



RESEARCH UPDATE

2013

Agricultural economics faculty and staff provide research results and services

Department Head Comments

The research program in the Department of Agricultural Economics aims to create practical, empirical knowledge that will increase the efficiency and productivity of Oklahoma agriculture and rural communities and improve the well-being of Oklahomans.

We also aim to contribute knowledge in the discipline of agricultural and applied economics. Through collaborations in interdisciplinary projects, we make significant contributions to the research literature in many disciplines.

Our faculty address issues in agribusiness, agricultural policy, food and consumer economics, marketing, natural resources and environmental economics, production and farm management, and rural development.

In 2012, we had articles published in more than 30 different journals, including the profession's flagship journal, the American Journal of Agricultural Economics. In this newsletter, you'll read highlights of a few of the many impactful projects in the department.

This summer we began a project with the OSU library to digitize older departmental research and technical bulletins to make our rich history more accessible. While the project is not yet complete, you can view currently uploaded documents at <http://dc.library.okstate.edu/cdm/search/collection/AEPapers>

Use the Advanced Search features to look for articles by specific authors, titles, or years.

We hope you enjoy this brief update on OSU Agricultural Economics research.

Damona Doye

In this issue of *Research Update*, topics include rural health care, whole-chain traceability systems, the U.S. cattle procurement market, green and sustainable manufacturing, and alternative or specialty crops.

The National Center for Rural Health Works (NCRHW), located at OSU, provides services in Oklahoma and nationwide. One research focus has been on the economic impact of rural primary care physicians.

A service provided by ag econ Extension is facilitating community health needs assessments in Oklahoma using a toolkit developed by NCRHW.

Food safety is an important issue, and two research projects have addressed that topic: one to develop a traceability system for the cow/calf, stocker, feedlot, processor, and retailer and the second to study the relationship between animal welfare and food safety.

Research in manufacturing by the New Product Development Center at OSU is geared to expanding existing resources for new product development and to make process and service-development strategies more accessible to manufacturers in Oklahoma.

A research project on specialty crops attempts to determine for Oklahoma researchers and farmers the economic and financial feasibility of horticultural crops and other alternative crops under



various production strategies.

Other publications and presentations by the researchers in this issue and other ag econ authors can be accessed at <http://agecon.okstate.edu/faculty/publications>. Enter the author's name in the database search.

Serving rural health care facilities in Oklahoma and the nation

Researchers

The National Center for Rural Health Works (NCRHW), located at OSU, provides the following services in Oklahoma and nationwide:

- Training and assistance on economic impact of health facilities
- Community health needs assessment facilitation and training toolkit
- Health feasibility needs assessments/ health feasibility cost and revenue analysis

Staff at the center includes Gerald Doeksen, Agricultural Economics Regents Professor and Director of NCRHW; Cheryl St. Clair, Agricultural Economics Associate Extension Specialist and Associate Director of the NCRHW; and Fred C. Eilrich, Agricultural Economics Assistant Extension Specialist and Project Analyst of the NCRHW.

One recent project conducted by the NCRHW is determining the economic impact of a rural primary care physician.

Another ongoing project is providing a community health needs assessment toolkit for rural hospitals across the U.S.

These guidelines are based on a process and initiatives developed in the 1990's for rural health needs assessments in Oklahoma. See related story on page 5.

Economic Impact of a Rural Primary Care Physician

Issues

Rural communities typically pay little attention to their health care systems until they need them. As a result,

many people do not recognize the significant economic importance of a health care system to their local communities.

A primary care physician in rural areas obviously provides needed medical services. Visits to a primary care physician are a major part of our health care needs. An estimated 55.5 percent of all physician visits are made to primary care physicians or mid-level practitioners such as physician assistants or nurse practitioners.

Because fewer primary care graduates are starting their own practices, privately-owned clinics are no longer the typical delivery method for primary care services.



Fairview Regional Medical Center is one of many medical facilities in Oklahoma served by Oklahoma Cooperative Extension Services personnel at OSU.

Availability of adequate primary care services is essential for a strong health care system, but most people in these communities do not fully understand and appreciate the additional economic contributions from the primary care physician.

Primary care visits account for health expenditures in the form of revenues to the medical clinic. A large portion of the revenues will create employment opportunities

and wages, salaries, and benefits for clinical staff, which in turn will be returned to the local economy as the employees spend locally.

Furthermore, the total impact of a primary care physician is greater than the impact at the clinic since the physician contributes to the local hospital through inpatient admissions and outpatient services. Not only is the support vital for maintaining sufficient hospital use, but the revenue generated at the hospital creates even more jobs and income. The employment opportunities and the resulting wages, salaries, and benefits make the health care system an extremely important part of the local economy.

Research from the NCRHW indicates

that between 10 and 15 percent of the jobs in many rural communities are in the health care sector. Hospitals often are the second largest employer in rural communities, trailing behind only local school systems.

Employee spending, along with clinic and hospital purchases from other local industries, stimulates additional economic growth or secondary impacts in many other parts of the

economy. This economic activity may also generate additional tax revenues that can be used by the local government to fund important community services.

Objective

This study strives to estimate the economic contributions from the direct and secondary impacts of a rural primary care physician on the community and the surrounding area including the local hospital.

The study includes impacts from:

- Clinic employment and wages, salaries, and benefits
- Local hospital employment and wages, salaries, and benefits

The assessment underestimates the total value as their impact on other sectors such as pharmacy and nursing homes is not included.

