was the principal investigator for this project. Other collaborators included Dr. Paloma Cuesta, FAPC postdoctoral research associate and Jennifer Nangle; FAPC microbiology manager. Graduate students Megan Bible, Trenna Blagden, Lacey Smith Guillen, Mindy Cauldwell James, and Imee Tudor also provided research assistance.

Analysis of Slime Formation on Canadian Bacon

Objective

The primary objective of this project was to identify the causes of slime formation on Canadian bacon processed by a local processor.

Approach

Samples of Canadian bacon returned to a local processor from customers were examined microbiologically for typical slime-forming lactic acid bacteria. The bacteria were identified as *Leuconostoc mesenteroides* from biochemical and DNA analysis by PCR. These particular bacteria have a gene that makes copious amounts of slime (i.e., dextrans) from sucrose. When questioned, the local processor indicated the recipe of the manufacturer recently was changed to sucrose prior to the products being returned with "slime." Although these are non-harmful bacteria, the slime produced on ready-to-eat meats is aesthetically unappealing to customers.

The data suggested these are indigenous bacteria to raw meats and are commonly present in the raw formulation area. One easy remedy would be to revert back to glucose (dextrose) sugar instead of sucrose, as the bacteria do not make "slime" on glucose and were likely present prior to the switch to sucrose without any ill effects on the product. It was identified the large food service customer preferred sucrose, but it was not an option.

Samples were taken at both the manufacturing plant of the supplying company and the processing plant of the local processor. Isolates from the manufacturer were found on both workers that packed product and on equipment surfaces. The manufacturer had both the disadvantage of having the raw ingredient stuffing area in close proximity to the RTE pack area, but the advantage of the process line from cook-to-packing was short and linear. The local processor also tested positive for isolates of the slime-forming bacteria. Although it was easy to suggest the bacteria were carried by the manufacturer's product, it was necessary to examine this further to ensure this was the case as these bacteria are endemic to most meat processors and replacement of the manufacturer for another may not eliminate the problem if the bacteria were indigenous to the local processor's facility.

Benefits

The benefit is mostly to help the large local processor who provides this product to a major fast food chain and could possibly lose a portion of its business if this were to continue. It also could be argued that if unwanted contaminants can survive and be distributed on the product, then it may be possible that pathogenic bacteria can survive as well. Consumers would benefit from having a better quality and safer product.

Economic Impact

The product represents a multi-million dollar product line for the processor.

Continuing Work

FAPC researchers helped identify an agar medium to readily identify whether slime-producing lactics were present. Researchers also helped with the analysis of DNA fingerprinting by Ribotyping and indicated this was not sufficient to discriminate between the various strains (to help identify commonality of microbes from various sources). The company subsequently used pulsed-field-gel-electrophoresis, which is a bit more discriminating. Researchers also examined the ability of liquid smoke extracts and electrolyzed water to help reduce potential levels of the slime organisms on product and/or equipment surfaces.

Publications

One student poster presentation has been completed about the project, and there are plans to publish a journal paper following additional experiments.

Funding

The client provided funding for this project.

Collaborators

Dr. Peter Muriana, FAPC food microbiologist, was the principal investigator for this project. Other collaborators included Jeffrey Gruntmeir, FAPC food microbiologist research specialist, and graduate students Leenalitha Panneerseelan, Kalpana Kushwaha, Sunita Macwana, and Shawnna Veasey.

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

Beef Chuck Innovations and Value Opportunities

Objective

The primary objective of this project was to explore innovative fabrication, preparation, and presentation methods of the beef chuck roll.

Approach

The U.S. meat industry has been characterized by long-standing, traditional methods for product fabrication and presentation. To address sluggish changes in the industry, a new products initiative has been identified and funded by the beef check-off program. This initiative has seen success throughout the last 10 years, with changes in beef sub-primal fabrication and subsequent product marketing successfully evolving. The result is novel approaches to making and marketing beef products. Most of this success has been exemplified by the presence of "new" products such as the "petite tender" and "flat-iron steak," which have successfully entered the marketplace.

This success, coupled with increased domestic supplies of beef chuck rolls resulted in beef innovators seeking opportunities to take a similar path with regard to beef chuck roll processing and marketing. The FAPC joined forces with the Beef Innovations Group to identify opportunities for the chuck roll. The Beef Innovations Group is a team of experts who collaborate and conduct activities that provide the industry with product ideas and tools to make their new beef products successful. The facilities and expertise of the FAPC provide an excellent partnership for all the processes associated with product development and evaluation.

