2013 Lincoln University of Missouri Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 05/15/2014

I. Report Overview

1. Executive Summary

Missouri ranks second only to Texas in the number of farms. Of the 108,000 farms in Missouri, approximately 101,600 small farms. This is based on farms with gross annual sales less than $250,000 excluding government payments (National Agriculture Statistics Service NASS).These traditional farms represent a way-of-life that Missourians and other rural citizens have taken for granted over much of the nations' history. However, prime farmland in Missouri, as well as in the remaining states, is being lost rapidly due to urban sprawl. This loss of farmland across the United States occurs at a rate of 50 acres every hour, which is one-half million acres per year. A major reason for this loss is because our increasing population results in cities expanding into areas traditionally used by farmers. During encroachment, farmland becomes too valuable to farm and is purchased for commercial development. A major component of this modified land use is for housing developments.

Incorporation of an integrated agricultural/organic production system resulting in high dollar products that are produced in an environmentally friendly manner should be an ideal method for examining various agricultural practices at the rural/urban interface. This integrated system would be as self-contained as possible and would provide a location for numerous extension, research and community activities. Other potential areas that can be evaluated at this location include: impact of farming practices on human health, human and family interaction, the environment, student experimental learning, energy use, and labor requirements.

Agricultural teaching continues to be an important aspect of Cooperative Research Programs and we train both graduate and undergraduate students as they participate in hands-on activities performing research under the supervision of the research faculty in different areas. Lincoln University currently offers undergraduate degrees in Agri-business, Agriculture, and Environmental Science. The Agriculture curriculum provides a choice of emphasis between Animal Science, Plant/Soil Science and Natural Resources. There is also a Master's Degree program in Environmental Science. All of our researchers are involved in the teaching programs at the undergraduate and/or the graduate level

Busby farm continues to be a focal point for this highly integrated research and extension unit at Lincoln University. Results from the research conducted at the farm will be transmitted to limited resource producers and families throughout the state of Missouri. This farm complements our extension urban family and youth development programs in Jefferson City, Kansas City, St. Louis, Southwest Missouri, and the Bootheel. Families and/or youth can be brought to campus for summer camps (they will be accommodated in our youth development camp). Youth are exposed to agricultural practices at Busby and provided the opportunity to assist the manager. This is a unique farm opportunity in Missouri and it is being developed with input from private individuals, area high school students, numerous agricultural organizations, and the University of Missouri.

Individual research projects will continue at Carver and Freeman farms. These projects allow investigators to examine specific issues of concern that cannot be readily incorporated into the integrated farming system. Projects that will be supported for continuing studies in cooperative research will include animal science, plant science, human nutrition, and environmental science.

Global Food Security and Hunger

Animal science

Ruminants:
The primary emphasis in animal science continues to be with goat production systems, but also includes grazing studies with sheep and cattle. These studies are highly integrated between research and extension, and between Lincoln University and the University of Missouri.

Ruminant research at Lincoln University is currently in three primary areas: First, researchers are testing various herbal treatments for the impact on internal parasite load. Second, embryonic and fetal mortality are large sources of economic loss in the livestock industry. Although average ovulation rates are sufficient, a significant economic loss results from a large percentage of those oocytes not resulting in live offspring. A recently approved project will involve real-time ultrasonographic examination of pregnant does throughout gestation in order to discover how much embryonic and fetal loss occurs in goats and when these losses occur. Third, Lincoln is evaluating the feasibility of developing a real-time biosensor for LH using nanotechnology derived components.

Another ruminant program that is gaining interest througout the state is the Value-Added Fiber Program. This program focuses on how to take fibers, make them into products, and to eventually sell products through a home based business.

The University of Missouri has no plans for expanding extension efforts into goat production and the above projects will allow Missouri residents to receive assistance without duplication of effort by the land-grant universities. It is planned that an investigator with training in pasture and forage production will be added with a split research and teaching component.

Mosquitoes are responsible for transmitting the causative agents of some of the most widespread and prevalent infections of humans, including malaria, lymphatic filariasis, yellow fever, dengue fever, and the encephalitis. The significance of mosquito-borne disease transported internationally was observed in the United States during the outbreak of the West Nile virus in New York City and surrounding areas in 1999. In order to control populations of disease vectors and, in turn, control the disease agents they transmit, an extensive and thorough knowledge of the life cycle and ecology of these arthropods must exist. One project examines the biology of mosquitoes from the viewpoint of interactions between mosquito populations and their ecosystems. Through this project we can gain a better understanding of the role that environmental factors play in larval development, adult mosquito production and fitness, and population dynamics.

Aquaculture

This is a relatively new research area at Lincoln University where information from ongoing and future studies will be made available for use by extension personnel at Lincoln University and at the University of Missouri. This program was initiated based upon strong support for starting aquaculture research for Missouri producers. Areas of research include genetic improvement of bluegill and crappie for use as food-fish, sunfish nutrition, and culture methods suitable for small scale/entry level producers. Research is needed that is specific to Missouri because the state has such wide climatic variation. There are no current plans at the University of Missouri to conduct research in production aquaculture systems and we will continue to fill this niche.

Plant Science

This program is highly integrated with the Extension Small Farm Program. Studies continue to

examine profitable and value added products and the marketing of new crops and other plants with particular interest in the needs of underserved farmers with limited resources. Additionally, horticulture is a profitable enterprise on many small farm operations.

The Native Plants Program is increasing awareness about native plants for their potential for human consumption and use as raw material to create value-added products. The Sprouts and Roots Program promotes gardening amont youth and seniors. A new project, called FINCA (Familes Integrating Nature,Conservation, and Agriculture) will focus on growing native edible plants.

Climate Change

Environmental Science

Integrated Risk Management of Impaired Environments in Missouri for Improving Quality of Life and Natural Resources Sustainability. A systematic study of our environment requires investigation of intersections of many disciplines. Studies in environmental science will focus on minimizing the impacts of agriculture on soil, water and air quality.

