# 2011 Annual Report

## Robert M. Kerr Food & Agricultural Products Center

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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 $2,200 for 700 copies. 0212 MHG.

# [ director's message ]

**The Robert M. Kerr Food & Agricultural Products Center (FAPC) is a research, product development, business and marketing, and technical assistance resource for the Oklahoma food and agribusiness industries.**

This 96,000-square-feet stand-alone facility has animal harvesting, food manufacturing, sensory profiling, food research, food microbiology, and analytical laboratory facilities. The FAPC has conference facilities and applications laboratories for demonstration and prototype testing. The FAPC has approximately 15,000 square feet of active research space, 16,000 square feet of active food processing space, 3,200 square feet of conference space, and more than 10,000 square feet of refrigerated and freezer space.

It truly is a state-of-the-art, one-of-a kind facility in the United States, and is available to help you.

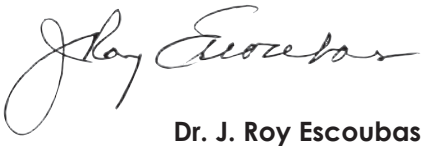
The FAPC has just reached its 15-year anniversary and has continued to contribute significantly to the Oklahoma economy. Data has shown the FAPC affects the Oklahoma economy by more than $200 million each year. Additionally, data has shown the FAPC has played a major role in the launch of more than 50 entrepreneurial businesses that have added more than 300 jobs in rural areas of Oklahoma and more than $6 million in annual sales revenue in Oklahoma.

The FAPC has 8 faculty members working in oilseed chemistry, cereal chemistry, horticultural products and processing, food industry economics, food microbiology, and value-added wood products. The FAPC has 11 professional and 6 technical staff members working in food process engineering, food microbiology, food sensory analysis, food harvest and processing technology, total quality management, communications and media support, and marketing and business management. In this reporting year, the FAPC trained more than 1,100 industry clients in more than 45 workshops and participated in more than 200 client projects.

The FAPC has an Industry Advisory Committee appointed by agencies of Oklahoma including the Governor, the Senate President Pro Tempore, and the Speaker of the Oklahoma House of Representatives. In this reporting year, the chairman of the Advisory Committee was Mr. David Howard, president and CEO of Unitherm Food Systems; Mr. Paul Schatte, the vice-chair, and general manager and co-owner of Head Country Foods; and Ms. Jill Stichler, secretary, and president and owner of Redland Juice Company. The immediate past-president was Mr. John Williams, owner and president of Chef's Requested Foods.

The FAPC strives to serve the Oklahoma food and agribusiness industries with the best science, technology, and business practices to compete in a global market. Leading work areas and trends include food safety, food traceability, food quality, locally grown, sustainability, convenience, and costs. These work areas and trends are expected to drive the food industry and will continue to be manifested by retail and food service consumer demands.

The FAPC is well prepared and ready to serve the food processing and agribusiness industries in Oklahoma, and help them to grow and be profitable. Contact us and allow us to assist you.



**Dr. J. Roy Escoubas**
FAPC Director

**For many, Oklahoma's agricultural and food industries evoke thoughts of wheat and cattle. While this is a rich part of Oklahoma's heritage and a significant portion of our economy, many of these commodities are currently sent to other states or even other countries for further processing into the bakery, meat, and other products that reach the consumer's table.**

The FAPC, located in Stillwater, Oklahoma, on the campus of Oklahoma State University, strives to keep the products, jobs, and dollars home in Oklahoma. The FAPC offers large and small businesses, producers, and entrepreneurs of Oklahoma, as well as other states, access to faculty and staff with expertise in business and technical disciplines.

The FAPC's research laboratories, pilot-processing facilities, educational programs, and seminars keep food and agricultural processors and entrepreneurs on the forefront of cutting-edge value-added processing and technology.

By offering large and small businesses, producers, and entrepreneurs access to faculty and staff with expertise in business and technical disciplines, the FAPC strives to discover, develop, and deliver information that will stimulate and support the growth of value-added food and agricultural products and processing in Oklahoma.

# [ industry advisory committee ]

## The FAPC has the privilege of an oversight committee to help guide the center. The Oklahoma State Legislature established the Industry Advisory Committee to serve as an advisory board for the FAPC.

The 16-member committee is composed of Oklahoma agricultural and business leaders, and they are appointed by the highest positions of the Oklahoma state government and the vice president and dean of OSU's Division of Agricultural Sciences and Natural Resources. The committee assists, counsels, and gives leadership to the FAPC.

Members of the 2011-2012 Industry Advisory Committee (IAC) include Roy Escoubas, FAPC; John Griffin, Griffin Food Company; Tommy Kramer, Durant Industrial Authority; Virgil Jurgensmeyer, J-M Farms; David McLaughlin, Advance Food Company; David Howard, Unitherm Food Systems (IAC Chair); Paul Schatte, Head Country Bar-B-Q (IAC Vice Chair); Jill Stichler, Redland Juice Company (IAC Secretary); Allen Mills, Reasor's Incorporated; Dick Davis, Agri-Services, Oklahoma Department of Corrections; John Williams, Chef's Requested Foods; Rodger Kerr, Southwest Technology Center; Danny Dupree, Bar-S Food Company; Gary Conkling, Producers Cooperative Oil Mill; Gary Crane, Ralph's Packing Company; Bill Wiley, BC Solutions LLC; and Robert Whitson, OSU's Division of Agricultural Sciences and Natural Resources.

The committee met twice during 2011. The first meeting was held on June 2, 2011, at the FAPC, and the second meeting was held November 10, 2011, at Unitherm Food Systems in Bristow, Oklahoma.