Benefits

The partnership between the FAPC and product innovators like the Beef Innovations Group exhibits far-reaching benefits. New product discovery benefits the consuming public by providing novelty and variety in beef products for consumption. New product discovery can expose value-added opportunities for those processors beyond the packing level who specialize in those processes needed to transfer the product to market. The Beef Innovations Group benefits from the facilities and expertise of the FAPC as an additional resource for product development needs. Finally, the FAPC benefits from this partnership in the form of networking and industry exposure.

Economic Impact

Market price data has not yet been discovered or collected. It is assumed that like the success of the beef shoulder clod, processors can capitalize on value opportunities in the chuck roll, as consumers pay for convenience, predictability, and satisfaction. Moreover, impacts in meat processing industries may be evident as the need for further processors increases with increased demand for new products.

Continuing Work

Currently, an extension to the current partnership is developing between the FAPC and the culinary arts program at OSU-Okmulgee. The intention is to evolve the product development process to include culinary-arts evaluations and recommendations. Often, traditional product development includes very little, if any, evaluation by culinary professionals. The input received by this type of evaluation should give totality to the final recommendations provided to the processor and consumer.

Publications

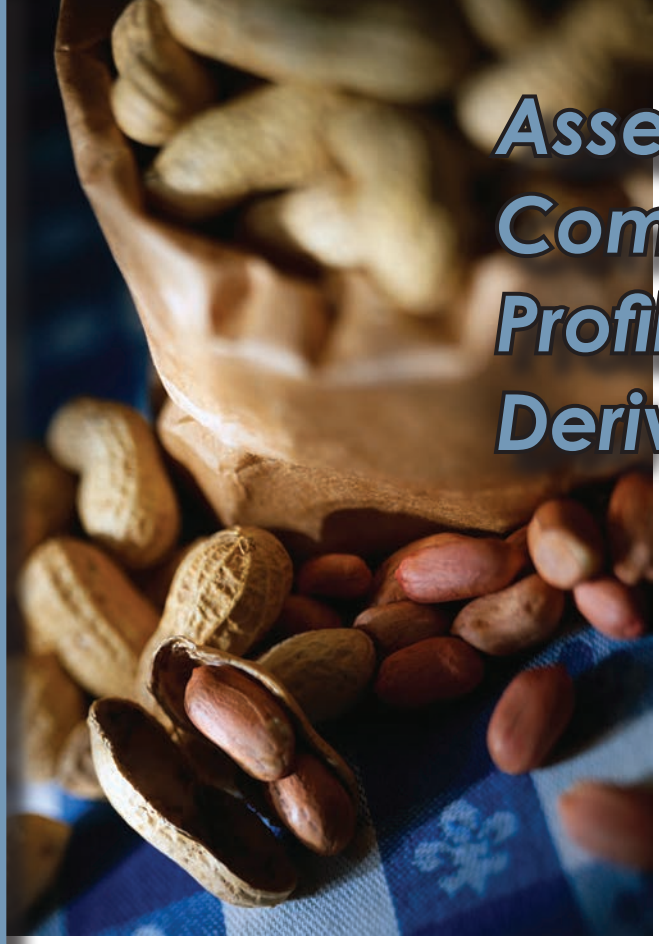
FAPC *Product Profiles* will be published about the beef chuck roll.

Funding

The FAPC, the National Cattleman's Beef Association, and Mata and Associates funded this project.

Collaborators

Jacob Nelson, FAPC value-added meat processing specialist, was the principal investigator for this project. Other collaborators included the National Cattlemen's Beef Association; Tony Mata of Mata and Associates; David Moe, FAPC pilot plant manager; Kyle Flynn, FAPC meat pilot plant manager; Guadalupe Davila-El Rassi, FAPC analytical services manager; and Andrea Graves, FAPC business planning and marketing specialist.



Assessment of Nutritional Composition and Flavor Profile of Biotechnology-Derived Peanut Varieties

Objective

The primary objective of this research project was to evaluate nutritional safety of transgenic peanut varieties.