Project

The methodology for this project estimates the total impacts to the clinic and hospital by estimating the direct impacts and then estimating the additional employment and income (wages, salaries, and benefits) created in other businesses from the purchase of goods and services by the local hospital and clinic (business spending) and by the medical staff (household spending).

At the clinic, the direct impacts are from the physician and the medical staff, along with corresponding wages, salaries, and benefits and proprietor income.

Hospitals must have support from local physicians to maintain sufficient utilization. Lack of local physician support significantly impacts the hospital's financial stability. In addition to the inpatient visits, physicians generate significant outpatient activities that increase hospital net revenues.

Hospitals allocate a significant

portion of their revenues to employee compensation costs. Therefore, the assumption is that the direct impacts can be estimated by allocating the total hospital compensation equally to the primary care physicians practicing in the hospital medical service area.

Results

The importance of a local primary care physician and the medical contribution made to the community can easily be revealed with improvements in residents' health and higher quality of life indicators.

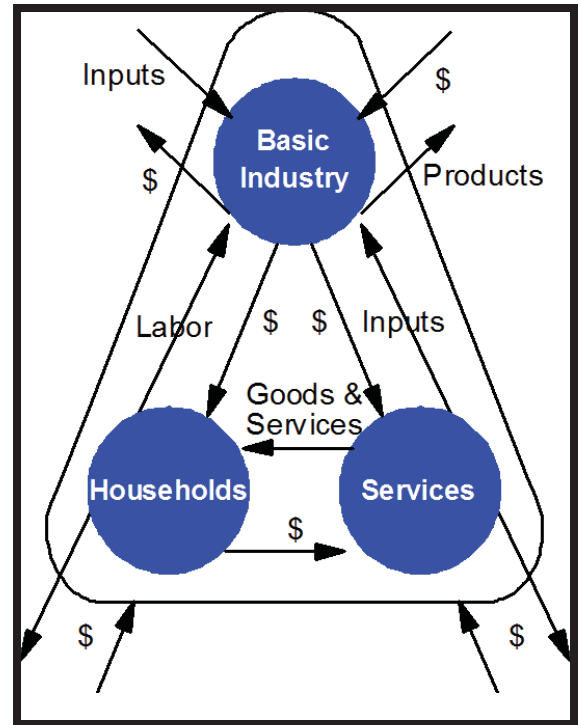
However, the economic contribution is not typically quantified. This study clearly demonstrates that economic contributions are equally as important as medical contributions. A rural primary care physician creates approximately 24.2 local jobs and over \$1.3 million in income (wages, salaries, and benefits).

The estimate is low as this study measures only the impacts from the clinic and hospital and does not include impacts from pharmacies, nursing homes, and other entities.

Impact

Key findings of this study include:

- A primary care physician provides needed medical services



Community Economic System-Flow of Dollars

Healthcare (Continued on page4)

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Health Care (Continued from page 3)

- The impact of a primary care physician is greater than just the impact of the clinic; the primary care physician also generates impacts at the local hospital from the inpatient admissions and outpatient services.
- The primary care delivery method is significantly changing as fewer primary care graduates are starting their own practices.
- A rural primary care physician creates approximately 24.2 local jobs and over \$1.3 million in income (wages, salaries, and benefits, and proprietor income).

The Community Economic System figure on page 3 illustrates the major flows of goods, services, and dollars from a basic industry, in this case the physician office or hospital.

Publications/Presentations

The National Center for Rural Health Works, "The Economic Impact of a Rural Primary Care Physician," Research Study, June 2013.

"Economic Impact of Rural Health Care," report prepared for National Organization of State Offices of Rural Health for the National Rural Health Day in November 2012.

Other publications and presentations can be found at www.ruralhealthworks.org.

Community Health Needs Assessment Toolkit

Project/Objective

To help rural hospitals meet the requirements of recent federal legislation and improve health care in their communities, the NCRHW has developed a Community Health Needs Assessment (CHNA) Toolkit.

The text and appendices for the entire CHNA Toolkit are available on the NCRHW website:



Newman Memorial Hospital in Shattuck, one of the hospitals in Oklahoma receiving health needs assessment facilitation.

www.ruralhealthworks.org.

Developing the toolkit has two goals:

1. Hospitals will be able to use the CHNA Toolkit to guide their own community health needs assessment process.
2. Professionals across the U.S. from State Offices of Rural Health, State Hospital Associations, State Cooperative Extension Services, consultants, or others use the CHNA Toolkit in their states to work with rural hospitals at no or reasonable cost.

NCRHW personnel make presentations to the groups listed above regarding use of the toolkit in the assessment process.

Results

After the community meetings have been completed, a report is prepared to summarize the health needs identified with proposed implementation strategies and responsibilities.

The hospital board reviews the health needs report and determines an action plan, considering available resources and other organizations' possible participation

in implementation. The hospital administration makes publicly available the community needs assessment and the action plan as specified by the Internal Revenue Service (IRS) and prepares the appropriate IRS Forms to meet all federal requirements.

The CHNA process generates two final reports:

1. The community health needs and proposed implementation strategies and responsibilities identified by the community
2. The hospital's final action plan with consideration for resource availability and for other organizations' possible participation in implementation strategies

Impact

Besides Oklahoma, the NCRHW has presented workshops (and continues to present two each year) regarding the three areas of service noted on page 2 in every other state in the U.S., including Hawaii. The CHNA toolkit is currently being used in 38 states.