**IAC Meeting**
**November 10, 2011**

**IAC Meeting**
**June 2, 2011**

**The FAPC established the Foundation Focus Program to enable the center to accomplish its mission with increased financial support from private donors. With these funds the FAPC is able to focus on delivering even greater economic impact to Oklahoma as it continues to serve the state's value-added agricultural industry. The FAPC would like to recognize the following 2011 donors:**

Advance Food Company
Shaymaa Alsharqi
Jennifer Bailes
Veneta Banskalieva
Bar-S Food Company
Jeff & Dani Bellmer
Matthew Bennett
Tim Bowser
Braum's
Jim Brooks
Terra Brown
Cedar Hill Seasonings
Chef's Requested Foods
Sanath Chilakala
Ernesto Colin
Consumer's IGA
Dancing Bear Ingredients, LLC
Guadalupe Davila-El Rassi
Nurhan Dunford
Patricia Rayas-Duarte
Roy & Judy Escoubas
Lori & Wayne Fancher
Field's Pies
Kyle Flynn
Steven Garrett
Emily Gaulden
Steve Gilliland
Rob & Andrea Graves
Mandy Gross
Guardian Food Technology
Bucky Gwartney
Hall of Fame Book Trader
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Head Country Foods, Inc.
Mary Katherine Henderson
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J-M Farms, Inc.
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Oklahoma Beef Council
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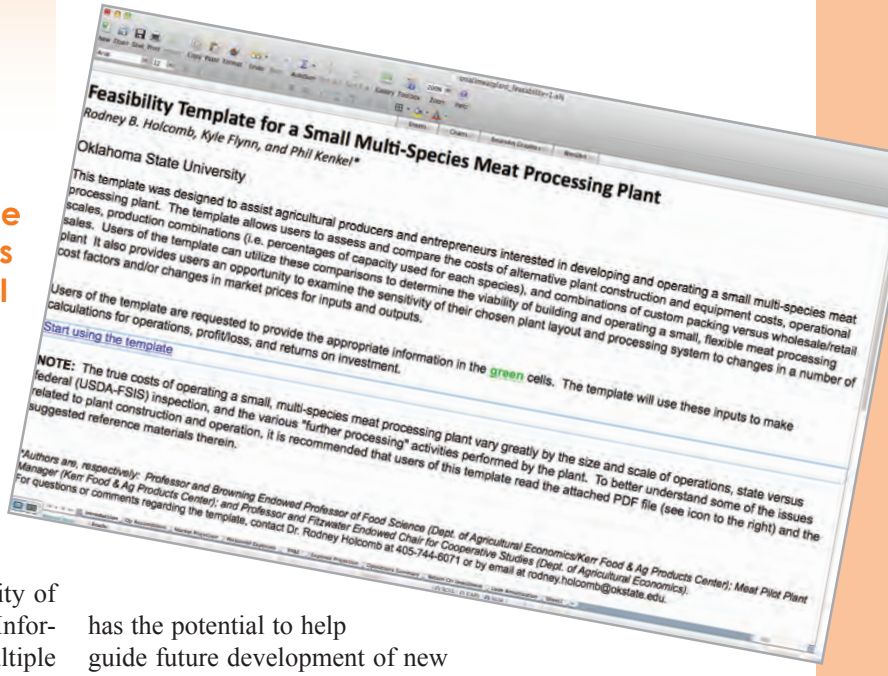
Unitherm Food Systems
Deb VanOverbeke
Vaughan Foods
Vinyard Fruit & Vegetable Company
Don & Kay Wagner
Ray & Charlotte Washam
Kylee Willard
John H. Williams
Chuck & Susan Willoughby
Craig Woods
Jason Young

# [ financial highlights ]

| | |
|---|---|
| **Working Funds** | **$3,135,257** |
| State Sourced | $2,903,959 |
| Fee-Based Sourced | $ 231,298 |
| **State-Sourced Funds** | **$2,903,959** |
| Research | $2,091,423 |
| Extension | $812,536 |
| **Fee-Based Funds** | **$231,298** |
| Conference & Training Accounts | $70,290 |
| Small Projects & Applied Product Development Accounts | $54,642 |
| Pilot Plant Processing Accounts | $106,366 |
| **Grants & Contract Research Funding** | **$677,210** |
| **Total Available Funds** | **$3,812,427** |
| State Sourced Funds | $2,903,959 |
| Fee-Based Funds | $231,258 |
| Grants & Contract Funds | $677,210 |
| **Disposition of Funds** | |
| State Sourced Funds | 76.2% |
| Fee-Based Funds | 6.1% |
| Grant & Contract Funds | 17.7% |
| **Disposition of Funded Activities** | |
| Research & Product Development | 72% |
| Outreach Activities | 28% |
| **Disposition of Budgeted Resources** | |
| Salaries & Benefits | 96.7% |
| Maintenance, Operational, & Facility | 2.3% |
| Small Projects & Market Development | 1% |
| **Disposition of Fee-Based Funds** | |
| Conferences & Training Programs | 30.4% |
| Pilot Plant Processing Programs | 46% |
| Small Projects & Applied Product Development Projects | 23.6% |
| **Foundation Focus Activities** | $522,000 |
| Endowed & Non-Endowed Gifts | $320,000 |
| In-Kind Gifts | $202,000 |

# Feasibility Template for a Small Multi-Species Meat Processing Plant




Feasibility Template for a Small Multi-Species Meat Processing Plant

Rodney B. Holcomb, Kyle Flynn, and Phil Kenkel*

Oklahoma State University

This template was designed to assist agricultural producers and entrepreneurs interested in developing and operating a small multi-species meat processing plant. The template allows users to assess and compare the costs of alternative plant construction and equipment costs, operational scales, production combinations (i.e. percentages of capacity used for each species), and combinations of custom packing versus wholesale/retail sales. Users of the template can utilize these comparisons to determine the viability of building and operating a small, flexible meat processing plant It also provides users an opportunity to examine the sensitivity of their chosen plant layout and processing system to changes in a number of cost factors and/or changes in market prices for inputs and outputs.

Users of the template are requested to provide the appropriate information in the green cells. The template will use these inputs to make calculations for operations, profit/loss, and returns on investment.

Start using the template

NOTE: The true costs of operating a small, multi-species meat processing plant vary greatly by the size and scale of operations, state versus federal (USDA-FSIS) inspection, and the various "further processing" activities performed by the plant. To better understand some of the issues related to plant construction and operation, it is recommended that users of this template read the attached PDF file (see icon to the right) and the suggested reference materials therein.

*Authors are, respectively: Professor and Browning Endowed Professor of Food Science (Dept. of Agricultural Economics/Kerr Food & Ag Products Center); Meat Pilot Plant Manager (Kerr Food & Ag Products Center); and Professor and Fitzwater Endowed Chair for Cooperative Studies (Dept. of Agricultural Economics). For questions or comments regarding the template, contact Dr. Rodney Holcomb at 405-744-6071 or by email at rodney.holcomb@okstate.edu.