Approach

Genetic engineering has been used to modify peanut varieties for improving agronomic performance and pest resistance. Food manufacturers are required by law to ensure the safety and quality of their products regardless of the source and identity of the ingredients. According to the Federal Food, Drug, and Cosmetic Act, producers of new foods have an obligation to ensure the foods they produce are safe and in compliance with applicable legal requirements. These requirements include demonstration that genetically modified foods do not contain substantially increased levels of previously known toxic substances, new hazardous substances, or different levels of nutrients than traditional counterparts.

In the safety assessment of biotechnology-derived foods, it is helpful to compare the new plant variety to its traditional counterpart because the counterpart has a history of safe use as a food. The flavor of peanut seed is an important characteristic influencing consumer acceptance. Hence, the flavor of the peanut varieties should be at least maintained during the genetic modifications.

In this study, three transgenic peanut lines – 188, 540 and 654 – and the parent line Okrun were examined for their oil, protein, ash, moisture, total dietary fiber, mineral, sugar, and fatty acid compositions. The flavor analysis was performed using a gas chromatograph/mass spectrometer equipped with an olfactory detector. The chemical composition and flavor profile of all peanut lines were within the range reported for traditional peanut varieties. This study indicated that, for the peanut lines studied, genetic modification did not cause substantial unintentional changes in peanut chemical composition, which might reduce the nutritional value of peanut.

Benefits

This research is the first study evaluating chemical composition and flavor profile of genetically modified peanut lines published in scientific literature. The data compiled in the study can be utilized by peanut geneticists to improve crop quality and/or develop new varieties. Peanut processors also can utilize this information for the selection of starting material and future food development applications. The implication of this study is significant, since it shows that peanut cultivars with greater pest and fungal resistance were successfully developed while maintaining their desirable flavor characteristics.

Economic Impact

Because it revealed these genetically modified peanut lines have increased disease resistance without reducing the nutritional quality of the crop, this study has the potential to increase peanut production.

Publications

Two masters theses and four journal articles have been published as a result of this study. An additional journal article is in development.

Funding

The Oklahoma Peanut Commission, Hatch Funds, and an FAPC graduate student assistantship provided funding for this project.

Collaborators

Dr. Nurhan Dunford, FAPC oil/oilseed chemist, was the principal investigator for this project. Other collaborators included FAPC graduate students Ramakanth S. Jonnala and Ee Chin Ng. Kelly Chenault of the U.S. Department of Agriculture-Agricultural Research Service in Stillwater also was a collaborator.

Collecting Carcass Yield Data from Cattle on a Feed Trial

Objective

The primary objective of this project was to collect beef carcass yield data from cattle that were on a feed trial.

Approach

To achieve the objective of this study, the FAPC Meat Pilot Plant received 268 beef carcasses selected at U.S. Department of Agriculture beef slaughter plants. The carcasses arrived in four intervals throughout a 14-week period.

The study involved collecting data about 60 sides per week for four weeks, 16 sides per week for seven weeks, and 120 sides during one week. Another 16 animals per week were harvested at the FAPC during a two-week interval.

During each project interval, the carcasses were divided into four treatment groups for statistical accuracy, and each group was fabricated using traditional Chicago style breaks.

Next, yield data were collected and verified for each primal. The primals were then vacuum packed, boxed, stored, and marketed for sale.

Benefits

Projections are that the cattle on the feed trial will have less days on feed thus higher feed efficiencies.

Economic Impact

The higher feed efficiency in cattle will reduce inputs and increase margins on cattle sales.

Funding

A private company provided funding for this project.

Collaborators

Kyle Flynn, FAPC meat pilot plant manager, was the primary investigator for this project. Other collaborators included Dr. Gretchen Hilton, animal science assistant professor; Dr. Deb Vanoverbeke, animal science assistant professor of meat science; Dr. Brad Morgan, animal science professor of meat science; Jake Nelson, FAPC value-added meat processing specialist, Scott Grumbles, FAPC meat pilot plant assistant coordinator; and numerous graduate students.

Developing a Frozen Chili Entrée Line

Objective

The primary objective of this project was to scale recipes for commercial processing.

Approach

The client currently has a specialty catering business that features menu items titled "Beef Chili" and "Beef Chili over Noodles." The client attended the FAPC Basic Training Workshop and soon after requested assistance in converting his existing catering recipes to commercial frozen entrees. His objective was to add value to his existing products and market them to present customers, as well as through convenience store channels. Recipes were tested and scaled up in the FAPC pilot processing facility. Preliminary cost estimates have been determined, nutritional facts calculated, and labels and packaging are being finalized. Discussions are currently in process with the co-packer.