Source of Funding

The NCRHW is funded by the U.S. Department of Health and Human Services Policy, Federal Office of Rural Health.

Providing community health needs assessments in Oklahoma

The Community Health Needs Assessment (CHNA) Toolkit described on page 4 provides a basis to facilitate the assessment process in communities in Oklahoma.

Project Facilitators

Lara Brooks, Agricultural Economics Extension Associate, and Dr. Brian Whitacre, Agricultural Economics Associate Professor, work through the Oklahoma Cooperative Extension Service (OCES) in partnership with the Oklahoma Office of Rural Health to provide facilitation of community health needs assessments to rural hospitals in Oklahoma.

Issue

“The Patient Protection and Affordable Care Act” of 2010 requires that all 501(c)(3) not-for-profit hospitals conduct a community health needs assessment every three years.

Other rural hospitals not fitting this criterion have also become interested in doing community health needs assessments to provide the best health care possible for their communities.

Objective

The overall goal of the project is to create awareness of the local health sector, identify community health needs, link local residents to local health services, and/or develop new health services.

The objective is to provide facilitation of CHNA with rural hospitals in Oklahoma and to help them meet their community health needs assessment requirements.

Project

The Oklahoma health needs assessment process itself takes about three to four months, with a total of

four meetings.

Results

The CHNA process, formerly known as the Community Health Engagement Process, has been a popular program, free of charge, to Oklahoma rural hospitals since its start over 17 years ago. More than 60 communities across the state have completed the process, and many of those have completed it more than once.

4. A location-specific report of health indicators and outcomes
5. A final report summarizing all community meetings and an implementation strategy for the health priorities identified

Source of Funding

This project is funded by the Center for Rural Health, a division of the OSU Center for Health Sciences, which is affiliated with OSU’s College of Osteopathic Medicine in Tulsa.



Lara Brooks facilitates the first Community Health Needs Assessment meeting at Newman Memorial Hospital in Shattuck.

Impact

The main products derived from the process are:

1. An economic impact of the local health sector that quantifies the impacts of the health sector
2. A survey of local residents on their usage of health services and what additional services they would like to see offered
3. An analysis of the demand for primary care physicians

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Whole-Chain Traceability from gate to plate and back again

Food safety is of the highest importance to today's consumers and to the many industries that provide the food we eat day after day, year after year. The concept of food traceability—being able to follow a product and provide transparent and reliable information from its origin to its point of consumption—is a critical element of food safety. For livestock, a traceability system could be critical to limiting the spread of industry-devastating animal diseases.

To achieve whole chain traceability, trading partners must be able to link products with locations and times through the supply chain. Advanced whole-chain traceability technology being developed at OSU will provide this capability.

Researchers

Researchers at OSU, the Noble Foundation, and the University of Arkansas, together with private industry partners Top 10 Produce and Stoner Family Farms, were awarded a half-million dollar competitive grant to build a pilot whole-chain traceability system for beef cattle. The system will allow producers to store information about their animals and other transactions in OSU servers.

A key feature of this technology is that it permits those who put the information into the system to choose who they share it with (if anyone), and then choose what specific information they want to share with them.

Researchers from OSU include the following:

- Tim Bowser (Biosystems and Ag Engineering and FAPC)
- Mike Buser (Biosystems and Ag Engineering)

- Brian D. Adam (Agricultural Economics)
- Blayne Mayfield (Computer Science)
- Johnson Thomas (Computer Science)
- Samuel Roberts Noble Foundation
- University of Arkansas

Issues

Increasingly, major beef producing and trading countries are implementing traceability systems. Of the eight largest beef exporters, only the U.S. and India have not adopted some form of mandatory animal ID and traceability system.

Moreover, major beef importers are stepping up preferences or even requirements that imported products be traceable back to the farm of origin. Thus, several studies have concluded that, in order to maintain competitiveness in international trade, the U.S. needs to adopt animal ID and traceability.

Following a BSE incident and the accompanying steep decline in U.S. market share, the U.S. developed the National Animal Identification System (NAIS) in 2005. However, many beef producers resisted the system because of concerns about cost, confidentiality, and liability, and the NAIS was abandoned in 2010.

In fact, while several studies have shown that U.S. livestock industries would benefit much more economically from adopting a traceability system than the system would cost, other studies showed that those who had to shoulder most of the costs (for example, small cow/calf producers) would benefit the least. Thus, while the industry as a

whole would benefit, it was not clear that individual beef producers would benefit.

The goal of this project is to reduce costs to producers and increase benefits.

Whole Chain Traceability

Costs to Producers

- Implementation and operation costs
- Loss of data confidentiality
- Increased potential for liability

Benefits to Producers

- Improved cattle production practices
- Enhanced marketing activities - communication between producers and consumers (both ways)
- Improved supply chain management
- Improved disease traceability
- Improved food safety

For example, a key concern of producers has been the loss of privacy. This loss could result if they share information that may give others a competitive advantage or open the data owners up to inappropriate scrutiny.

To reduce this "cost" of traceability, a key feature of the system and its technology is that each participant in the beef supply chain, from cow/calf producer to feedlot operator and processor, has the ability to control who sees what pieces of information. Each operation along the supply chain has complete control of the information they put in – if sharing

that information would benefit the operation, it can share it. For example, if a cow/calf producer has animals with genetics that will perform above average in the feedlot, and the feedlot operator is willing to pay a premium for those animals, the cow/calf producer can choose to share information about only those animals, with only that feedlot operator.