**The objective of the project was to provide those interested in meat marketing efforts (e.g. locally-grown/locally-processed, all natural, and organic) with a tool to help them determine the economic feasibility of starting such a venture.**

## Approach

A spreadsheet-based model, complete with an imbedded user's guide and a companion "how to" video, were developed to help entrepreneurs assess the economic viability of constructing and operating a small multi-species meat plant. Information provided by FAPC meat processing specialists, multiple Oklahoma small meat plants, and USDA's Food Safety Inspection Service (FSIS) was used to create an example (or "base") scenario, which users of the template get to see and modify to fit their specific needs. The template is available online on the FAPC website.

## Benefits

The benefits of this project represent an increase in locally-grown/processed foods, and farm-to-fork marketing efforts during the past decade has spurred increased demand for local livestock processing. However, the past two decades have seen a marked decline in the number of small meat processing plants, both in Oklahoma and on a national scale. As a result, existing meat processing plants have become back-logged with business, and producers trying to niche market their livestock have found themselves without timely and consistent access to slaughter facilities.

As a result, the FAPC has seen an increase in requests for assistance related to meat processing plant evaluations. Starting any food business can be challenging and expensive, but starting a livestock slaughtering and further processing operation that meets USDA-FSIS criteria can be especially daunting. Thus, the small meat plant template provides anyone with an interest in operating their own processing plant with a tool to evaluate the financial ramifications of operational considerations. They can essentially change a number of input and output factors to perform "what if" analyses before committing time and resources to the construction of a facility.

## Economic Impacts

To date, the template has been reviewed by existing meat plants but has not generated discernable impacts. However, the template has the potential to help guide future development of new small meat processing facilities in Oklahoma. This would result in the creation of jobs, state revenues, and new products. Furthermore, the template is applicable to similar start-up efforts in other states, representing national business development potential.

## Continuing Work

The project is complete, and the template is available for use on the FAPC website.

## Publications

The project has resulted in a food science master's thesis, a presentation at the 2011 Food Distribution Research Society meetings, and a forthcoming paper in the Journal of Food Distribution Research and FAPC Flash.

## Funding

The project was funded by the FAPC and the Charles B. Browning Endowment for Food Science.

## Collaborators

Dr. Rodney Holcomb, FAPC agricultural economist, was the principle investigator on this project. Other collaborators included Kyle Flynn, FAPC meat pilot plant manager; and Dr. Phil Kenkel, professor and Fitzwater Endowed Chair from the OSU agricultural economics department.

**The feasibility template, along with an instructional video, can be found at www.fapc.biz/services/agribusiness.html**

# Quality of Beef Cow Milk Fat as Affected by Breed and Stage of Lactation

**The objective of the project was to study the effect of breed and the stage of lactation on fatty acid composition, with a special interest to CLA and PUFA in milk fat of different cow breeds.**

## Approach

This project is a part of a larger, long-term cross-breeding project aiming to evaluate sire breed differences in milk yield and quality at the USDA-ARS, Grazinglands Research Laboratory in El Reno, Oklahoma. Milk quality in beef cows has an important influence on the weaning weight of calves, beef cow production, meat quality, maintenance requirements, etc. Of exclusive interest are the values of 9-*cis*, 11-*trans* conjugated linoleic acid (CLA), ω-3 polyunsaturated fatty acids (PUFA), and the ratio ω-6 PUFA/ω-3 PUFA, considered to some extent as markers for the beneficial values of milk. However, comparing to milk cows, little work has been done in evaluation of milk fat quality of beef cows.

To achieve the objective, milk samples for analysis have been taken from 4 animals of each of 6 beef cow breeds – Bonsmara, Brangus, Charolais, Hereford, Gelbvieh, and Romosinuano, in early May (40-45 days postpartum), early July, and late August 2009 and 2010. Generally, different cows were used each year and repetition of cows across years was minimal. Animals were raised on native rangeland pasture at the experiment base. Fatty acid composition of milk fat was analyzed at the FAPC Analytical Services Laboratory.

The results show that the content of CLA varied among the breeds and stages of lactation. Pooled data for all animals indicates that the milk samples in August contained the lowest amounts of CLA. Among the breeds, milk from Brangus, Charolais, and Romosinuano contained more CLA than the other breeds. The ω-6 PUFA/ω-3 PUFA values did not differ among the breeds in each stage of lactation. In all breeds, this ratio was far less than 4 (between 1.1 and 1.8), considered as more desired balance between the contents of ω-6 polyunsaturated and ω-3 polyunsaturated fatty acids. So far, data obtained shows that regardless of the breed, the collected milk in early July is of higher quality, richer in CLA, and with better, more optimal ω-6 PUFA/ω-3 PUFA ratio.

## Benefits

From the producer and breeder point of view, it is important to have more information about the amounts of the beneficial fatty acids (CLA, ω-3 PUFA) in milk of beef cow, and how they are influenced by breed and diet. This will allow producers by using genetic capacities of breed and environmental conditions to increase the quality of milk through desirable fatty acid profile.

## Economic Impacts

The awareness of breed difference and production system will reflect on the animal performance and enhance farmer profitability.

## Continuing Work

The experimental design of the project requires a third year (2011) analysis of milk. The analysis of fatty acid composition is in process. Final conclusion will be made after the project is completed.

## Publications

Results of this study will be presented at the 2012 FAPC Research Symposium and 2012 American Society of Animal Science meeting.

## Funding

Funding was provided from the FAPC and USDA-ARS, Grazinglands Research Laboratory in El Reno, Oklahoma.

## Collaborators

Dr. Guadalupe Davila El-Rassi, FAPC analytical services manager, was the primary investigator on the project. Other collaborators include Dr. Michael A. Brown, USDA-ARS, Grazinglands Research Laboratory of El Reno, Oklahoma; Dr. Veneta Banskalieva, FAPC analytical services research specialist; and Angie Lathrop, FAPC analytical services research specialist.

# Effect of Temperature on Viscous Flow and Elastic Recovery of Gluten in Different Strength

**The main objective of this project was to evaluate the viscoelastic properties of gluten from commercial flours using a creep-recovery test at temperatures ranging from 25 degrees Celsius to 65 degrees Celsius.**

## Approach

Six commercial hard red winter wheat flours and one soft red cultivar varying in protein content and strength were selected. Viscoelastic properties of the isolated gluten were measured at 25, 35, 45, 55, and 65 degrees Celsius using a creep and recovery test to separate the viscous flow and elastic recovery components of the gluten. A large percent of variance (88.1 percent) was explained by gluten time constant of creep, viscous flow, and recoverability. These 3 parameters are good candidates for a combined index of viscoelastic properties of gluten.

