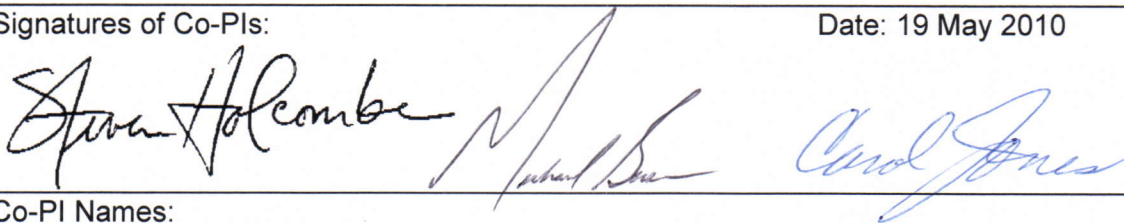


Cover for Pre-Proposal

Co-PI Names: Steve Holcombe, J.D., Dr. Michael Buser & Dr. Carol Jones	
Economic Development Generating Excellence (EDGE)	
FY11 Proposal Application	
1. Title of the Project: Leveraging USDA Specialty Crops Funding to Lay the First Foundational of a Conceptual OSU Agricultural Product Traceability Center	
2. Amount of EDGE funds requested: \$3,126,858	
Year 1: \$522,622	Start Date: Nov 9, 2010 (or soonest thereafter)
Year 2 and Beyond: Y2 -\$517,123; Y3-\$634,003, Y4-\$717,839, Y5-\$735,271	
3. Areas of Focus: Please mark only <u>ONE</u> area as the Primary Area of Focus. Any other Applicable areas of focus should be designated as secondary.	
PRIMARY - Information Tech/telecom	Secondary - Sensors
Secondary - Agriculture	Secondary - Weather Science
Secondary - Biotechnology	Secondary - Nanotechnology
Secondary - Energy	
4. Principal Investigators (PIs) Information:	
Name of Co-Principal Investigator(s): Steve Holcombe, J.D., Dr. Michael Buser, Dr. Carol Jones	
Position or Title: Steve Holcombe, CEO, Pardalis Inc.; Michael Buser, Ph.D., Asst Prof., Biosystems and Ag. Engineering, Oklahoma State University; Carol L. Jones, Ph.D., P.E., Asst Prof., Biosystems and Ag. Engineering, Oklahoma State University	
Address: Include Organization and Department, Division or Equivalent :	
Steve Holcombe, CEO Pardalis Inc., 601 S. Washington St., Ste 211 Stillwater, OK 74074 (405) 334-2300 steve@pardalis.com http://www.pardalis.com	Michael Buser, Ph.D., Assistant Prof. OSU Biosystems and Ag. Engineering 214 Ag Hall Stillwater, OK 74078 (405) 744 -5288 buser@okstate.edu
I hereby accept responsibility for the conduct of the project and for providing the materials and information required for contract performance evaluation. I give consent for the materials in this application to be viewed, as required by member of the EDGE staff and Board members.	
Signatures of Co-PIs:	Date: 19 May 2010
	
Co-PI Names: Steve Holcombe, J.D., Dr. Michael Buser & Dr. Carol Jones	

5. Official Acting as Fiscal Agent:

If multiple contractors, show official of organization designated as Fiscal Agent. This is the official to whom EDGE will send all contract payments.

Name: Robert Dixon

Title: Director, Grants and Contracts Financial Administration

Name of Applicant Organization Acting as Fiscal Agent: Oklahoma State University

Address: Include Organization and Department, Division or Equivalent. No P.O. Boxes.