The system also allows processors or feedlot operators to share information with producers who supplied their cattle, so that those producers could find out how well their animals performed in the feedlot or how they graded at the processor.

Value-added opportunities may exist that would more than cover the cost of putting Radio Frequency ID (RFID) tags in the animals' ears. A pharmaceutical company, for example, may want to know the weaning weight of animals that used its product, and is willing to pay for that information.

Project

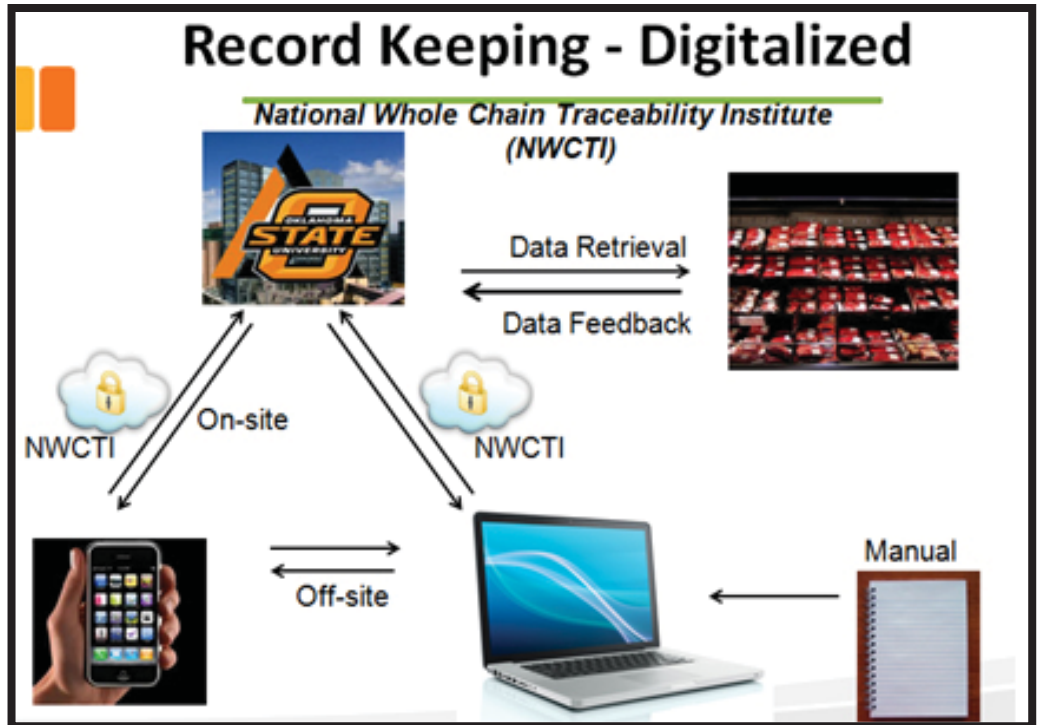
The project is to advance a whole-chain, stakeholder-driven traceability system for agricultural commodities as a beef cattle demonstration.

Objective

The objective of this research is to develop a traceability system that will integrate cow/calf, stocker, feedlot, processor, and retailer data management systems.

Specific objectives are to:

- Deploy the traceability system as a pilot beef cattle demonstration
- Develop consumer information links to the traceability system using mobile and social media
- Identify value added opportunities that make participating in the system profitable



Information for the traceability system can be entered and managed through a smartphone or computer, and through commercial herd management software.

- Evaluate the benefits and costs of using the system
- Transfer lessons learned about benefits and costs of using the system to producers, industry professionals, retailers, and other stakeholders, with the goal of extending the technology to other commodities and products
- (stockers and feeders).
- Sharing benefits with all participants (made possible by a traceability system) results in net profits for all participants.

Impact

Research at Kansas State U. by Pendell et al. (2010) indicates that adoption of an animal identification system could increase export demand for U.S. meat products. Alternatively, it could prevent losing access to specific international markets or may allow a more rapid resumption of exports following future animal disease or food safety outbreaks.

The cost of a traceability system would be more than paid for if it prevents losing access to one large

Traceability (Continued on page 17)

Traceability system goals

- Improve food safety
- Improve disease traceability
- Improve supply chain management
- Improve cattle production practices
- Enhance marketing activities, including two-way communication between producers and consumers

Initial Findings

- The costs to cow/calf producer of implementing a traceability system are five times more than stocker and feedlot producers. Tagging material and labor are the major costs.
- Benefits are highest for downstream producers

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Studying market power and efficiency effects in the U.S. cattle procurement market

As agricultural food processing and retailing industries have become increasingly concentrated, numerous studies have examined the impact of changes in market structure on social welfare.

Market power estimates have been increasingly used in guiding merger policy and antitrust enforcement decisions. Such policy decisions have important implications for welfare distributions between consumers, manufacturers, and input suppliers.

Researchers

Chanjin Chung, Agricultural Economics professor and Charles Breedlove Professor has been studying the market power and the efficiency effects in the U.S. cattle market, in particular between producers, processors, and retailers.

Issues

Several studies in the cattle procurement literature have reported a negative relationship between cash market price and captive supply.