Childhood Obesity

Human Nutrition

Basic, as well as applied, studies continue in this area examining the causes and impacts of obesity and other related health issues in minority populations. A particular focus in this area are the causes and prevention of obesity, in both youth and adults.

Food Safety

Food Safety

Detection and identification of bacteria and food pathogen is an essential step in food safety inspection. A recently approved project in the area of food safety will develop a novel 3-dimensional (3-D) interdigitated microelectrode array (IDE) based impedance biosensor. This biosensor will be capable of rapid detection and selectively identifying E. coli O157:H7. This design is unique in the use of a 3-D IDE which increases the surface area compared to a single (2-D) IDE sensor. The increased surface area will enhance the sensitivity of impedance detection. Efforts are currently underway to hire an additional person in food safety that will have a split research and extension appointment.

Sustainable Energy

Sustainable Energy

Studies are being undertaken to develop alternative fuel sources that are feasible, economical, efficient, and environmentally friendly. Microalgae studies are designed to evaluate the mass cultivation of microalgal biomass as an alternative fuel source. Leaves are being studied to evaluate their potential use as a secondary fuel source, particularly in power plants, in lieu of or in conjunction with coal.

The application of biochar to soil is a novel approach to establish a long-term sink for atmospheric carbon dioxide in the terrestrial ecosystem. The application of biochar to soil has the potential to improve soil fertility and and increase crop production. This study, started late in the fiscal year, will examine potential hazards associated with biochar applications.

Programs without strong research counterparts

Extension efforts to improve the educational and economic opportunities for under-represented populations in Kansas City, St. Louis, Jefferson City, Southwest Missouri, and the Bootheel will continue. Expansion of programs in Southeast Missouri will occur through acquisition of property and construction of a facility. Programs in all these areas will assist families, youth and the elderly, as well as, entire communities that have underserved and under-represented populations.

Programs of this type include:1) Family and Youth Development, 2) Community Development, and 3) Minority Health and Aging, 4) Expanded Food and Nutrition, 5) Urban Gardening, and 6) Childhood Obesity.

A grant from the Missouri Department of Senior and Health Services will fund the Abstinence Program, which is designed to reduce teen pregnancy and out of wedlock births. Another grant from the Susan G. Komen Foundation, will address Breast Cancer awareness and education in the underserved aging minority population.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	36.0	0.0	44.5
Actual	0.0	35.0	0.0	57.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Research proposals submitted by investigators for Evans-Allen funding are reviewed within each program area, then submitted to the Associate Research Director..The Associate Director evaluates them on feasibility and adherence to the Plan-of-work and complement/integrate with the extension programs. Proposals are then submitted to scientists to evaluate their scientific merit and then returned to the Associate Director. The names of reviewers are removed and the Associate Director returns the comments to the investigator(s) for their response. If the response is satisfactory and/or if satisfactory modifications are made to the proposal it is then submitted by the Director to NIFA. Programs within extension and research will be evaluated for overall direction, progress, and cohesiveness by a panel of program leaders, directors, and non-university stakeholders. Family, youth and community programs will also solicit input from stakeholders located near the satellite offices maintained by Lincoln University in St. Louis, Kansas City, Southwest Missouri, and the Bootheel region.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

Invitations and announcements were sent to radio stations, newspapers and to stakeholders by mail, telephone, and e-mail. Word of mouth was also used to extend invitations to non-traditional stakeholders. Special invitations were sent to minority stakeholders. When English was not their first language, invitations were sent in their native language. Invitations specified that the learning experience would be presented bi-lingual (English and Spanish).

Trainings and other events for traditional and non-traditional stakeholders were offered to the stakeholders.

For seminars targeting minorities: personal invitations were sent, churches were visited, advertisements were played on appropriate radio stations, bilingual newspapers were utilized, and community leaders were contacted. This provided an opportunity to arrange for discussions to address their specific needs at a date, time, and location that was convenient for them and their organizations.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use External Focus Groups
- Needs Assessments
- Use Surveys

Brief explanation.

Not all of the identified methods were used in every discipline. All of the programs used a combination of multiple methods, employing those that would more accurately identify interested individuals and groups.

All major programs have Advisory committees/boards. Stakeholders serving on the boards are surveyed for input at least once a year and programming is adjusted.

Participants were identified by the program specialist during face-to-face conversations, interviews, and telephone conversations; responses to e-mail questions from individuals and referrals from other Extension staff, minority stakeholders, and collaborators.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

Individual opinions were solicited and received on issues affecting stakeholders.

Surveys and meetings were used to collect information from larger groups of people.

3. A statement of how the input will be considered

- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- To Set Priorities

Brief explanation.

The input was used to strengthen and focus efforts in needed areas. The input was also used to adjust Extension activities and the content of presentations. Recommendations were made to the administrator regarding new positions needed to address expressed needs. The core staff of Extension will be expanded in response to information gathered.

Organized additional workshops to cover additional training. Requested information was used to submit a 2501 grant proposal. Passed information on to other agencies if they could not be helped.

Brief Explanation of what you learned from your Stakeholders

There was a high interest and strong desire for continuous learning in composting, health, dieting, landscaping, environmental improvement, landscaping, and eating with native plants.

Many times minority stakeholders are difficult to reach and sometimes were not willing to be identified. In general, they are interested in learning more about native plants to improve their way of life by improving biodiversity and providing an alternative source of income (direct or indirect). Minorities, whose language is not English, have a hard time understanding the opportunities available from USDA. More time and effort is needed to reach out to Hispanics, for example.