Benefits

This project will allow the client's current customers to purchase the chili outside of a catered venue. These new value-added products also offer a convenient alternative to existing chili products in the marketplace.

Economic Impact

This project helped an existing business expand into a new market niche. It also provides additional opportunity for an existing Oklahoma co-processor.

Continuing Work

The next steps of this project include determining final pricing and marketing strategies and finalizing packaging and label design. In addition, the products will undergo preproduction testing at the co-packer to finalize "standard operating practices." Eventually, the products will be produced for customer presentations and test marketing.

Funding

The client and the FAPC funded this project.

Collaborators

The primary investigator for this project was David Moe, FAPC pilot plant manager. Other collaborators included Darren Scott, FAPC food scientist/sensory specialist; Erin Early, FAPC business/marketing client coordinator; and Jim Brooks, FAPC business and marketing services manager.

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

Assisting Client with Ingredient Formulation and Product Scale-up

Objective

The objective of this project was to help the client determine if it was possible for the company to manufacture an ingredient in house that they currently were purchasing from an outside vendor.

Approach

The FAPC worked with the client to formulate and manufacture several test batches of product utilizing the client's raw materials and ingredient guidelines as a set of specifications. Establishing a sufficiently low pH also was important to ensure the product maintained proper flavor and color during refrigerated storage, so the client also requested assistance with choosing the appropriate acidulants and preservatives to help extend the product's shelf life.

Small batches of product were first made in the test kitchen to allow collection of basic information about the client's process, weights, and formulation yield. Different acidulants and preservatives also were tested to measure their affect on pH and flavor. After the initial testing was completed, processing was moved to the pilot plant where larger batches of the client's product were manufactured. These formulations then were evaluated to determine if they met the desired requirements.

It was concluded that a combination of lactic, citric, and acetic acid was sufficient to lower the pH to the appropriate level without producing a product with an extremely harsh acidic flavor. Potassium sorbate and sodium benzoate also were found to be suitable preservatives for the product.

Benefits

By producing this ingredient in house, the client will be able to offer products to consumers at a lower cost.

Economic Impact

This project will help the client utilize in-house production of the ingredient, which can lower expenditures. In addition, the company will be able to manufacture the finished product faster and more efficiently.

Funding

The FAPC and the client funded the project.

Collaborators

Darren Scott, FAPC food scientist/sensory specialist, was the primary investigator for this project.

- *Analytical Chemistry*
- *Business Planning & Marketing*
- *Cereal Chemistry*
- *Communications*
- *Food Engineering*
- *Agribusiness Economics*
- *Horticulture Processing*
- *Food Microbiology*
- *Meat Science*
- *Oil/Oilseed Chemistry*
- *Pilot Plant*
- *Product Development*
- ***Quality Control & Assurance***
- *Value-Added Wood Products*