For example, the captive supply procurement methods could lower cattle prices in the cash market because the packers are already guaranteed a majority of cattle for slaughter.

Also, sellers could choose their selling time based on their expected price, which means that captive supply sellers could control their delivery time to receive the highest expected price.

A decades-long debate continues on

whether packers have practiced anti-competitive methods with negative effects on the cash market price-captive supply relationship.

Objective

The objective is to investigate the causality (relationship of cause and effect) between cash market prices and captive supplies.

The first study particularly attempts

Projects

In the first study, the Granger causality Wald test and the Granger causality with a modified Wald test are used to examine the causality using weekly data of captive supply quantities and cash market prices in the U.S. cattle procurement market.

The researchers test the causal relationship between cash market



Packer-owned feed lots are one of the captive supply procurement methods considered in this research.

to answer the question of whether packers use predetermined captive supply as an instrument to depress cash market price, or if feeders use the previous cash market prices as expected prices to determine their cattle delivery.

A second study considers bilateral imperfect competition between processors and retailers to estimate the trade-off between market power and cost efficiency.

price and total captive supply. They also test the relationships between cash market price and each of the captive supply methods, such as formula, forward contract, and packer-fed cattle, using both bivariate and multi-variate models.

The model for the second study is based on pricing rules from a firm's profit maximization and nests both oligopsony (the market condition

that exists when there are few buyers, as a result of which they can greatly influence price and other market factors) and oligopoly (the market condition that exists when there are few sellers, as a result of which they can greatly influence price and other market factors).

Results

Overall test results in the first study indicate that captive supply causes cash market price, and it favors the price-dependent model.

In the second study, an empirical analysis for U.S. beef processors and retailers suggests that processors tend to exercise oligopsony market power in procuring cattle, but they are unlikely to exercise market power on retailers.

When retailers and processors are considered as one integrated sector, efficiency effects from the increased concentration in the U.S. beef packing industry are slightly larger than market power effects.

When processors' market power is considered separately from retailers' market power, the difference between cost savings and market power effects becomes greater.

Therefore, although efficiency effects were found to currently be larger than market power effects, a further increase in concentration in the U.S. beef processing industry could narrow the gap between the two effects.

Impact

Finding the correct causal direction between captive supplies and cash market prices could provide useful information in the packers anti-competitive debate. It should also help researchers find better econometric specifications for the cash market price-captive supply



Marketing power and efficiency effects are important factors in buying and selling cattle such as these at the Oklahoma National Stockyard, Stockyard City, which is the home of the largest stocker/feeder cattle market in the world.

relationship.

The findings from the second study also lead to important policy implications. They suggest that consolidations in the beef packing industry have not led to market power exploitation by packers. Rather, the beef processing industry seems very competitive.

However given that potential cost savings are small, further increases in concentration might lead to market power effects greater than the costs savings effects.

Results from recent studies, including this study, seem to suggest that legislation and monitoring systems have been working well in preventing anti-competitive behavior by beef packers. However, this might not be true for retailers since retailers' potential market power seems more important than processors' potential market power.

Publications/Presentations

Ji, In Bae, Chung, Chanjin. "Causality Between Captive Supplies and Cash market Prices in

the U.S. Cattle Procurement Market." *Agricultural and Resource Economics Review* 41/3 (December 2012) 1-11.

Chung, Chanjin, Tostao, Emilio. 2012. "Effects of Horizontal Consolidation Under Bilateral Imperfect Competition Between Processors and Retailers." *Applied Economics*, 44, 3379-3389.

Chung, Chanjin, Tostao, Emilio. 2009. "Nonparametric Estimation of Oligopsony Power in First-Price Auction." *Journal of Agricultural Economics*, Vol 60, No.2 318-333.

Source of Funding

Funding is provided by the Oklahoma State University Agricultural Experiment Station.

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Studying the relationship between farm animal welfare and food safety

A consensus shared among many people in the U.S. is that raising animals in more humane conditions guarantees higher food quality and safety. Many of these people also consider foods derived from animals to be less safe than those derived from plants.

When discussing the relationship between animal welfare and food safety, many factors have an effect, and it is necessary to look at the big picture.

Researchers

Bailey Norwood, Agricultural Economics associate professor, and Jayson Lusk, Agricultural Economics professor and Williard Sparks Endowed Chair, have been studying animal welfare and food safety for several years.

Issues

Perceptions of food safety are just as important as actual safety, in driving consumer choice and retail sales. Food producers face a daunting challenge. Not only must they raise live animals that are naturally covered with bacteria, viruses, and other infectious agents, and then transform the animal products into safe foods, producers must convince the public that the food is safe. Their success is already astonishing if not publicly acknowledged—for every 39 million Americans, only one will die of a food-related illness, and

that individual is typically very old, very young, or has a compromised immune system.

However, food activists will go

investigated to calculate the number of annual illnesses and deaths attributable to different foods and the economic costs of the illnesses



Several elements impact whether farm animal welfare determines food safety, but public perception is a major factor.

to great lengths to convince the public their food is unsafe, so livestock industries must not only battle bacteria and germs but sensationalized information as well.

Some of the issues addressed in this project include:

- Are animal welfare and food safety trade-offs, or are they complements?
- When we pay for humane meat, are we getting safer food or are we accepting greater risk?
- Which is more dangerous to consume: plant or animal?

Project

In this project, researchers have reviewed the literature and studied research results regarding food safety's correlation to animal welfare. Actual outbreak data has been

(medical costs, productivity losses, and estimates of the value of mortality).