There is a huge desire to engage, network, connect, and share resources, information, services, and programs. The stakeholders were able (and willing) to readily identify areas of concern and needs in their respective communities and their perspective of the causal agents. Getting their buy-in to their own community and providing a platform for change, increased a more of a vested interest in the success of the programs.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	2930001	0	3245818

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	3077541	0	3260283
Actual Matching	0	1939135	0	2051967
Actual All Other	0	0	0	0
Total Actual Expended	0	5016676	0	5312250

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	871702	0	173030

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships		5%		8%
111	Conservation and Efficient Use of Water		5%		5%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants		2%		2%
204	Plant Product Quality and Utility (Preharvest)		5%		5%
205	Plant Management Systems		5%		7%
212	Pathogens and Nematodes Affecting Plants		2%		2%
216	Integrated Pest Management Systems		5%		5%
301	Reproductive Performance of Animals		5%		5%
302	Nutrient Utilization in Animals		5%		5%
303	Genetic Improvement of Animals		10%		10%
307	Animal Management Systems		15%		15%
311	Animal Diseases		6%		6%
313	Internal Parasites in Animals		5%		5%
405	Drainage and Irrigation Systems and Facilities		2%		2%
503	Quality Maintenance in Storing and Marketing Food Products		5%		0%
601	Economics of Agricultural Production and Farm Management		8%		8%
604	Marketing and Distribution Practices		5%		5%
721	Insects and Other Pests Affecting Humans		5%		5%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890

Plan	0.0	7.0	0.0	20.0
Actual Paid Professional	0.0	7.0	0.0	31.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	873956	0	1545820
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	725112	0	1157230
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

a. Conduct research to control internal parasites and prevent diseases in small ruminants.
b. Practice the use of artificial insemination in large and small ruminants to improve the genetics of herds and flocks.
c. Determine embryonic and fetal loss in goats throughout gestation, using real-time ultrasound.
d. Research biosensors to facilitate artificial insemination.
e. Develop sunfish cultigens for distribution to the industry.
f. Determine nutritional requirements of sunfishes.
g. Develop optimal production dynamics for sunfishes.
h. Provide aquaculture fish health services for stakeholders.
i. Develop technology to reduce mosquito populations responsible for transmitting the causative agents of some of the most widespread and prevalent infections of humans.
j. Conferences, meetings, workshops, and training and educational opportunities for small farmers.
k. Introduction and evaluation of new crops (especially native crops) and improved cultural practices.
l. Abstracts, publicatons, grant proposals, and guide sheets.
m. Promotion of backyard and community gardening.
n. Conduct analysis of the challenges of rural entrepreneurship and their impact on the prospects of community development.

2. Brief description of the target audience

Lincoln University's Cooperative Research and Extension programs focus on enhancing the quality of life for diverse, limited resources audiences. Low-income, limited resource farmers and ranchers, and underserved population in rural and urban communities.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1334	2850	366	2

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	7	7	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Projects completed, presentations and manuscripts. Enhanced profitability of small farms. Enhanced vitality and strengthening of rural communities.

Year	Actual
2013	132

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-Develop better understanding of environmental factors which contribute to the mosquito's ability to transmit disease to humans and animals. To develop mosquito population management strategies focused on manipulation of environmental factors to influence the mosquito's ability to transmit disease.
2	Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.
3	Farmers adopt new technologies for increased and sustainable production.
4	Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.
5	Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.
6	Enhanced profitability of small farms. Increase farm growth income by $5,000. Enhanced vitality and viability of rural communities. Increase farm retention rates.

Outcome #1

1. Outcome Measures

Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-Develop better understanding of environmental factors which contribute to the mosquito's ability to transmit disease to humans and animals. To develop mosquito population management strategies focused on manipulation of environmental factors to influence the mosquito's ability to transmit disease.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small limited resource farmers to improve production and increase profits. Commercial fish farmers.

What has been done
Aquaculture-Application of research diets, verification of cage studies for food sized sunfish. Small Ruminant-Apply the use of herb cultivars on three farms for the control of internal parasites, using native plant cultivars for grazing sheep and goats.
Conversion of empty swine facilities to aquaculture farming, raising food fish. Transfer new technologies for sunfish, small and large ruminant production for farmers. Refining re-cycle aquaculture systems to be sustainable on small farms. Workshops have reached approximately 1,000 potential fish farmers.

Results
Several novel bluegill crosses have been created with considerable variation in terms of their performance. Data indicates that higher protein and lipid feeds resulted in greater growth and fillet yields in bluegill sunfish. Even though the data is not completely analyzed the higher cost (Higher protein, higher lipid) feeds appear to produce a lower cost of fish produced per pound of feed. Survival of hybrid sunfish in the laboratory was excellent. Survival of cold shocked fish was higher

than expected.
These fish are currently being grown to a stage were ploidy can be determined with the Coulter Counter.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals
721	Insects and Other Pests Affecting Humans

Outcome #2

1. Outcome Measures

Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Commercial fish farmers.
Small farmers interested in ruminant and fish farming

What has been done
Taught 4H youth quality assurance and proper techniques used in livestock care.
Educated producers about disease transmission and control.
Programs delivered included Goat and Sheep disease update, goat meat updates, Animal

Agriculture Emergency Response and Emergency Preparedness for Livestock Specialists. Current LU Small Ruminant research was presented. Workshops and presentations have reached approximately 1,000 potential fish farmers.

Results
Awareness of disease transmission between animals and between humans and animals, how easily it can happen and what producers can do to control transmission. Producers learned how to recognize specific diseases and are now better able to detect and prevent economic losses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #3

1. Outcome Measures

Farmers adopt new technologies for increased and sustainable production.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increased and sustainable production. Farmers should adopt new technologies

What has been done

Through clinics and workshops, introduced new philosophies and methods in controlling internal parasitism in small ruminants such as non-chemical control, sustainable management and control measures that small ruminant producers would be able to utilize. Over 930 farmers participated in workshops and presentations.