The samples were separated by a gradient of viscous flow. A clear separation of two groups due to the effect temperature was obtained. The first group, 25 and 35 degrees Celsius, was positively related to gluten recovery while the second group, 55 and 65 degrees Celsius, was negatively related to gluten recovery. A clear separation of the soft wheat flour from the hard flours also was obtained. The softer wheat flour was highly related to the time constant of recovery when exposed to 25 and 35 degrees Celsius. In contrast, when subjected to 45, 55, and 65 degrees Celsius treatments, it was highly related to the viscous flow. Creep and recovery effectively separated the change of viscoelastic properties as affected by temperature. Thus, it is a potential tool for quantitative evaluation of processing quality performance of flour samples.

## Benefits

The milling and baking industry will benefit from the information as a measure of comparison of viscoelastic properties of gluten and dough during a range of temperature in the production of baked products. Estimates of changes of viscous flow and elastic recovery occurring during heating can be of special interest to food engineers who can use modeling to predict performance based on temperature effects.

## Economic Impacts

It is envisioned that the potential economic impact of the project includes modifications of processing or a combination of processing and formulation to maximize the potential performance of wheat flours.

## Continuing Work

In the continuation of this project, the number of samples will be increased representing a wider range of gluten strength properties. The temperature range also will be increased to 75, 85, and 95 degrees Celsius. The program also includes the use of higher stresses to a maximum of 500 Pa in the creep-recovery test.

## Publications

One master's thesis was published as a result of this study.

## Funding

Funding for the project was provided by the Oklahoma Wheat Foundation and the FAPC.

## Collaborators

Dr. Patricia Rayas-Duarte, FAPC cereal chemist, was the principle investigator on this project. Other collaborators included Pavalee Chompoorat, FAPC graduate student; and Dr. Steve Mulvaney, Cornell University of Ithaca, New York.

# Design of Marketing Displays for Use at Industry Trade Shows

**The objective of this project was to assist US Roaster Corp with the development of marketing displays to use at industry trade shows.**


## Approach

US Roaster Corp, located in Oklahoma City, has served the roasting industry for more than 30 years specializing in new roaster fabrication and rebuilding older roasters.

With the assistance of the FAPC, US Roaster Corp received a $209,833 matching grant from the Oklahoma Applied Research Support Program within the Oklahoma Center for the Advancement of Science and Technology (OCAST) to support the development and commercialization of a high-efficiency coffee roaster, The Revelation.

As a result of receiving the grant, the FAPC designed one 10-foot lit popup display and four 3-foot lit retractable banner stands to market the company, as well as The Revelation coffee roaster. Following the completion of the design, the displays were ordered and printed by Mod Displays. The displays were used during 3 national coffee trade shows during 2011.

## Benefits

Participating in trade shows is one of the best ways for companies to expose their businesses. Because of this project, US Roaster Corp now has a display to use when promoting its products during trade shows. Some of the benefits include generating sales leads and actual sales during trade shows, enhancing its image and visibility, reaching its audience, establishing a presence in the marketplace, improving the effectiveness and efficiency of its marketing efforts, meeting customers and competitors, introducing new products, and educating its target audience.

## Economic Impact

The use of the new marketing displays during trade shows has lead to an increase in customers for US Roaster Corp, which resulted in an increase of sales in its custom built coffee roasters. US Roaster Corp has seen more sales in 2011 than any other year since the inception of the company. Overall sales have increased by 50 percent and 14 new jobs were created since receiving the OCAST grant.

## Continuing Work

This specific project of developing trade show displays is completed; however, the FAPC continues to provide communications and marketing assistance to US Roaster Corp when needed.

## Publications

One news release has been published as a result of this project.

## Funding

The client provided funding for this project through the awarded grant from the Oklahoma Applied Research Support Program within the OCAST.

## Collaborators

Mandy Gross, FAPC manager of communications services, was the principle investigator on this project. Other collaborators included Dr. Tim Bowser, FAPC food process engineer; Kylee Willard, FAPC communications graduate assistant; and Dan Joliff, owner of US Roaster Corp.

# Production of Pineapple Jerky for Commercial Sales

[ food engineering ]

**The objective of this project was to help Jerky.com produce their own pineapple jerky for commercial sales.**

## Approach

Jerky.com normally uses co-packers to produce their product. However, due to issues with a co-packer for the pineapple jerky, Jerky.com decided to take matters in their own hands. The company was referred to the FAPC in the early stages of the project. The FAPC has assisted every step of the way. Jerky.com has highly competent staff that works well with minimal coaching and assistance.

The FAPC has worked with the client to produce initial product at the FAPC to demonstrate process feasibility. The jerky shack (dehydrator) and facilities on the FAPC second floor were used to test recipes and processes. Dr. Darren Scott, FAPC food scientist/sensory specialist, developed the nutritional statement. It was suggested that the local co-packers and suppliers select a location for the manufacturing facility. Next, the FAPC assisted the client to select machinery and startup. Jason Young, FAPC quality management specialist, worked with the client to develop a HACCP plan. Currently, the FAPC is assisting with production issues.

A recent side project has been the development of a new meat jerky with a unique flavor, Spicy Ranch. The project was undertaken as part of a class assignment by 2 biosystems and agricultural engineering undergraduate students with anticipation of commercializing the product and featuring it on the Jerky.com website.

## Benefits

Potential benefits include new jobs in Oklahoma, increased sales for an Oklahoma company, increased tax revenues for Oklahoma, high-quality and tasty pineapple jerky for sale nationally and internationally, and possible royalties for FAPC/OSU through sale of newly developed jerkies.

## Economic Impact

The economic impact includes 3 new positions, a new production facility in Stillwater, Oklahoma, at the Meridian Technology Center incubator, increased revenue, and potential new product flavors of meat jerky and new fruit jerkies.

## Continuing Work

Future work of this project will include continuing to assist with product commercialization and growth, and the development of new flavors and products.

## Publications

No publications have resulted from this study.

## Funding

Funding was provided by Jerky.com and Digimedia, the parent company.

## Collaborators

Dr. Tim Bowser, FAPC food process engineer, was the principle investigator on this project. Other collaborators included Jason Young, FAPC quality management specialist; Dr. Daren Scott, FAPC food scientist/sensory specialist; Andrea Graves, FAPC business planning and marketing specialist; Jacob Nelson, FAPC value-added meat processing specialist; Stacey Kowalski, food science graduate student; Rao Kakarala, food science graduate student; Cody Faulkenberry, food science undergraduate student; and Landon Stallings, food science undergraduate student.