Objective

The objective of this research is to determine if the facts support or negate some of the information and consumer perceptions prevalent in today's society.

Results

Differences in categorization, grouping, and measurement techniques make it difficult to determine what conditions produce the safest foods.

For example, researchers determined that in general, production systems that provide animals outdoor access have the potential to expose animals to pathogens, viruses, and other parasites. In some cases, it appears that this potential is realized.

However, in other cases, perhaps due to effects of lower stocking densities or better managerial competence, the risks can be alleviated or even reversed. In short, animal housing conditions are but one factor, and far from the deciding factor, affecting food safety.

But the most important conclusion made is that regardless of conditions, animal treatment, or the actual safety of the food, consumers' perceptions are what matter.

Consumers conflate perceptions of safety with perceptions of animal welfare. This correlation is not necessarily irrational since care and managerial competence in one domain are likely to be correlated with meticulousness in another.

Food safety is hard to observe on the farm, especially for the average consumer. However, through pictures and videos, consumers can readily observe tidiness and stocking density, and the ability of animals to exhibit natural behaviors.

Although these methods do not necessarily relate to food safety, it is not wholly unreasonable for consumers to presume that someone who cares about the one cares about the other.

Impact

The results of this research helps to educate food producers on the importance of consumer perception along with production methods.

In a telephone survey conducted with the American Farm Bureau Federation, 78 percent of Americans agreed with the statement, "Animals raised under higher standards of care will produce safer and better tasting meat."

No separation exists between perceived animal welfare and perceived food safety. While the first priority of producers of meat, eggs and dairy products is ensuring food



Vegetables, and other plant foods, are often perceived to be safer than food derived from animals; however research facts do not fully support this belief.

is safe, in reality, safe food only has value if it is also perceived to be safe. Regardless of whether higher animal welfare creates safer food, food from happy animals will be considered safer.

If the concern is about the volume of pathogens people actually consume, then their perceptions—which drive what they put in their mouths — must be an important consideration.

Publication

F. Bailey Norwood and Jayson L. Lusk. "Animal Welfare and Food Safety." *Food Safety Magazine*. <http://www.foodsafetymagazine.com/magazine-archive1/februarymarch-2013/animal-welfare-and-food-safety/>

Source of Funding

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Innovation and new product development in Oklahoma manufacturing

While stressful economic times can challenge the resiliency of Oklahoma manufacturers, how they prepare themselves to be innovators and leaders in their industry improves their ability to successfully compete in a highly competitive, global economy.

Helping Oklahoma manufacturers with the capacity to make new product introductions and create a more innovative and profitable business capable of capturing global market share is important for job creation in rural and urban areas of Oklahoma. In many cases, the jobs created are important sources of income for agricultural households in Oklahoma.

multidisciplinary team of NPDC professionals that work regularly with manufacturers on new product design and market development.

The mission of the NPDC is to link the innovative ideas and capabilities of Oklahoma's small- and medium-sized manufacturers with the knowledge and technical expertise of land-grant university faculty, staff, and students. NPDC facilitates formation of faculty, staff, and student teams that address product and process development problems that frequently do not fit in one unique campus discipline or department. Innovation opportunities are often in the overlapping boundaries of multiple

small Oklahoma company with development and testing of a new product.

NPDC faculty and staff have a history of working with manufacturers in a diverse set of industries including those manufacturing products for the oil and gas, chemical, electrical equipment, livestock equipment, roofing and building materials, medical equipment, and recreation industries.

Engaging the best available expertise from multiple campus departments is critical to success. Projects are best if they are consistent with the interests and expertise of the faculty and students that NPDC engages to



Shown above is Dr. Robert Taylor, NPDC Director, with a group of interns. Dr. Dan Tilley works with a multidisciplinary team of faculty, staff and students as the Associate Director of the NPDC.

Multidisciplinary Teams

Dan Tilley, a professor of agricultural economics and Barry Polland MD/P&K Equipment, Inc., Riata Center Fellow, and Associate Director of the New Product Development Center NPDC at OSU, is part of a

disciplines.

NPDC projects have involved faculty and staff from nearly all OSU colleges. A recently completed project included faculty from Agricultural Economics, Biosystems and Agricultural Engineering, and Animal Science working with a

complete the work.

At any given time, NPDC has 20 to 25 graduate and undergraduate student interns in engineering, other sciences, communications, business, and agribusiness addressing issues associated with product and process design and evaluation.

Multidisciplinary collaboration allows for the development and commercialization of economically competitive new products and improved manufacturing processes that strengthen manufacturers' competitive advantage, allow the manufacturers to create and retain jobs, make capital investment and increase the tax base in local communities.

Graduate and undergraduate student interns are frequently important components of project teams. Manufacturers have been increasingly interested in engaging interns that are supervised by NPDC staff. In many cases, the costs of the internship are paid by the companies.

Project

The Oklahoma Manufacturing Alliance, the National Institute of Standards and Technology Manufacturing Extension Partnership (NIST MEP) and the OSU NPDC partnered to complete a project titled "Next Generation Green and Sustainable Manufacturing in Oklahoma Program" to expand existing resources for new product development. The program helped companies complete process, product, and service-development strategies more accessible to manufacturers in Oklahoma.