401 Whitehurst

Stillwater, OK 74078

Phone: 405-744-6097

Fax : 405-744-7487

Email: rdixon@okstate.edu

URL:

Organization NAICS Code: **611310**

Organization Federal Employee Identification Number (FEI): 73-6017987

6. Designate Contract Official:

Show official designated as the Contracting Official for the project. This is the official to whom EDGE will send all award of contract correspondence including (1) the award letter, (2) requests for information and documentation, (3) the initiated contract, (4) the executed contract and (5) progress report and performance evaluation information and requests. If multiple applicants, the designated Contracting Official is responsible for sharing contractual information with all other applicant organizations.

Name: Stephen W.S. McKeever

Title: Vice President for Research and Technology Transfer

Name of Applicant Organization Acting as Designated Contract Official: Oklahoma State University

Address: Include Organization and Department, Division or Equivalent. No P.O. Boxes.

203 Whitehurst

Stillwater, OK 74078

Phone: 405-744-6501

Fax: 405-744-6244

Email: research@okstate.edu

URL:

7. Resubmission

Is this a resubmission?

No

In which year prior was this submitted?

n/a

1) Research and/or Commercialization Opportunity. How is the proposed project likely to strengthen Oklahoma's technology capabilities, which, in turn, may increase the State's ability to attract more external funding, greater human capacity, and/or confer a competitive advantage?

Traceability is a key component in the development of a safe food supply. Recent outbreaks of food borne illnesses attributed to spinach, peppers, and tomatoes illustrate the importance of a fundamentally sound traceability system in protecting public safety and American agriculture. As a result, the fruit and vegetable industry developed a Produce Traceability Initiative (PTI). Unfortunately, this approach to traceability is a one-up, one-back information sharing at the GTIN (global trade item number) lot level which sidesteps the maximal benefits and perceived drawbacks of the internet. As a result, the PTI opportunities for a real-time, item level, stakeholder driven traceability system for fresh produce are extremely limited.

The Biosystems and Ag Engineering Department at Oklahoma State University (OSU BAE) is currently conducting traceability research for handling grain and specialty crop oilseeds in Oklahoma; funded by the Anderson Group and USDA IPM. These researchers are interacting and employing several proprietary traceability methods and are positioned to successfully deploy this project and compete with other "silo" software approaches to traceability. These OSU researchers are committed to establishing a national traceability system and have invested internal funding to establish traceability and food security research in Oklahoma with an emphasis on the efforts being extended both nationally and internationally. Graduate research assistants and laboratory technicians supporting this research are currently developing software, sensing hardware, and process modeling for grain and bioenergy feedstock traceability and quality detection.

In January, 2010, OSU BAE, North Dakota State University, Michigan State University, Pardalis, Inc., Stillwater, OK, and Top 10 Produce LLC, Salinas, CA, submitted a \$4M/5YR application under the USDA NIFA Specialty Crops Research Initiative (USDA-NIFA-SCRI-002672) for a coordinated agricultural project entitled A Real-Time, Item Level, Stakeholder Driven Traceability System for Fresh Produce. This SCRI proposal requires 100% matching funds, which can be covered by EDGE funding. Of the \$4M requested, Pardalis requested \$870,499 and OSU BAE requested \$1,639,805 to cover critical position salaries, essential travel, and materials and supplies.

Pardalis is an Oklahoma advanced technology company and a 2004 OCAST/i2E TBFP awardee. The proposed SCRI research and extension project will innovatively employ Pardalis' multi-tenant central server providing tenant-controlled data/metadata that will - with the permission of each tenant - position both grower data and consumer data for real-time, item-level traceability viewed through additional interfaces. The proposed system will allow all stakeholders including government, consumers, and growers to obtain real-time information at the item level when needed.