# Regional Food Ba
# Fighting Hunger

**For many years, the Regional Food Bank of Oklahoma has received various food product donations from food processors and manufacturers. The food bank feeds the hungry in 53 counties in western Oklahoma. However, in the past 2 to 3 years, donations have steadily decreased as many manufacturers and processors have adjusted their inventories based on actual customer orders, current economic conditions encountered with costs of raw materials, packaging and supply, and fuel expenses. Unfortunately, the demand to feed the hungry has only increased during this time leaving the food bank with the challenge of finding alternative ways to feed those families in need. Rodney Bivens, executive director of the Regional Food Bank of Oklahoma, formed a committee of board members to explore ways this void of donations could be replaced for those in need.**

## Approach

The selected committee met to discuss potential opportunities that could replace the donations with healthy nutritional meals. One of the first suggestions was to develop 4 different varieties of meals that were shelf stable, required minimal preparation, and would provide healthy and nutritional benefits to the families who received them. It was the objective of the committee to identify an Oklahoma company who could source the raw materials, had the appropriate packaging equipment, and the capacity to produce the volume of meals required. It was suggested that the committee contact Cedar Hill Seasonings located in Edmond, Oklahoma. A meeting was scheduled with Felicia Schaffer, owner of Cedar Hill Seasonings, to discuss the project and the development of 4 shelf-stable recipes.


Through a series of additional meetings, Cedar Hill developed four prototype meals that included red beans and rice, southwest chili, macaroni and vegetables, and baked ziti pasta. A tasting was scheduled for the committee and employees of the food bank for constructive comments regarding taste, texture, and flavor of each meal. With the comments, a local chef and dietitian assisted in making minor adjustments to each recipe, and with those minor changes, the four meals were determined to meet the criteria established for nutritional and healthy consumption.

## Benefits

The meals were developed specifically for the need of feeding the hungry through the food bank, but also the market potential for retail grocery stores and health care institutions was identified. Additionally, all ingredients, including the appropriate spices, are in one package for usability. For serving purposes, all the consumer has to do is heat water to boiling temperature then add the contents. The meals are also afford-

# ank of Oklahoma ... Feeding Hope



able with a cost of under 50 cents per person feeding a family of 4. The varieties also can be expanded to other meals while keeping the unit cost in the same price range and be sold to other food banks in the region.

### Economic Impact

The increased volume of production for Cedar Hill Seasonings could mean an addition of 6 to 8 new jobs. Additionally, if usage of the meals through the food bank meets the expected distribution, it may become necessary to add a second shift or another 6 to 8 new jobs. This new venture for Cedar Hill Seasonings could more than easily double their current annual revenues benefiting in additional growth of their overall business model.

### Continuing Work

Design of labels, nutritional information, and ordering of bags, boxes, and raw materials are in process. Production is scheduled to begin sometime in early January 2012. If the volume of meals meets the expectations, Cedar Hill Seasonings will move to preprinted bags eliminating the use of pressure sensitive labels. This will be a very significant point in the project, as it will increase production output by eliminating the labeling portion of the process.

### Publications

At this time, no publications have been completed.

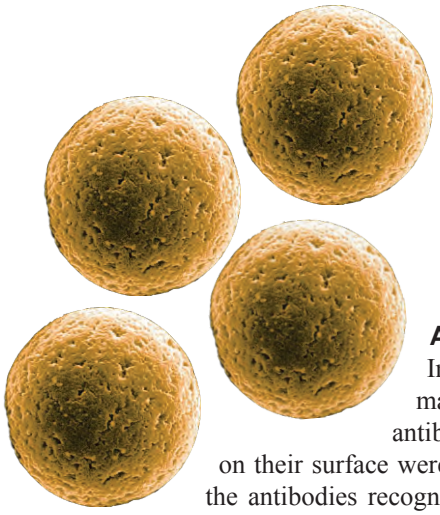

### Funding

The Regional Food Bank of Oklahoma has funded the start-up of the project, and Cedar Hill Seasonings has purchased a new automated labeler that can be used in normal production of their branded products.

### Collaborators

Jim Brooks, FAPC manager of business marketing services, is the primary investigator of the project. Other collaborators include Andrea Graves, FAPC business marketing specialist; Chuck Willoughby, manager of business client relations; Rodney Bivens, executive director of the Regional Food Bank of Oklahoma; Steve Moran, vice president of the Regional Food Bank of Oklahoma; Felicia Schaffer, owner of Cedar Hill Seasonings; Mark Harsha, president of Harsha Productions; and John Williams, president of Chef's Requested Foods.

# Immunomagnetic Bead-based Recovery and Real Time Quantitative PCR for Sensitive Quantification of Aflatoxin B1



**The main objective of this project was to develop an assay to quantify aflatoxin B1.**

## Approach

Immunomagnetic beads, i.e. magnetic beads coated with antibodies (primary antibodies) on their surface were used to capture targets that the antibodies recognize. The magnetic aspect allows the use of magnets to fixate the beads to a plastic sleeve around the magnet and remove them to other sample tubes for washing and cleaning debris from extracted samples. The recovery of the immunomagnetic bead-aflatoxin complex was facilitated by an automated Bead Retriever™. Then, secondary antibodies, which were tethered small pieces of DNA, were used. If the magnetic beads were able to capture any aflatoxin, the secondary antibodies that were added also bond to form a capture complex. This would then be processed by PCR to amplify the signal to create a highly sensitive quantification assay for aflatoxin B1.

## Benefits

There are different permissible levels in foodstuffs in the U.S. (20 ppb) vs. Europe (0.05 ppb), so a sensitive, quantifiable assay is important in accurately determining the level in food and feeds. It is commonly accepted that consumption of subchronic levels of aflatoxin may lead to long-term problems and physiological damage in animals and humans.

## Economic Impacts

It is estimated that mycotoxins account for losses of 25 percent of the world's agrarian commodities each year, and losses in the U.S. are estimated at nearly $1 billion annually. It is difficult to prevent aflatoxin production in the open production environment of open fields; however, the understanding of the impact of storage conditions of feed and grain can help reduce the proliferation and production of aflatoxins by mycotoxigenic molds. It is hard to do anything once it is produced; although, there are many studies examining methods of processing contaminated food/feeds. However, improved detection methods can reduce the risk of exposure to aflatoxins by detecting subchronic levels.

## Continuing Work

This project is complete.