Marketing workshops to eventually increase small farmer income. This included the Value-added Fiber Program

Results
A large percentage of the producers who participated stated they would be willing to change management practices and try new ideas, including different marketing strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #4

1. Outcome Measures

Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers need additional income.
Because of the increasing number of older farmers, the state of Missouri is losing minority small farmers and ranchers at an alarming rate due to retirement and death.
Horticultural crops are most attractive to the small-scale producer because they produce high returns per unit land area.

What has been done
Pre- and Post-activity surveys showed the knowledge or techniques were well received by participants. On-farm visits for questions and answers to some commercial vegetable growers; Pre- and Post-activity surveys showed the knowledge or techniques were well received by participants. On-farm visits for questions and answers to some commercial vegetable growers.

Results
More small farmers have learned seasonal extension techniques with high-tunnels. More educators have learned how to organize and manage community gardens. Positions for the ISFOP were advertised.
Individuals redirected their production and marketing practices. Businesses and government adjusted their policies as a result of publications, journals and abstracts. More than 1,800 people were contacted through publications. Twenty younger farmers have joined the cooperative. The name of the cooperative has been selected. Market contracts have been signed with large chain stores.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
503	Quality Maintenance in Storing and Marketing Food Products
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #5

1. Outcome Measures

Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farmers need new technologies to increase farm income.
Alarming poverty rates among farmers, ranchers and residents in Southeast Missouri.

What has been done
More high-tunnel greenhouses were built by small farmers. More community gardens were planned by community leaders for next year.
Conducted meeting and conferences to discuss marketing opportunities for minority farmers and ranchers.
Presented the development of business and market plans to the audiences identified above.
Organized computer literacy training to assist the audience in good farm record keeping.
Buyers have been set up to purchase from Farmer's Cooperative.
Marketing Cooperative has been developed to facilitate collective production and marketing.

Results
Increased/extended supply of freshly produced vegetables and small fruits.
Farmers' income increased by approximately $3,000, less than expected because of the flood and drought that caught farmers by surprise.
Farmers gained invaluable knowledge of computers for purposes other than record keeping.
Younger farmers are still being recruited to begin farming (target is 20).
Hispanic producers and workers were recruited for the first time. The workers assisted in harvesting the produce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
503	Quality Maintenance in Storing and Marketing Food Products
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Enhanced profitability of small farms. Increase farm growth income by $5,000. Enhanced vitality and viability of rural communities. Increase farm retention rates.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Extreme weather conditions had an effect on some of the outcomes. There was flooding in the Southeast portion of Missouri, where a majority of our Extension efforts are concentrated. The biggest challenges were financial and attributed to funding costs. The downturn in the economy affected most of these poor areas. Joblessness became worse and funds for other assistance dried up.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

We found that if the program is maintained and enhanced, profitability of farmers will increase. The quality of life of farm families will improve. Rural communities will become vibrant and attractive to live in.

Key Items of Evaluation

Evaluation was based on current and previous performances of farmers in the region.

- It was also based on market discovery for farmers to profitably sell their produce.
- Recruitment of young farmers played a role in the evaluation.
- The willingness of older farmers to educate the young on the process of farming plays a significant role in the evaluation.
- Last, and not least was on the farming participation rate.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Community and Leadership Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development		60%		50%
802	Human Development and Family Well-Being		10%		0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities		20%		50%
805	Community Institutions, Health, and Social Services		10%		0%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	0.0
Actual Paid Professional	0.0	2.0	0.0	1.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	58218	0	204814
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

S**trengthening leadership and management skills for small towns, communities. and organizations**

Workshops and training sessions covering critical skill areas and topics such as: leadership, community resource planning, negotiation skills, planning, communication skills, self-awareness, understanding and leading people, getting results, strategic thinking , basic leadership skills, work planning and goal setting, customer/resident relations, effective communication skills, budgeting, funding accounting and grant administrations, managing personnel issues, and negotiations.

2. Brief description of the target audience

Small towns, community organizations and agencies.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	425	377	219	83

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Informational sessions including, workshops, presentations and face-to-face meetings.

Year	Actual
2013	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Demonstrate increased knowledge and understanding of community development planning. Demonstrate increased partnerships and resources for the community. Demonstrate increased civic engagement in deliberating community issues.
2	Community decision makers will increase inclusivity when seeking stakeholder input. Stakeholders will be empowered and concerned about improving the quality of life in their community. Community decision makers will seek extramural funds to make improvements. Community decision makers will review, and update ordinances to make operation more efficient.
3	Evidence of community goal attainment * Increased capacity to deal with future issues *Change in community practice *Improved community fiscal and economic performance * Those participating in local government are more representative of the population of the community * Sustained capacity for informed local decision making

Outcome #1

1. Outcome Measures

Demonstrate increased knowledge and understanding of community development planning. Demonstrate increased partnerships and resources for the community. Demonstrate increased civic engagement in deliberating community issues.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community stakeholders lacked understanding of how to be effective when planning for the community's future. Issues of improving the quality of life for youth and future generations. The community stakeholders care and are very concerned about the quality of life in the community where they live.

What has been done
Training and workshops have been facilitated for strengthening leadership and management skills for small towns, communities, and organizations.

Results
Demonstrated an increased knowledge and understanding of community development planning.
Demonstrated an increase in partnerships and resources for the community.
Demonstrated an increase in civic engagement in deliberating community issues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #2

1. Outcome Measures

Community decision makers will increase inclusivity when seeking stakeholder input. Stakeholders will be empowered and concerned about improving the quality of life in their community. Community decision makers will seek extramural funds to make improvements. Community decision makers will review, and update ordinances to make operation more efficient.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community stakeholders lacked understanding of how to be effective when planning for the community's future. Issues of improving the quality of life for youth and future generations. The community stakeholders care and are very concerned about the quality of life in the community where they live.

What has been done
Training and workshops have been facilitated for strengthening leadership and management skills for small towns, communities, and organizations.