The closest comparable model to the approach being taken by the SCRI team is Vendor Relationship Management (VRM). VRM is the reciprocal of Customer Relationship Management (CRM). VRM describes a set of tools, technologies and services that help individuals go to market and manage relationships with vendors. In turn, vendors who align

themselves to these tools, technologies and services will have the opportunity to build better customer relationships. Project VRM, at Harvard University's Berkman Center for Internet and Society, is working to support development of VRM tools and methodologies to provide customers with both independence from vendors and ways to engage with vendors. Recently the top identity management officer of Acxiom, a major data mining and analytics company headquartered in Arkansas, said "that ... giving individuals control over the data that is shared ... increases the quality of the data and opens up new business models". Acxiom funded Kynetx (<http://www.kynetx.com/>), the VRM movement's most visible company, with \$2M last fall. Yet, within the VRM movement there is currently no interest in how data/metadata technologies may improve upon the PTI.

The traceability system being developed by OSU BAE and Pardalis, Inc. is cutting edge. Successfully deploying a system of this magnitude at Oklahoma's land grant university will bring national and international recognition to Oklahoma and OSU. A successful system deployment will put Oklahoma on the leading edge of national and international food safety technology. The system will provide a fee based revenue stream into the Oklahoma economy and put OSU in an outstanding position to secure future research dollars from federal and private industry sources. Pulling together the funding that needed to move this laboratory scale system to national and international arenas is time sensitive and critical. The window of opportunity for deploying a national stakeholder driven traceability systems is wide open and someone will fill this need in the very near future; Oklahoma has the opportunity to fill this national and international need.

2) Deliverables. Is the proposed research or technology well enough understood that its potential can be evaluated at a reasonable level of confidence? Yes. Does it represent an extension or application of the state-of-the-art? Extension. How would one judge its significance and potential impact? See below. What is its probability of success? High.

This will not be the first deployment of Pardalis' enterprise class system to an agricultural supply chain (see Holcombe bio). The SCRI participants seek to apply Pardalis' intellectual property (IP) and engineered system for real-time granular data sharing and traceability. Pardalis' patented methods were first envisioned by Steve Holcombe and Dr. Marvin Stone, now Professor Emeritus of OSU BAE, for technologically addressing product data sharing fear factors as they exist between buyers and sellers of fragmented supply chains. The Microsoft tooled system is multi-tiered for scalability, designed as an online service for producers and consumers information, and is deployable to thousands of concurrent users, millions of transactions per month, and terabytes of data storage. This technology extends well beyond the current legal and industry requirements of the PTI.

Pardalis' IP is secured throughout the world (see <http://pardalis.squarespace.com/patents/>). With the SCRI funding Pardalis will provide its source-code to the SCRI project under a permanent, nonexclusive, global, royalty-free copyright license permitting its free, open, and permanent publication with the following conditions: (a) the public, open source license will be currently limited in its application to specialty crops; and (b) all source code developed within the proposed SCRI coordinated agricultural project (CAP) under Pardalis' IP shall likewise be open

sourced in its application to specialty crops. Furthermore, a cost-effective, highly scalable, open-source business model will be applied to help crack the continuing food safety crises.

The probability for success is high and so OSU, NDSU, MSU, Pardalis and others have invested significant time and resources in submitting grant proposals and letters of intent (expected to cumulatively exceed \$50M in applications in 2010). For example:

- Organic Agriculture Research and Extension Initiative (USDA-NIFA-ICGP-002696) application entitled “A Stakeholder Driven Real-Time, Item Level, Traceability and Marketing System for Organic Commodities” and filed in February 2010 for \$3M/4YR.
- Two Letters of Intent have been filed under CFDA Number 10.310, Agriculture and Food Research Initiative (AFRI) Food Safety Challenge Area. Each LOI is for a Coordinated Agriculture Project (CAP), each providing potential funding of up to \$25M for 5 years. (a) Program Area Code A4121 (Prevention, Detection and Control of Food-borne Viruses in Food: A Focus on Noroviruses). LOI filed in April 2010; (b) Program Area Code A4101 (Prevention, Detection and Control of Shiga toxin-producing *Escherichia coli* (STEC) from Pre-Harvest through Consumption of Beef Products). LOI filed in May 2010.