## Publications

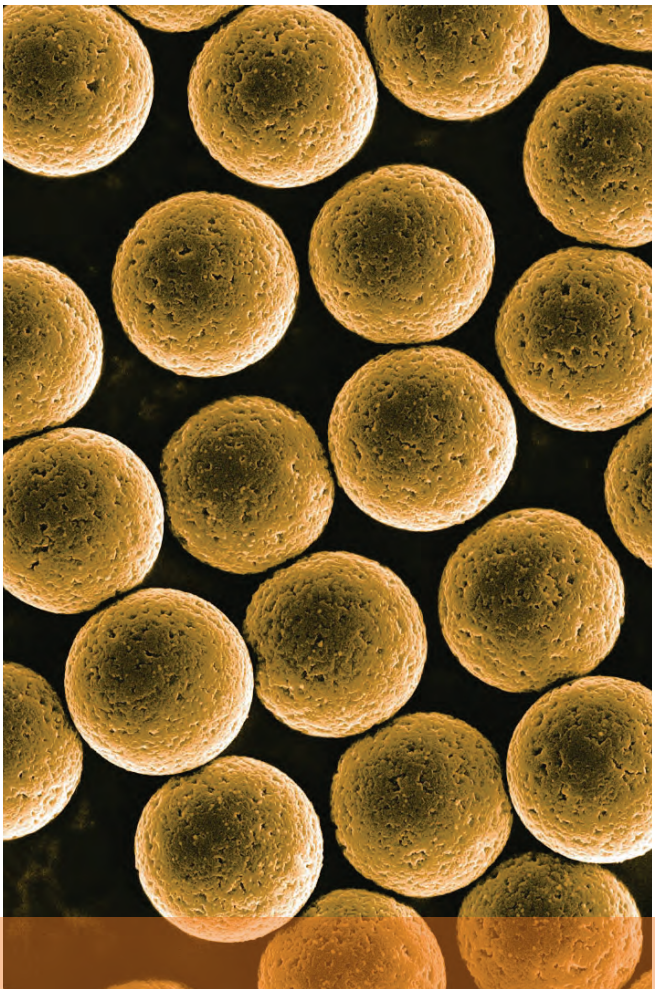
One research publication, doctoral dissertation, and national meeting presentation was a result of this work.

## Funding

Funding was provided by the USDA Farm-to-Table grant.

## Collaborators

Dr. Peter Muriana, FAPC food microbiologist, was the principle investigator. Dinesh Babu, former food microbiology doctoral student, collaborated on the project.



# Development of New Products Containing Soy Hull Pectin



**The objective of the project was to scale up a patented pectin extraction process, develop new products containing soy hull pectin, and facilitate the commercialization of the process and the products by industry partners.**


### Approach

U.S. soybean production in 2010 was estimated to be approximately 3,329 million bushels. Every 60 pound bushel of soybeans contains approximately 23 pounds of protein, 11 pounds of oil, and 9 pounds of water insoluble carbohydrates, mostly pectins. These pectins are an underutilized waste stream. Soybean hulls are currently used mainly as filler, low-value poultry litter, or animal feed ingredients. Substantial value could be reclaimed from this waste stream if additional uses could be found for extracted soy hull pectins.

A patented method for extracting soy hull pectin was developed by Dr. Philip Crandall. This process produces a pectin material that is a good source of dietary fiber and may be well-suited for adding fiber to a number of food and feed products. However, the production process has not been scaled up from laboratory-scale batches and the functional and sensory properties of the pectin have not yet been well quantified in actual food or feed products. To date, the project team has worked on the scale-up portion of the project and has successfully used pilot plant scale equipment to increase batch size by about 50 times.

### Benefits

The soy industry will benefit from having a high-value ingredient reclaimed from what is currently mostly a waste stream material – soy hulls. Food processors will benefit from having a relatively low-cost soluble fiber food ingredient that can be used in various food products to enhance fiber content. Consumers will benefit from having additional fiber in their diets; fiber contained in products that do not necessarily have the sometimes-undesirable sensory properties of traditional high-fiber foods.

### Economic Impacts

This project has the potential to create a significant number of new jobs and new products as it essentially involves the creation of a new byproduct processing and utilization chain.

### Continuing Work

The research team will seek to further refine the pilot-scale commercial production process, and also develop a prototype high-fiber snack food product containing soy pectin and evaluate its nutritional and sensory properties.

### Publications

No publications have resulted from this project.

### Funding

Funding was provided by a grant from the Arkansas Soybean Promotion Board.

### Collaborators

Dr. William McGlynn, FAPC horticultural products processing specialist, was the primary investigator on this project. Other collaborators include Dr. Phil Crandall, University of Arkansas professor of food science; Dr. Steve Ricke, University of Arkansas professor and Wray Endowed Chair of Food Safety; Dr. Tim Bowser, FAPC food process engineer; and Richelle Stafne, former FAPC horticultural research specialist.

[ meat science ]

# Beef 4 Battle - Supporting Oklahoma Troops

**The primary objective of the project was to provide process review and product analysis for regulatory compliance and food safety. The Beef-4-Battle program serves as a catalyst for home-based support to Oklahoma troops serving in the military.**

## Approach

The Beef 4 Battle concept began with retired engineer, George Huggins of Blanchard, Oklahoma. Huggins had the idea of providing an easy solution to hunger pains often experienced by troops in battle. He proposed his idea of helping to feed the troops to the Oklahoma Farm Bureau's FARM Foundation in a show of support. After discussions with the FARM Foundation, a coalition of members was formed to identify the mechanism needed to source, produce, and distribute an all beef stick to the Oklahoma troops deployed to Afghanistan. Members of the Beef 4 Battle coalition include the FARM Foundation; FAPC; Burt Buitenhuis, owner of Chickasha Meat Co.; George Huggins; and Larry Schwab, owner of Schwab's Finest.

The basic model is structured so that Oklahoma donors contribute livestock, meat, and/or monetary resources to the manufacturing process. Livestock are processed at Chickasha Meat Company, and the boneless beef raw materials are transported to Schwab Meat Company for the beef-stick manufacturing. The FAPC reviewed and verified the packaging, labeling, processing, and finished product for regulatory compliance and food safety. FAPC staff consulted with the processors, fashioned a label, helped develop the right process for the need, and repeatedly analyzed the finished product for food safety characteristics.

## Benefits

Two Oklahoma processors benefit from their own contributions to the program. Additionally, support is shown for the troops.