Results
Demonstrated an increased knowledge and understanding of community development planning.
Demonstrated an increase in partnerships and resources for the community.
Demonstrated an increase in civic engagement in deliberating community issues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #3

1. **Outcome Measures**

Evidence of community goal attainment * Increased capacity to deal with future issues *Change in community practice *Improved community fiscal and economic performance * Those participating in local government are more representative of the population of the community * Sustained capacity for informed local decision making

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Extreme weather conditions in Southeast Missouri increased the joblessness situation in an already hard hit area. Overall, the economic situation has made it more difficult on families in underserved areas. State budget cuts have had a huge impact in some areas, resulting in more stress and tension in families and communities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A survey of statewide regions resulted in a response from over 3,000 stakeholders. These results were entered into a database for evaluation. That evaluation is currently in progress. We hope to compare the various regions on what programs were effective, what were some regions doing well, that did not work in other regions, and the overall status of programs throughout the state.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Family and Youth Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
724	Healthy Lifestyle		5%		0%
801	Individual and Family Resource Management		10%		0%
802	Human Development and Family Well-Being		15%		0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities		5%		0%
805	Community Institutions, Health, and Social Services		10%		0%
806	Youth Development		35%		0%
901	Program and Project Design, and Statistics		10%		0%
903	Communication, Education, and Information Delivery		10%		0%
	Total		100%		0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	22.0	0.0	0.0
Actual Paid Professional	0.0	20.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	1937477	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	115118	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The activities in the four Regions; Kansas City, St. Louis, Central, and Southeast regions all have similarities and differences. However, all have been developed to design, implement, and evaluate educational programs for youth and families at-risk. Program implementation includes club member retention, workshops, camps, and after-school programs.

Specific examples of activities from the Kansas City area include:

• Mentoring Program that matches community volunteers who will spend time with interested youth. Delta Sigma Theta sorority and Phi Beta Sigma and Alpha Phi Alpha fraternities often assist with this program.
• ACT Preparation: Work with students to prepare for the English and Math portions of the ACT test.
• Fatherhood Programs: This includes youth and adults and these are meetings that address topics related to self-esteem, nutrition, fitness, computer skills, relationships and parenting.
• Afterschool Tutoring Program: Programs are to assist students K-8 with homework, tutoring, computer classes, reading and math labs, life skills, arts, and crafts and recreation. Collaboration with the National Book Bank provides donations of books to non-profit organizations.
• Fitness Program: LUCE currently offers the Division of Youth Service classes in their physical education component. The community also participates in exercising to increase their energy level and to improve their overall health.
• The Abstinence Program, for youth to learn the advantages of remaining abstinent.

Specific examples of activities from the St. Louis area include:

• Teen Drop In: This program has open enrollment for neighborhood youth and is to provide an after-school community safe haven. The teen drop in offers an array of opportunities for youth between the ages of 12 to 17. Activities and educational workshops include but will not limited to homework assistance, open-microphones to develop their skills in public speaking/poetry, teen talk to discuss youth community issues and concerns, and educational games as well as activities that teach to enhance their life skills. Offered through the school year.
• North Side after School Neighborhood Initiative: This is a partnership between Lincoln University Urban Impact Center of St. Louis, community volunteers and two St. Louis Public grade schools. Our initiative is to provide a power-hour implementing homework assistance for youth after school, provide life skills activities that teach addressing communication skills, drug and alcohol prevention, conflict resolution etc, as well as health and nutrition via snacks and physical activity in the school gymnasiums. This program offers open enrollment to youth participants. This activity uses 10 community volunteers.

• Urban Garden Beautification Project collaborative effort with the St. Louis Neighborhood Stabilization Office and community leaders to continue transforming a weed infested vacant lot into a neighborhood asset that will assist in stabilizing the neighborhood and revitalize community.

Specific examples of activities in the Southest Missouri Region include:

• Health and Fitness Classes
• Health fair designed to educate youth on nutrition, fitness, and the dangers of alcohol, tobacco, and other drugs.
• Field Day - a culmination of educational workshops on a variety of topics for all ages.
• Back-to-school rally to prepare students for the upcoming school year.
• HIV/AIDS/STD Awareness Day
• Summer Camp, a partnership with YMCA, community and state agencies to provide fitness and health, character development, arts and crafts, self-esteem building, recreation, and field trips for 5 weeks.
• Women's Wellness Conference
• Teen Talk/Young Scholars, a weekly program that allows teenagers to express themselves freely on different topics.

Specific activities in the Central Region include:

• Underserved minorities and other disadvantaged older adults 50 + in Cole Co. area will become more aware and knowledgeable about importance of adopting a healthy lifestyle.
• Participants will become proactive in seeking health information.
• Participants will become more aware of ways to manage their personal health
• Youth will develop increased communication skills, receive feedback, certificates of award and recognition for their efforts.
• Family and community empowerment experiences to assist parents helping their children close the educational achievement gap.

Activities that have been implemented in all four Regions include:

Black History Programs for youth (K-12) in the school districts. This is an educational program on the accomplishments and struggles of African-Americans.

Program to address childhood obesity for parents and youth.

Financial Management and Youth Program, which is designed to teach youth about basic financial management in order to help them make better economic and life decisions.

A Gathering of Kings Conference develops skills for making healthy choices when dealing with oppressive issues. By providing youth with positive mentors and role models, the issue of increased high school drop out rate is addressed and children are more likely to complete high school and attend college. By providing the youth with positive mentors and role models we are also aiding suicide prevention and combating in lowering suicide attempts

2. Brief description of the target audience

Minority and other under-represented youth in urban St. Louis, Kansas City and selected locations in the bootheel region of the state (Primarily Sikeston, Lilbourn and Caruthersville). Minority and under-represented populations in Central Missouri, especially those living in public housing developments.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4103	3886	12894	9543

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Education classes, invited speeches, workshops, in-service education, consultations, media appearances, web sites, newsletters

Year	Actual
2013	193

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short term: 1) Enhanced academic productivity, 2) Improved rate of community volunteerism 3) Development of leadership skills, 4) Increased knowledge and life skills.
2	Medium term: 1) Completion of current grade and promotion to the next, 2) Increased graduation rates from high school, 3) Reduced probability of acts of crime, 4) Increased self-esteem, and 5) Better life choices.
3	Long term: 1) Improved education levels, 2) Increased standard of living, 3) improved quality of life.