3) Process. Is the proposed research or technology commercialization to be conducted by those with the greatest expertise and with the best partners? Yes.

The joining of three major land grant institutions (NDSU, OSU, MSU) in the SCRI application uniquely blends food sciences, engineering sciences, and sociology to address the critical challenges of traceability relative to specialty crops. By partnering with private sector companies, Top 10 Produce (http://en.wikipedia.org/wiki/Top_10_Produce) and Pardalis, the proposed research and extension effort is expected to provide creative and original answers to three problems inherent to traceability within agricultural produce supply chains: (1) cost effectiveness, efficient data collection from producers at the beginning of a food supply chain, (2) producers’ privacy concerns about the data they are asked to contribute into supply chains, and (3) lack of data sharing between the proprietary data silos of supply chains.

Steve Holcombe is a third generation, native born Oklahoman. He is a licensed attorney and from 1987 until 2003 operated a private general law practice in Stillwater. Since 2003 he has devoted his full time to guiding Pardalis, Inc. as its Founder, CEO and General Counsel. Holcombe is the co-inventor of an information technology designed for user-centric traceability of data/metadata in supply chains. From October, 2005 to March, 2006 Pardalis – comprised of 10 fulltime employees - executed a privately financed, market-driven project tracking thousands of from a commercial Texas livestock auction. Unfortunately, this promising model could not be scaled because the USDA reduced its efforts in 2006 to introduce mandatory livestock identification. Holcombe found a ‘safe harbor’ for the system first in the Dickinson Research Extension Center of NDSU (2006-2009) and now in OSU BAE. Sponsored by Michigan State University, Holcombe has also given food traceability presentations to the AAAS (‘07), Beijing Food Traceability Symposium (‘07), the Third International IFAS Conference on Nanotech (‘07), and the University & Industry Consortium (‘08).

Dr. Michael Buser is a native Oklahoman who received his Ph.D. in Biological and Agricultural Engineering from Texas A&M University in 2004, MS and BS in Biosystems and Agricultural Engineering from Oklahoma State University in 1998 and 1995, respectively. Dr. Buser worked for the USDA Agricultural Research Service as a Project Leader and Category I Scientist from

1998 to 2009. In this role, Dr. Buser led several multi-million dollar projects funded by federally allocated funds, federal and state grant funds, and private industry funds. In September 2009, Dr. Buser returned home to Oklahoma taking an Assistant Professor position at Oklahoma State University in the Biosystems and Agricultural Engineering Department; 50% research/50% extension appointment. During his career, Dr. Buser has published more than 80 refereed or proceeding manuscripts in industry-related journals or conference proceedings; transferred technology through more than 200 oral presentations; and his work has been highlighted in more than 125 popular press articles. In addition to having the critical application and development expertise and ability to technology transfer, Dr. Buser brings a proven track record of developing and implementing successful national programs.

Dr. Carol Jones is a native Oklahoma who received her Ph.D. in Biosystems and Agricultural Engineering and BS in Agricultural Engineer from Oklahoma State University in 2006 and 1977, respectively. Dr. Jones has managed an Oklahoma farm that produces small grains, feeder cattle, caprine dairy animals and products, and eggs for the past 26 years. In 2006, Dr. Jones joined the Biosystems and Agricultural Engineering Department as Assistant Professor with a 60% research, 25% extension, and 15% teaching split. Dr. Jones has published more than 30 refereed or proceeding manuscripts in industry-related journals or conference proceedings; transferred technology through more than 40 oral presentations. Dr. Jones is an expert in traceability, grain storage, sensor development, and bioenergy. Dr. Jones has a proven track record in research and extension programs.

What is the business model for the project? See 2, above. What previous investments have been made in the work? Source code development. If support from partners or investors is available, how is this included in the proposal? See below.