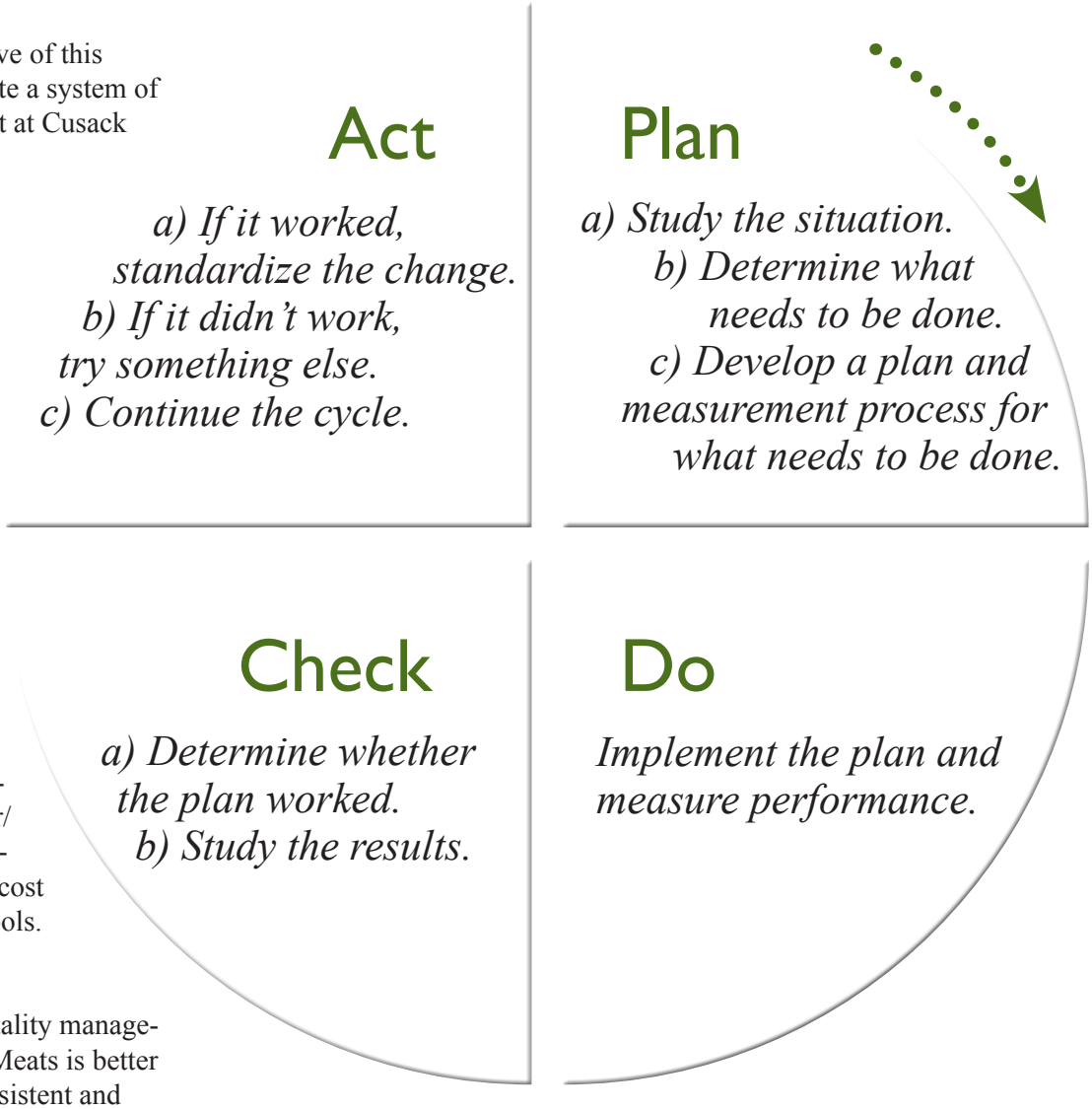
Incorporating a Process Improvement Initiative

Objective

The primary objective of this project was to incorporate a system of continuous improvement at Cusack Meats.

Approach

Cusack Meats saw the potential benefits of establishing quality management practices in the company and contacted the FAPC for assistance. The FAPC provided training to Cusack supervisors and employees in the following quality management concepts and practices: Quality 101, the Plan-Do-Check-Act model, vision and mission statements, internal customer/stakeholder/external customer relationships, the cost of quality, and quality tools.



Benefits

By establishing a quality management program, Cusack Meats is better prepared to produce consistent and efficient value-added products without increasing costs.

Economic Impact

Cusack Meats and other businesses that use quality and best practices can reduce product variation, increase customer satisfaction, reduce waste, and increase profits.

Continuing Work

The FAPC is continuing to work with Cusack Meats to facilitate a quality management project in the establishment and document the resulting financial improvement.

Publications

There are plans to publish information about this project in an *FAPC Flash* and in the *fapc.biz* magazine.

Funding

The FAPC funded this project.

Collaborators

Jason Young, FAPC quality management specialist, was the principal investigator for this project. Other collaborators included David Moe, FAPC pilot plant manager; Dr. Tim Bowser, FAPC food process engineer; and Jake Nelson, FAPC value-added meat processing specialist.

Analytical Chemistry

Business Planning & Marketing

Cereal Chemistry

Communications

Food Engineering

Agribusiness Economics

Horticulture Processing

Food Microbiology

Meat Science

Oil/Oilseed Chemistry

Pilot Plant

Product Development

Quality Control & Assurance

Value-Added Wood Products

Surface Quality of Wood Treated with Eastern Red Cedar Oil

Objective

The primary objective was to evaluate the surface quality of pine treated with Eastern Red Cedar oil as an alternative treatment chemical.