Class Projects

Students in classes are also engaged in the multidisciplinary problem-solving process. Agribusiness and Agricultural Economics students have worked on teams with students from Biosystems and Agricultural Engineering, Entrepreneurship and Emerging Enterprises, Mechanical and Aerospace Engineering, and International Agriculture.

Students with experience on multidisciplinary teams are better equipped for employment opportunities that involve problem solving. More than 250 OSU students have completed multidisciplinary

innovation projects for Oklahoma manufacturers.

Collaboration off-Campus

The NPDC faculty and staff comprise a diverse collection of education and experience and include Robert Taylor, director; Dan Tilley, associate director; Heather Lewis, Terri Ventress, and Jennifer Vinyard, design engineers and Jessica Stewart, grant coordinator.

This group regularly works with the Oklahoma Manufacturing Alliance and its Manufacturing Extension Agents. OSU Applications Engineers, who are also supported by the Oklahoma Manufacturing Alliance, are often involved in identifying and participating in NPDC project activities for manufacturers.

The NPDC also provides program support to the Oklahoma Center for the Advancement of Science and Technology and serves as the Inventor's Assistance Service (IAS) for Oklahoma. Between 50 and 60 inventors request IAS services annually in an effort to evaluate ideas, perform business case analysis, and acquire design assistance and commercialization advice. Five to 10 products from inventors are currently in various stages of commercialization.

The NPDC works regularly with the Oklahoma Department of Commerce, i2E Inc., the U.S. Small Business Administration and other agencies with an interest in economic development in Oklahoma.

Objective

The project focused on utilizing public and private engineering, business, and communications expertise, plus public and private laboratory facilities for work on high-impact projects developed by Oklahoma manufacturers.

A particular emphasis is on developing "green" projects with efforts made to quickly take new products and technologies to

market.

Impact

In the first three years of the projects 131 unique companies were engaged in 113 program activities. Short-run impacts include:

- Capital investment: \$1.3M
- Unnecessary investment avoided: \$5.9M
- Change in sales: \$35.9M
- Retention of sales: \$30.3M
- Cost savings: \$7.9M
- Jobs created: 117
- Jobs saved: 68

Additional Impacts

Preparing Oklahoma manufacturers will help them realize a greater market share during the recovery. Several former interns are currently employed by Oklahoma Manufacturers and are continuing to contribute to their employer's innovation capacity. Adding to the innovation capacity of companies by adding professionals who have innovation experience with Oklahoma companies assures that the project impacts will extend through the careers of the former interns.

Manufacturing (Continued on page 16)

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Evaluating economic feasibility and importance of specialty crops

Oklahoma farmers and ranchers continue to face decisions concerning changes in government support, foreign competition, the demographic make-up of the domestic population, and the concentration of industry marketing power.

Many Oklahoma farmers continue to examine alternative production and marketing strategies to enhance their incomes. Alternative, or specialty crops including horticultural crops, may provide a niche for certain producers when equipped with adequate resources and the required management skills.

Researchers

Dr. Merritt Taylor, Agricultural Economics professor, continues to research the economics of specialty crops in Oklahoma through a Hatch project.

Previously, as director of the Wes Watkins Agricultural Research and Extension Center in Lane, Oklahoma, he tested the technical feasibility and development of economically viable alternative horticultural enterprises for Southeastern Oklahoma.

Issues

Government budget changes have forced producers to evaluate the profitability of current production practices and to consider alternative production methodologies and alternative cropping systems.

According to previous research, horticultural crops can potentially provide profitable alternatives and fit the whole farm plan for some Oklahoma farmers. However, much of the data used in these analyses is not current.

Anyone considering the addition of horticultural crops to the farm plan

needs current information about several factors related to alternative production strategies.

While scientists in Oklahoma continue to identify and develop varieties of horticultural crops suitable for production in Oklahoma, very little economic information is available for these crops and the associated recommended cultural practices under Oklahoma climatic conditions.

The 2008 Farm Bill includes support

increasing obesity in the young population has provided incentives for federally funded lunch programs to include an increased amount of low-fat fruits and vegetables. Support for programs such as "Buy Local", "Local Farmers Markets", "Know Your Farmer Know Your Food," and the "Farm to School" lunch program have caused producers to consider participating in the new markets.

The project is an attempt to provide newly emerging vegetable



Grapes are a widespread specialty crop in Oklahoma.

and funding for horticultural crop production, organic crop production, and farm-to-school marketing programs. This support has generated an interest by growers and potential growers in considering horticultural crops grown under conventional, sustainable, and organic production practices.

Much of the information needed to make rational business decisions by Oklahoma growers however, is limited or not available.

Project

Congressional concern with

producers and traditional farmers with estimates of expected yields and current costs of production for both conventionally produced and organically produced vegetables.

The technology disseminated would be expected to increase markets for vegetable producers especially in markets where product voids exist. These markets include early and late season extension production when local production is declining.

Over the last 25 years, several related economic projects concerning specialty crops have

been undertaken at Oklahoma State University. Most dealt with marketing issues rather than economic analysis of production practices and enterprises.

Budgets

Economic analysis now being conducted includes enterprise budgets that are being developed or revised to reflect current and recommended practices for the selected crops using various production strategies.

Data for these budgets are being supplied by selected cooperating farmers who provide the basic data reflecting the technology and practices actually being used on their farms to compare the practices being developed by scientists in experimental plots.

Farmers can only develop the specialized knowledge required for successful production by actually participating in the production of horticultural crops or observing other farmers.