Outcome #1

1. Outcome Measures

Short term: 1) Enhanced academic productivity, 2) Improved rate of community volunteerism 3) Development of leadership skills, 4) Increased knowledge and life skills.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lack of availability of services and resources for underserved and minority populations to reduce health disparities and inequities in access to health-related care and literacy. Limited resource and underserved minority youth and families are in need of supplemental education to increase academic achievement and school success.

What has been done
Provide culturally and educationally appropriate information on health management and established collaborations with other health entities and interested health professionals; including conducting focus groups, educational workshops, afterschool programs, volunteer and leadership training.

Results
Many participants reported feeling that the educational presentations extended their knowledge of health issues, as well as resources available for adults, especially the older clientele. In particular, 98% of participants reported that the content of the Missouri Institute on Minority Aging provided helpful health/resource information to them professionally and personally. Increased knowledge and skills, and enhanced academic productivity. Youth participants in afterschool reading programs have increased their scores by two grade levels, as evidenced by test scores. Youth are more knowledgeable, make better life decisions, and show more leadership skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management

802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development
901	Program and Project Design, and Statistics
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Medium term: 1) Completion of current grade and promotion to the next, 2) Increased graduation rates from high school, 3) Reduced probability of acts of crime, 4) Increased self-esteem, and 5) Better life choices.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lack of availability of services and resources for underserved and minority populations to reduce health disparities and inequities in access to health-related care and literacy. Limited resource and underserved minority youth and families are in need of supplemental education to increase academic achievement and school success.

What has been done
Information was compiled from monthly health educational sessions, health screenings, face-to-face interviews, and testimonies from program participants via in-person and/or small group settings.
Afterschool tutoring, summer enrichment, EFNEP, computer literacy program and college preparatory classes. Workshops and seminars focused on leaderships skills, health education, making better choices, and nutrition.

Results
Participants indicated adopting one health behavior (decreased sodium and sugar consumption) that aided in better blood pressure and glucose monitoring of hypertension and diabetes,

respectively.
Completion of current grade and promotion to next, increased graduation rate, increased self-esteem, better life decisions, and increased interest in attending college. Students who were identified as high risk youth were provided additional education, social, and emotional support. Those identified youth were able to achieve academic improvement and graduated to the next grade level. Teenage parents are making positive changes in the way they parent at home. Youth are learning to set goals with new aspirations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development
901	Program and Project Design, and Statistics
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Long term: 1) Improved education levels, 2) Increased standard of living, 3) improved quality of life.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lack of availability of services and resources to underserved and minority populations to reduce health disparities and inequities in access to health-related care and literacy. Limited resource and underserved minority youth and families are in need of supplemental education to increase

academic achievement and school success.

What has been done
Survey results of participants indicated a change in better health management and knowledge based on health educational sessions. There was qualitative and quantitative analysis using pre-post test, testimonials and survey evaluations.
Workshops on college prep, financial aid completion for college, volunteer and leadership training, summer enrichment programs, and EFNEP.

Results
Participants plan to have more health screenings, especially for blood pressure and diabetes.
Expected outcomes and impacts were described through monthly, quarterly and annual reports.
Improved life decisions, healthier and more fit individuals, and improved quality of life.
Students who were identified as not being able to complete grades 11 and 12 were given academic and emotional support, and completed grades 11 and 12, and subsequently graduated high school.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development
901	Program and Project Design, and Statistics
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

- Participants have made family and friends aware of the importance of adopting a healthy lifestyle.
- Participants utilized health literature as resource information on culturally

appropriate healthcare, regional health and aging programs, health issues and concerns.

- An assessment identified an initial set of issues facing Callaway County, which was identified by partners through community organization and with additional input from individuals in the county.
- More youth are graduating from high school with an improved quality of life.
- Youth are making better grades in school, learning leadership skills, and serving less suspensions.
- Youth are eating healthier and are more active.
- Individuals completing evaluations indicated they learned helpful information and will share it with friends and families.
- Communities are excited about continued participation with Lincoln University Extension.
- Returning participants brought siblings along for enrollment in programs and workshops.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A survey of statewide regions resulted in a huge response from stakeholders. This input allows staff to make necessary program adjustments.

Key Items of Evaluation

- It is important that varying degrees of flexibility and uniqueness be reasonably allowed for the maximization of program delivery and participation.
- Some issues are still a concern: increased high school dropout rate in urban areas, the non-parental presence and support in the lives of urban youth, the increasing number of young African-Americans affected by HIV/AIDS, and a high teenage pregnancy rate in urban schools.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships		25%		25%
112	Watershed Protection and Management		20%		10%
123	Management and Sustainability of Forest Resources		5%		5%
136	Conservation of Biological Diversity		10%		10%
141	Air Resource Protection and Management		10%		10%
215	Biological Control of Pests Affecting Plants		5%		5%
216	Integrated Pest Management Systems		5%		5%
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals		10%		10%
403	Waste Disposal, Recycling, and Reuse		5%		5%
511	New and Improved Non-Food Products and Processes		0%		10%
723	Hazards to Human Health and Safety		5%		5%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	16.0
Actual Paid Professional	0.0	2.0	0.0	15.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	140966	0	568934
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	2327	0	570661
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Water Quality Studies:

1) To establish baseline data, evaluate practices at CAFOs identified sites, and quarterly determine the concentrations of E. Coli, nitrate, nitrite, ammonia, total nitrogen, phosphorus, and antibiotics in lagoon/holding tanks, during manure applications, in CAFOs runoffs, and in streams and compare data obtained with natural systems.