## Economic Impacts

This project was established as a charitable cause for the troops in the Oklahoma 45th National Guard. However, two Beef 4 Battle board members who own private companies have acquired new customers because of the project and have had many requests to produce the beef sticks for consumers through the experience with the Beef 4 Battle Foundation.

## Continuing Work

The project is complete.

## Publications

One press release, FAPC Flash, and Facebook and Twitter postings have resulted from this project.

## Funding

Funding was provided by the Oklahoma FARM Foundation, the FAPC, Schwab Meat Company, Chickasha Meat Company, and George Huggins.

## Collaborators

Jacob Nelson, value-added meat processing specialist, was the primary investigator on this project. Other collaborators included Jim Brooks, FAPC businesses planning and marketing services manager; Dr. Guadalupe Davila-El Rassi, FAPC analytical services manager; Dr. Veneta Banksalieva, FAPC analytical services research specialist; and Angie Lathrop, FAPC analytical services research specialist.

# Stabilization of Cinnamon Roll Icing for Freezing and Transportation

[ milling & baking ]

**The main objective of this project was to adjust a well-liked restaurant recipe for cinnamon roll icing to withstand freezing and transportation, which are necessary changes for this restaurant to expand beyond its restaurant doors and grow to become a "food company."**

## Approach

Like many clients who come to the FAPC seeking assistance, a wonderful product is brought in but it is homemade or made in a restaurant. When products are brought to the Center, the task at hand is figuring out how to make the product like a food manufacturing company would. The FAPC provided guidance to this food company about processing, and understanding that some ingredients need to be added or changed for icings to withstand freezing and thawing temperatures. Experimentation for the project included using different ingredients to achieve the desired stability while maintaining the characteristics of the original recipe.

## Benefits

The project helped maintain and make available a Made in Oklahoma product that is enjoyable and safe for consumers and also keep a consistent eating experience for customers.

## Economic Impacts

This long established Oklahoma restaurant has a great following of customers who desire their products beyond restaurant hours, and even as they move away from Oklahoma. The restaurant sees this venture as an opportunity to grow. They desire to increase sales by walk-in cinnamon roll orders and Internet sales, perhaps even entering the food service arena. All factors contribute to the potential of adding increased revenue for the restaurant and its employees.

## Continuing Work

An icing formulation has been developed. The client is scheduled to come to the FAPC to evaluate the formulation to see if it meets the criteria.

## Publications

No publications have been published to date as a result of this project.

## Funding

The FAPC provided funding for this project.

## Collaborators

Renée Albers-Nelson, FAPC milling and baking specialist, was the primary investigator on this project. Other collaborators included Dr. Darren Scott, FAPC food scientist/sensory specialist; Steven Garret, food science undergraduate student; and Taylor Hansen, food science undergraduate student.

[ oil/oilseed chemistry ]

# Adding Value to Canola Oil Processing Byproducts

**The main objective of the project includes the development of new and high value products from canola oil processing byproducts, specifically recovering surface active compounds from crude canola oil refining (degumming) byproducts.**

## Approach

Crude canola oil needs to be refined to remove undesirable oil components and produce edible grade products. Relatively polar lipid components such as phospholipids (PL) and glycolipids (GL), also referred to as gums, are removed during the degumming process, which is the first step in oil refining. Commonly gums are added back to meal (residual seed material after oil extraction) and sold as animal feed.

However, PL and GL have surface active properties and can also be used as emulsifiers. Hence, crude gum that is produced as a byproduct during canola oil refining is fractionated to obtain PL and GL rich products. Solvent (i.e. ethanol, acetone) fractionation, column chromatography, supercritical fluid technology, and enzymatic conversion methods are being used to develop emulsifiers for food and industrial bioproducts industries. The expectation is to develop emulsifiers that will have improved functionality as compared to the similar products available in the market today.

## Benefits

Currently, main source of emulsifiers or lecithin used in food industry is the gums that are produced during soybean oil refining. Emulsifiers derived from a source, which do not contain allergens, can be used to prepare foods targeting individuals with soybean allergies. Improved functionality of the new emulsifiers also would lead to development of new or better quality food and industrial bioproducts.

## Economic Impacts

Utilization of crude oil processing byproducts to develop high value products would improve economic feasibility of the oil processing operations and lead to new job creation.

## Continuing Work

Characterization chemical, physical, and functional properties of the PL and GL rich products are being developed.

## Publications

Successful completion of this project will lead to a dissertation and peer-reviewed journal articles.


## Funding

Funding for this project was provided in-kind contributions from Producers Cooperative Oil Mill (PCOM), ADM, Cargill, and Bunge.


## Collaborators

Dr. Nurhan Dunford, FAPC oil/oilseed specialist, was the primary investigator on this project. Meizhen Xie, FAPC doctoral student, was a collaborator.

# Providing FDA Facilities for Co-packing GoFit Burgers

**The objective was to provide FDA facilities for the co-packing of GoFit Burgers.**


## Approach

A meeting with Solae and the inventors of the GoFit Burger was arranged to see if the FAPC was a good fit to co-pack the product. The client believed the facilities at the FAPC would work, and product was produced 3 different times. After the final production trial, the client found a larger co-packer in California, where the company was based, to produce the GoFit Burger. The FAPC produced the product for the initial start-up and to test market sales. The FAPC also helped develop procedures for making the product.

## Benefits

Potential benefits include a better vegetarian burger that tastes like a real beef burger.

## Economic Impacts

GoFit Foods is a startup company producing a vegetarian burger. As sales increase, this vegetarian burger has the potential to increase soy products sold by Solae. Currently, the GoFit Burger is being sold in Ruby's Diner chain in California. GoFit Burgers account for 17 percent of the burgers sold at Ruby's Diner.

## Continuing Work

The project is complete.

## Publications

No publications have been published as a result of this project.

## Funding

The client provided funding for this project.

## Collaborators

Kyle Flynn, FAPC meat pilot plant manager, was the primary investigator on the project. Other collaborators included Jim Brooks, FAPC business planning and marketing services manager; Jacob Nelson, FAPC value-added meat processing specialist; and John Hathcock, FAPC meat laboratory assistant coordinator.

[ product development ]

# Reformulation of Donut Glaze to Minimize Cracking and Flaking

**The primary objective of the project was to assist the client with minimizing the cracking and flaking of donut glaze through reformulation and proper equipment utilization.**

## Approach

The glaze formulation the client used on its donuts did not properly adhere to the product and flaked off. Because the glazed donuts were exposed to temperatures ranging from just above freezing in the client's coolers to above 80 degrees Fahrenheit in the client's display cases, the issue was related to storage conditions of the product. Currently, the client purchasd 5-gallon pails of commercially prepared glaze to minimize the flaking. However, this was expensive, tied up employee resources, and generated large amounts of waste.