Approach

Decay, fungi, insects, and other biological organisms decay wood and reduce its service life under environmental conditions. Therefore, wood is treated with various chemicals, such as borates and copper-based treatment chemicals, to extend its efficient use. However, many of these chemicals can be poisonous to both humans and the environment and can reduce the surface quality of wood. This influences further finishing processes.

It is therefore important to determine surface quality of treated wood products to ensure efficient finishing processes. It also is necessary to develop alternative wood preservatives that are not poisonous. Oil from Eastern Red Cedar (ERC) is one such alternative product that can be used to treat wood.

In this study, radial and tangential Southern Pine samples were treated using ERC oil. Samples were brushed and soaked in ERC oil for periods of time ranging from 2 hours to 10 days. Surface quality of each sample was measured using a stylus type profilometer before and after each treatment to provide initial data about the influence of oil treatment on the samples.

A total of seven roughness measurements across the grain orientation with a span of 12 millimeters were taken from each sample. A portable stylus profilometer, the Hommel T-500 unit, was used for the roughness measurements.

The profilometer consisted of a main unit and pick-up, which has a skid-type diamond stylus, with a 5 micrometer tip radius and 90 degree tip angle. The stylus traverses the surface at a constant speed of 1 millimeter per second over 12.5 millimeter tracing length.

The device uses digital filtering to separate the surface profile into two profiles – waviness and roughness. A cut-off length of 3 millimeters, a parameter that differentiates roughness and waviness profiles from each other, was used for the measurement.

Many roughness parameters can be calculated from the digital information. Three parameters, (average roughness, mean peak-to-valley height, and maximum roughness) were considered to evaluate surface characteristics of the samples.

Benefits

This study provides initial data about the effect of using ERC oil as a preservative on the surface quality of treated wood.

Economic Impact

This study has potential to affect the wood treatment industry by introducing ERC oil as an alternative treatment chemical that is not poisonous to humans or the environment.

Continuing Work

The next step in this project is to test how the treated samples perform under termite damage.

Funding

The FAPC funded this project.

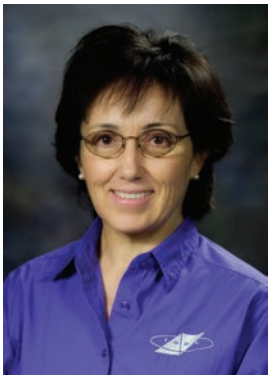
Collaborators

Dr. Salim Hiziroglu, FAPC wood products specialist, was the principal investigator for this project.

FAPC Faculty & Professional Staff

"The year provided opportunities for the FAPC and the Browning Endowment to support a research effort that will benefit wheat trade between the U.S. and Mexico."

Rodney Holcomb, Ph.D.
Agribusiness Economic Specialist
114 FAPC
rodney.holcomb@okstate.edu



"There was much excitement with the results of the Oklahoma dairy products research during the year of the state's Centennial celebration!

Guadalupe Davila - El Rassi, Ph.D.
Analytical Chemist
315 FAPC
guadalupe.davila_de_el_rassi@okstate.edu

"We have had the opportunity to assist several new companies enter the retail and food service industry with new innovative products for the consumer."

Jim Brooks
Business & Marketing Services Manager
143 FAPC
jim.brooks@okstate.edu

"Having realized the impact we have had on Oklahoma our first 10 years gives feelings of excitement, motivation, and pride, and it reinforces how effective our teamwork model is.

Chuck Willoughby
Business & Marketing Relations Manager
141 FAPC
chuck.willoughby@okstate.edu

"It has been an exciting year, Happy Birthday FAPC!"

Erin Early
Business & Marketing Client Coordinator
140 FAPC
erin.joy.early@okstate.edu

"In my first year at the FAPC, I have enjoyed the variety of products and enthusiasm from the entrepreneurs who come through our doors."

Andrea Graves
Business Planning & Marketing Specialist
142 FAPC
andrea.graves@okstate.edu

FAPC Faculty & Professional Staff

"Basic knowledge of the mechanisms controlling the expression of wheat proteins will translate in a better understanding of how proteins are affected during periods of drought."

Patricia Rayas, Ph.D.
Cereal Chemist
123 FAPC
pat.rayas_duarte@okstate.edu

"It has been a year of transition for me within the FAPC. I am truly excited with my new position and am enthused about what the next years hold."