2) To evaluate rainfall events and possible water quality changes due to Escherichia Coli, nitrate, nitrite, ammonia, phosphorus, and antibiotic drugs in streams and leachates from identified CAFOs.

3) Relate farm operations on the partitioning and fate of phosphorus in streams and sediments.

4) Assess the occurrence of antibiotic drugs in native fish collected from streams near CAFO identified sites.

5) Apply analytical data obtained in water quality modeling to better predict water quality near a CAFOs site.

6) To provide BMPs that will assist in water quality improvements near identified CAFOs in Central Missouri.

7) Develop new methods for the accurate determination of the source and magnitude of fecal pollution in water.

Risk Reductions and Remediation of metal-Contaminated Mining Wastes in Missouri :

Characterize the physical/chemical properties of the tailings and determine the spatial variability of metal contamination in the areas. This objective will focus on the collection of soil and water samples within the study site, the analyses of metal concentration and metal species in samples, and the determination of the extent or degree of the contamination and spatial distribution of contaminants. This study will provide base information of the site for selecting in situ treatment.

Watershed Based Studies:

The specific objective of the geospatial studies is to create a geospatial digital database for the Lake of the Ozarks, Lamine, Lower Missouri-Moreau, and Osage watersheds. The database will play an integral role in designing field sampling strategies, plotting sample locations, conducting spatial analysis and modeling of analytical data. The primary task is to locate and assemble relevant geospatial data from the various state and federal agencies. The database will consist of various layers including digital elevation models, land use/land cover, geology, soil, hydrology, mine locations, wetlands, floodplains, and remote

sensing data (satellite and air photo).

One project looked at improving our understanding of the hydrologic pathways and their controls on nutrient and herbicide transport and leading to the continued development of tools to mitigate the export of nutrients and herbicides.

Air Quality Studies:

The specific objectives of this study are to investigate,

1) How soil pore space and thermal properties indices (pore tortuosity factor, relative gas diffusion coefficient and thermal conductivity, diffusivity and resistivity) relate to greenhouse gas fluxes from soils under agricultural fields, forest and pasture,
2) How pore space indices vary in these soils with different vegetation types,
3) How pore space indices, soil thermal properties (thermal diffusivity, conductivity and resistivity), greenhouse gas fluxes and other dynamic soil properties relate to static soil characteristics such as texture and bulk density in soils under agricultural fields, forest and pasture, and finally
4) How the use of geo-spatial technologies (GPS, GIS and Geostastics) in our sampling strategies improve the estimation of greenhouse gas fluxes, static soil characteristics and dynamic soil properties.1) Examine how management, use, and restoration of grasslands affect their biological diversity,

Behavior of Select Surfactants in Soil: Interactions with Physicochemical and Microbial Properties

The specific objectives of this study are**:**
1. Study the changes in soil microbial consortia as affected by different surfactants. Knowledge of the natural evolution of microorganisms in the soil will be crucial to successful study of the fate of these chemicals and possible bioremediation design schemes.
2. Determine the effect of different surfactants on plant nutrient uptake. This objective will investigate the possible interactions of surfactants with macro-and micronutrient uptake by plants.
3. Measure the activities of enzymes involved in the cycling of C, N, P and S in the presence of different surfactants.Surfactants can interact with microbial enzyme activity.

Natural Resource Diversity Studies

Objectives of the studies are to
1) Examine how management, use, and restoration of grasslands affect their biological diversity,
2) Develop recommendations for planting CRP fields which would increase their biological diversity,
3) Identify farm practices which would lead to conservation of biological diversity.
4) Examine application of Biochar to soil to improve soil fertility and crop production.

2. Brief description of the target audience

The target audience includes activists, teachers, researchers, policy makers, and professionals in environment related areas. The general public target audience includes farmers, students, and residents living in contaminated mining sites. Part of the specific target audience includes residents of rural communities in Central Missouri, i.e., residents of Cole, Miller, Morgan, and Moniteau Counties.
The Extension programs targeted a diverse population, including Hispanic, African-American, women,

children, and youth. The presentations averaged about 50% minority and 50% white.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1096	1618	557	517

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	14	10

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Short term output measures are: Abstracts(16), Presentations (20), Training students (10),and Workshops (4). Intermediate output measures are publications. Long-term: After five years

Year	Actual
2013	87

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Chemical and biological characterization of the ecosystems.
2	Expected change in agricultural practices from farmers. Better management of agricultural and natural ecosystems complex.
3	Environmental sustainability; Improved quality of life
4	Contribution to understanding of interactions between human practices and natural ecosystems; Enhanced stakeholders knowledge and understanding of environmental issues; Better management of agricultural and natural ecosystems complex.
5	Increase knowledge about using native plants for conservation practices, such as providing habitat for pollinators and other beneficial wildlife.

Outcome #1

1. Outcome Measures

Chemical and biological characterization of the ecosystems.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lead contamination in soil, which is causing serious health problems for children. The chemical and toxic leachates, pathogens, biological organisms can negatively impact public health, ground water, and streams. Water runoff from CAFOs contaminating water quality of streams near CAFOs

What has been done
Started mapping and analyzing rock, mineral, and water samples from seven abandoned mines. Identified potential soil controlling factors for greenhouse emissions from soil. Increased knowledge of Pb behaviors and risks in soil ecosystem. Collected water samples near CAFOs, to evaluate levels of E. coli, nitrogen, phosphorous and antibiotic drugs from animal waste.