The individual enterprise budgets will then be aggregated into whole farm budgets to determine the overall potential impact of including one or more horticultural enterprises in the whole farm production plan.

Models

In addition, models, including risk evaluation, farm planning, and mathematical programming models, are being used to evaluate the income variability of the production of horticultural crops under various farm and random parameter and price variability situations.

The models will consider feasibility not only in terms of profit but also cash flows, capital requirements, labor requirements, market outlets, and risks of income and cash flow variability.

From these models, information will be developed that can be used in extension programs on the potential variability of incomes, expenses, and cash flows.

Objective

The overall objective of the project is to determine for Oklahoma researchers and farmers the economic and financial feasibility of horticultural crops and other alternative crops under various production strategies.

Specific objectives are to:

1. Identify economically viable and sustainable production practices and whole farm budgets for selected horticultural crops and other alternative crops in Oklahoma, similar to those developed for program and other crops

The information will be used to develop publications that can assist farmers and financial lenders in determining the potential of alternative crops for individual situations.

Impact

The number of small producers growing vegetables has increased in the last 15 years providing Oklahoman's a variety of products that come fresh from the farm.

The Oklahoma Department of Agriculture, Food and Fiber has recognized the opportunities and have provided incentives such as grants to producers and providing



Farmers markets in Oklahoma are a good marketing opportunity for specialty crops.

2. Whole farm risk analyses will determine the potential financial and economic feasibility that horticultural and other alternative crops have for providing a main or supplemental source of income for Oklahoma farmers.

funds for SNAP benefit card readers at farmers markets.

Scope of Impact

In Oklahoma, farmers' markets are spread across the state from Mangum to Bartlesville and Antlers to Guymon. At a farmer's market,

Crops (Continued on page 16)

Results

From the budgets and models, information is being developed that can be used in extension programs on the potential variability of incomes, expenses, and cash flows.

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Crops (Continued from page 15)

shoppers can select from a variety of fresh vegetables; salad greens; herbs; watermelon; peaches; cantaloupe; meat products; baked goods; processed jams, jellies, and salsas; and even non-food items such as cut flowers and skin care products.

The number of farmers' markets in Oklahoma has continued to grow over the years (over 70) and more vendors are participating in both weekday and weekend markets.

Farmers' markets offer Oklahomans a variety of products that come fresh from the farm plus the opportunity for shoppers to visit one-on-one with the agriculture producers who are producing their food.

The American public has an increasing interest in where and how their food is produced and farmers' markets allow for direct interaction with agriculture producers. "For many Oklahomans, knowing the person who produces the food that they eat is an important factor in their purchasing decisions," stated Jim Reese, Oklahoma Secretary of Agriculture. "Having farmers' markets

available throughout the state allows people to have access to fresh, locally grown food."

Publications/Presentations

Since the project objectives are to provide existing growers and newly emerging producers with current information on varieties and technologies that are profitable in the diverse climate and marketing atmosphere of Oklahoma, the educational focus has been on public extension presentations directly to growers and the public.

Therefore, the venue of state-wide horticultural meetings has been used extensively. These meetings have included the annual Oklahoma-Arkansas Horticultural Industry show in the early part of the year when most field operations are at a standstill.

Other conferences have been specific to a commodity or group of products such as the annual Cucurbit and vegetable marketing meetings and the annual organic vegetable meetings. Presentations have also been made at small farmer meetings, risk management meetings,

Oklahoma Black Historical Research Project meetings, Plasticulture program meetings, Oklahoma and Texas Watermelon Association meetings, and several international conferences.

Publications and presentations can be accessed on the ag econ website: <http://www.agecon.okstate.edu>. Click on "Publications" in the left-hand column. Then enter "Taylor Merritt" in the database search.

Source of Funding

Oklahoma Agricultural Experiment Station Hatch funds partially support the salary, benefits, and support costs of the professor on this project.

Other funds came from a Congressional Special Grant titled Integrated Production Systems. From 2009 through 2013, proposals were submitted to USDA and accepted and funded for a two-year research project for funding to support the costs of field experiments, three research scientists, two technicians, and several part-time summer field workers.

NPDC (Continued from page 13)

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NPDC activities are primarily support by grants and contracts. Grants have been awarded from the United States Department of Agriculture,

the National Science Foundation, the National Institute of Standards and Technology (NIST), the Economic Development Administration, Department of Energy, Small Business Administration, NASA, and Oklahoma Center for the Advancement of Science and Technology (OCAST) plus private companies engaged in projects.

Several of the grants and contracts require that projects are evaluated by the client manufacturers. Surveys of the impacts generally measure the impacts on sales, cost savings, jobs retained, jobs created, and capital investments. The initial client surveys are collected by Oklahoma Manufacturing Alliance manufacturing extension agents and then are later audited by NIST.

Traceability (Continued from page 7)

importer, such as Japan. This result does not even consider the gains from improving food safety and gains to individual producers from improved supply chain management, improved cattle production practices, and value-added marketing opportunities. Thus, gains to the industry, and to individual producers, could be large if this research is successful.

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Source of Funding

Funding for this project has been received from a USDA-National Integrated Food Safety Initiative grant and a Provost's Oklahoma State University Planning Grant for Establishing an Interdisciplinary Program.

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To access other publications and presentations by agricultural economics authors, go to <http://agecon.okstate.edu/faculty/publications>.

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