The client approached the FAPC to assist with reformulating the glaze and also to make suggestions for any additional pieces of equipment that would be needed for production.

The client's glaze formulation was modified by adding several additional ingredients (shortening, hard fat flakes, stabilizers, oil), and small test batches of glaze were produced in the FAPC for evaluation by the client.

## Benefits

Consumers will enjoy a product that meets their expectations.

## Economic Impacts

The client will see increased revenue due to manufacturing the glaze in-house rather than purchasing it from an outside company. They also will see an increase in revenue due to a decrease in returns of unacceptable donuts. Additionally, the client will see increased revenue due to the reduction in waste generated by purchasing individual 5-gallon pails of glaze. Also, they will gain employee resources that were previously spent processing and disposing of the empty glaze pails.

## Continuing Work

The FAPC is currently working with the client to fine tune the glaze formulation so it can be produced on existing equipment. Additionally, the FAPC is working with the client to explore opportunities for purchasing new equipment to facilitate easier manufacture of the glaze.

## Publications

No publications have been published to date.


## Funding

The client funded the project.


## Collaborators

Dr. Daren Scott, FAPC food scientist/sensory specialist, was the principle investigator on this project. Other collaborators included Renée Albers-Nelson, FAPC milling and baking specialist; Dr. Tim Bowser, FAPC food process engineer; and Andrea Graves, FAPC business planning and marketing specialist.

# Granna's Food Safety Systems and Sanitation Audit Preparation



**The main objective of this project was a third-party audit certification to meet potential customer requirements.**

## Approach
Granna's James Bennight and Tiffany Thompson contacted the FAPC to discuss how they could meet all of the criteria outlined in the third-party audit checklist determining what programs were currently in place, and what programs still needed to be written and implemented. During the next several weeks, emails of model programs were exchanged to edit and implement.

As an FSIS-inspected facility, Granna's already had many of the programs in place and well implemented.

## Benefits
The primary benefit to the consumer is an enhanced food safety system at Granna's.

## Economic Impacts
James Bennight of Granna's said the potential economic impacts included an increase in business by $750,000 annually, 4 new positions added, and 7 new meals developed.

Due to the increase in business, storage requirements, and manufacturing output, Dr. Tim Bowser, FAPC food process engineer, assisted with facility design and improvement for increased production capacity.

An increased awareness has been placed on food safety the last several years due to multiple foodborne outbreaks and recalls. Distribution and retail chains require suppliers to be diligent in their food safety initiatives and provide documentation of third-party audits before conducting business and ongoing. By implementing the criteria and passing the third-party audit, Granna's will have more business opportunities.

## Continuing Work
A third-party food safety and sanitation-auditing firm audited Granna's, and they received an excellent certification score. The company will be required to participate in an annual audit.

## Publications
No publications have resulted from work of this study.

## Funding
The FAPC and client provided funding for this project.

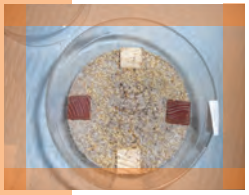
## Collaborators
Jason Young, FAPC quality management specialist, was the primary investigator on this project. Dr. Tim Bowser, FAPC food process engineer, was a collaborator.

# Termite Resistance of Southern Pine Treated with Easter Redcedar Oil

**The primary objective of this project was to evaluate termite resistance of pine samples pressure treated with Eastern redcedar oil.**

## Approach

Subterranean termites, *Retricullitermes flavipes* (Kollar), are widespread pests of wood products in North America, and cause extensive damage annually. These wood-destroying pests are a growing threat to wood materials in residential and commercial structures. Preservative treatments to wood products using a variety of poisonous chemicals have been effective against termite damage. Eastern redcedar (*Juniperus virginiana* L.) is one of the most important underutilized invasive species in Oklahoma. Its wood contains approximately 3.8 percent oil that is commonly used to scent soaps, to manufacture disinfectants and insecticides. Eastern redcedar wood also is considered as naturally chemically treated wood due to its high oil content.



The study investigated resistance of pressure treated Southern pine samples with Eastern redcedar oil against termite damage. Two cm by 2 cm by 0.5 cm pine samples were treated with Eastern redcedar oil in a dessicator by using a full-cell treatment schedule. All samples were soaked in the oil and vacuum of 30 mmHg was applied for 15 minutes before they were exposed to a pressure of 1.2 MPa for 30 minutes. Treated specimens were rinsed and kept in a plastic containers before termite tests were carried out. Subterrenean termites were collected from field colonies in Payne county. Separate groups of 500 and 100 termites were drawn from each colony for use choice and no-choice feeding, respectively. Weight loss and survival rate of the no-choice sample were higher than that of choice type tests. Survival rate between colonies did not show any significant difference from each other.

Based on initial results of this study, oil treated samples did have certain amount of resistance against termite damage suggesting that oil from such underutilized invasive resource can be considered for possible treatment agent to reduce damage caused by termites.

## Benefits

This project directly addresses reduced termite damage of wood products by using oil from underutilized invasive Eastern redcedar. The importance of this project lies in its potential to expand the use of oil from redcedar as environmentally friendly treatment chemical to enhance resistance of wood against termite deterioration.

## Economic Impacts

Currently, there is no Eastern redcedar oil producer at commercial scale in Oklahoma. Producing oil from this resource and using it as possible treatment chemical for wood products to extend their service life would create important impact. Manufacturing of such value-added products will not only develop environmentally sound method to treat wood products but also create new job opening at certain extend.

## Continuing Work

In the second phase of this study, different schedules will be used to treat the samples to get a better understanding of resistance of the samples against termite damage. Also, fixation of the oil into the cell structure will be considered to investigate at micro level.

## Publications

No publications have been published at this time.


## Funding

McIntire Stennis and the FAPC provided funding for this project.


## Collaborators

Dr. Salim Hiziroglu, FAPC value-added wood products specialist, was the primary investigator on this project. Collaborators included Dr. Brad Kard, OSU entomology and plant pathology professor; Dr. Hilmi Toker, OSU visiting scientist and wood products scientist at Mugla University, Turkey; and Dr. Charles Konemann, OSU entomology and plant pathology senior agriculturalist.

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|---|---|
| **Client Projects** | **129** |
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| Beef | |
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| Goat | |

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