Reneé Albers-Nelson
Milling & Baking Specialist
105 FAPC
renee.albers_nelson@okstate.edu

"The highlight of 2007 was celebrating a decade of FAPC adding value to Oklahoma and announcing our new name change during the annual FAPC Media Day."

Mandy Gross
Communications Services Manager
144 FAPC
mandy.gross@okstate.edu

"One year closer to renewable, sustainable energy."

Danielle Bellmer, Ph.D.
Food Engineer
108 FAPC
danielle.bellmer@okstate.edu

"Innovation is needed to reduce the increased costs of production and to combat fierce competition from low-cost producers and the rising complexity of consumer demands."

Timothy Bowser, Ph.D.
Food Engineer
124 FAPC
bowser@okstate.edu

"The year 2007 marked 10 years of service and accomplishment."

William McGlynn, Ph.D.
Horticulture Processing Specialist
112 FAPC
william.mcglynn@okstate.edu

FAPC Faculty & Professional Staff

"The past year has been very rewarding in the area of research related to food safety and/or probiotics."

Stanley Gilliland, Ph.D.
Food Microbiologist
111 FAPC
stan.gilliland@okstate.edu

"They sure don't make things like they used to (in reference to several equipment breakdowns in the lab during the year)."

Peter Muriana, Ph.D.
Food Microbiologist
109 FAPC
peter.muriana@okstate.edu

"Research and development work on non-edible feedstock sources is essential to sustain a large biofuels industry, and we are working toward that end."

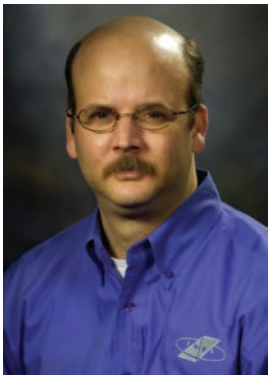
Nurhan Dunford, Ph.D.
Oil/Oilseed Chemist
103 FAPC
nurhan.dunford@okstate.edu

"Congratulations to the FAPC for 10 years of service."

Jacob Nelson
Value-Added Meat Processing Specialist
106 FAPC
jacob.nelson@okstate.edu

"Entrepreneurs are alive and well in Oklahoma."

David Moe
Pilot Plant Manager
204 FAPC
david.moe@okstate.edu



"Anything is possible with hard work."

Kyle Flynn
Meat Pilot Plant Manager
205 FAPC
kyle.flynn@okstate.edu

FAPC Faculty & Professional Staff

"In 2007, research tested our capabilities and skills to make us better prepared for the projects ahead of us."

Scott Grumbles
Meat Pilot Plant Assistant Coordinator
203 FAPC
scott.grumbles@okstate.edu

"2007 went out with a bang!"

Darren Scott
Food Scientist/Sensory Specialist
101 FAPC
darren.scott@okstate.edu

"Organizational and personal learning through continuous education, along with the development and delivery of improvement programs to add value to clients, contribute to market place success."

Jason Young
Quality Management Specialist
102 FAPC
jason.young@okstate.edu

"The highlight of the year was my sabbatical leave at various universities in Asian countries."

Salim Hiziroglu, Ph.D.
Value-Added Wood Products Specialist
303G Ag Hall
salim.hiziroglu@okstate.edu

"2007 has been a year of accomplishments and the celebration of accomplishments at the FAPC."

Roy Escoubas, Ph.D.
Director
148 FAPC
roy.escoubas@okstate.edu

Administrative Staff

Betty Rothermel
Administrative Assistant

Colleen Fleming
Senior Financial Assistant

Karen Smith
Administrative Support Specialist I
Workshop Coordinator

Terra Brown
Administrative Support Assistant II
Receptionist

405-744-6071 • 405-744-6313 FAX • www.fapc.biz

Robert M. Kerr Food & Agricultural Products Center

Adding Value to Oklahoma

148 FAPC, Oklahoma State University
Stillwater, OK 74078-6055
(405) 744-6071 • www.fapc.biz

Division of Agricultural Sciences and Natural Resources • Oklahoma State University

Oklahoma State University
Robert M. Kerr Food & Agricultural Products Center
148 FAPC
Stillwater, OK 74078-6055

Nonprofit Organization
U.S. POSTAGE PAID
Stillwater, OK
Permit No. 191