In the context of the SCRI funding initiative, Pardalis has committed to making a non-exclusive, in-kind contribution valued at \$870,499 in the form of source code. For nominal consideration, Pardalis has also committed to permanently – though non-exclusively - licensing it's globally IP to OSU BAE for specialty crops research. Furthermore, it is expected that with additional research funding jointly applied for by OSU BAE, Pardalis and others, that Pardalis will on a case-by-case basis widen the non-exclusive, permanent licensing of IP to include the crops of other agricultural research initiatives. However, the proposed funding of \$75K per year for the 5 years of a funded SCRI project is for exclusively licensing to OSU BAE for the life of the patents (until 2022) the application of Pardalis' IP to any agricultural research.

4) Importance. Why is an investment from the EDGE Fund necessary? Acceleration. What are the anticipated consequences/impacts of the investment?

The joining of OSU, NDSU, MSU and Top 10 Produce LLC in, first, the SCRI application and now a continuing series of applications, is a significant multi-institutional, multi-state, private/public combination of resources applicable to the areas of agriculture, information technology, biotechnology, sensors (including RFID, Barcode, nanotechnology), biotechnology, energy, weather science (e.g. carbon footprints), etc. And with the filing of the AFRI LOIs, the core SCRI team is now expanding with the inclusion of additional major universities and private companies.

The investment of EDGE funds is not necessary for the long-term success of the Pardalis/OSU collaboration; it will accelerate the success. When it comes to information technology, Oklahoma is universally regarded as a “fly-over” state. The investment of EDGE funds are essential in providing Oklahoma with the best opportunity to (a) rapidly expand the number of researchers, technicians, and support services in the area of food safety within the State of Oklahoma, (b) rapidly grow an existing, home-grown advanced technology company in Oklahoma, and (c) accelerate the development and deployment of an *Agricultural Product Traceability Center* at OSU that will be well positioned to attract \$100s of millions in federal research grants and/or privately funded research.

5) Budget. Compensation for FY1 employees is detailed here:

	Annual	%		Annual + Taxes	
FY1 Employees (EEs)	Salary	EDGE	SCRI	EDGE	SCRI
CEO (Holcombe)	114,370	25	25	31,452	31,452
Admin Asst	32,220	50		17,721	
CTO	112,210	100		123,431	
Soft Engineer	66,570		100		73,227
Soft Engineer	75,590		100		83,149
Soft Engineer	73,830	100		81,213	
Supp Specialist	39,600		100		43,560
Contractor (Dr. Stone)					20,800
Bookkeeper				5,850	
Grad Student	29,388	100		32,327	
Grad Student	29,388	100		32,327	
Grad Student	29,388	100		32,327	
Sub-total				356,648	252,188

The 10 employee positions remain the same throughout the five years of the SCRI project transformed – with EDGE funding – into a conceptual *Agricultural Product Traceability Center*. Increases in employee compensation are related to COLAs and increased funding for original SCRI positions. Total SCRI funding for Pardalis and OSU over 5 years is \$870,499 and \$1,639,805, respectively. Total EDGE funding for a conceptual *Center* would be \$3,126,858. Total funding EDGE and SCRI funding would be \$5,637,162.

	EEs		Travel		Equipment		IP	Total	
Year	EDGE	SCRI	EDGE	SCRI	EDGE	SCRI	EDGE	EDGE	SCRI
1	356,648	252,188	67,400	5,850	23,574	15,176	75,000	522,622	273,214
2	370,095	251,926	68,778	5,976	3,250	0	75,000	517,123	257,902
3	483,019	152,469	72,734	4,068	3,250	0	75,000	634,003	156,537
4	560,756	88,486	76,834	2,058	5,250	5000	75,000	717,839	95,544
5	578,071	85,220	78,950	2,082	3,250	0	75,000	735,271	87,302
Total	2,348,589	830,289	364,696	20,034	38,574	20,176	375,000	3,126,858	870,499

*OSU SCRI line item funding requests are not included in the above table due to EDGE page limits, but will be made available upon request.