Results
Increased understanding of greenhouse gas emissions from agricultural fields. Preliminary results showed that the H3PO4 treatment effectively immobilized soil PB, thus lowering the risks to human health, however more studies are needed. Extensive education given to members of the target audience. Better management to improve water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity

141	Air Resource Protection and Management
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Expected change in agricultural practices from farmers. Better management of agricultural and natural ecosystems complex.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Understanding greenhouse gas emissions from agricultural fields and devising strategies to mitigate these gases. Deterioration of water quality due to runoff from CAFOs. Conservation and protection of native plants and other natural resources help to protect watersheds, which results in cleaner water, air, soil, and healthier and safer environments

What has been done
Field collections from agricultural fields, pastures, and forests in Central Missouri to identify potential soil controlling factors for greenhouse gas emissions from soil. Water sample collections to determine level of E.coli, nitrogen, phosphorous, and antibiotic drugs. Through field days, conferences, seminars and other events, awareness has been increased about the importance of protecting natural resources.

Results
Better understanding of greenhouse gas emissions and a new approach to measure these emissions from fields, pastures, and forests. Education for stakeholders to alter agricultural practices to reduce emissions from agricultural fields. Better management practices to improve water quality.
There are positive changes associated with the Native Plants Program, Native Pollinator Program, and the restoration of warm season grasses, but they are too hard to measure at this time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Environmental sustainability; Improved quality of life

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lead contaminated soil and contamination from runoff associated with abandoned mines and CAFOs. This is a health risk for those who live in and near contaminated sites.
Participants in field days, seminars, and workshops were introduced to conservation practices.

What has been done
Risk reduction of lead (Pb) contamination is soils and lands through in situ phosphate treatment of contaminated soil. This helps re-establish vegetation cover to protect human and environmental contamination. Water samples from streams near CAFOs.
Native Plant gardens are under development for education and to provide a relaxing atmosphere to improve quality of life. Also these plants could provide a specialty crop for small farmers or

producers.

Results
Reducing the health and ecological risks associated with Pb in soil ecosystem. Sustaining natural resources and improving environmental quality and quality of life. Better management practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
403	Waste Disposal, Recycling, and Reuse
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Contribution to understanding of interactions between human practices and natural ecosystems; Enhanced stakeholders knowledge and understanding of environmental issues; Better management of agricultural and natural ecosystems complex.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Educating stakeholders and target audience about the relationship between soils and soil properties to reduce greenhouse gas emissions. Contamination of soil, groundwater, and streams by lead concentrations, abandoned mining operations, and runoff from CAFOs.

What has been done
Numerous workshops and presentations were given to help educate the target audience. Tests were conducted to evaluate in situ phosphate treatment of contaminated soils. Samples were taken from abandoned mines and one stream for further analysis to help determine level of contamination and impacts to ground water.

Results
The overall results, so far, is a better understanding of the relationship between soil properties and greenhouse gas emissions. More of the target audience has been informed about environmental issues and the complex interaction between natural ecosystems and human practices. Better management practices and conservation practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Increase knowledge about using native plants for conservation practices, such as providing habitat for pollinators and other beneficial wildlife.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extension specialists work with small farmers, producers, and landowners. Along with educators such as Master Gardeners, Master Naturalists, and teachers interested in ecology, biology, and conservation.

What has been done
Native plant and native pollinators workshop introduced the idea of using native plants as habitat for beneficial insects.

Results
Several participants have offered workshops about native pollinators in their own regions. Awareness about native pollinators has been increasing steadily. Partnerships between Lincoln University and other organizations have occurred as a result of this workshop. Additional workshops of this nature are planned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
136	Conservation of Biological Diversity
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

These factors could have impacted outcomes, but in the past year there were few external factors that did hinder the projects. The economy is always an issue, as joblessness, in certain areas is more prevalent and creates anxiety and tension among families and communities.

There were some problems to reach out to Hispanic audiences because of immigration issues, as many people either do not have legal documents or have relatives who are illegal. There is a false idea that Universities are governmental organizations that will report illegal immigrants to authorities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

These factors could have impacted outcomes, but in the past year there were few external factors that did hinder the projects. The economy is always an issue, as joblessness, in certain areas is more prevalent and creates anxiety and tension among families and communities.

There were some problems to reach out to Hispanic audiences because of immigration issues, as many people either do not have legal documents or have relatives who are illegal. There is a false idea that Universities are governmental organizations that will report illegal immigrants to authorities.

Key Items of Evaluation

Overall, the stakeholders were very receptive to the studies that are designed to provide healthier living conditions for their families. People are aware of the environment and understand the need to study and document runoff from abandoned mines and CAFOs. Participants were excited about the idea of using native plants as pollinators and a special crop subsidy.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
402	Engineering Systems and Equipment		0%		25%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources		0%		50%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins		100%		25%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	4.0
Actual Paid Professional	0.0	3.0	0.0	5.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	837454
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	1096578	0	324076
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1) Perform experiments and publish results
2) Presentation of experimental results in scientific conference and seminars
3) Conduct workshops
4) Distribution of information of nutrition and physical activity to clientele

2. Brief description of the target audience

African-Americans, low-income families and other under represented groups in St. Louis, Kansas City, Bootheel and Jefferson City areas in the State of Missouri.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4739	4369	1302	746

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	5	0	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publication, presentations, workshops and contacts.

Year	Actual
2013	23

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Measurable improvements in public health and reduction in health care costs for specific population such as African-Americans, low-income families and other under represented groups. Expect 80% positive response of those contacted.
2	Children and adults make short-term and long-term decisions on healthier choices and increased physical activities.

Outcome #1

1. Outcome Measures

Measurable improvements in public health and reduction in health care costs for specific population such as African-Americans, low-income families and other under represented groups. Expect 80% positive response of those contacted.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
All families who prepare food want to know that the food they purchase and prepare is free of bacteria and other pathogens.

What has been done
Workshops and presentations to community groups, schools, and students to stress the importance of nutritious, fully cooked food.

Results
Expect an 80% positive response of those contacted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Children and adults make short-term and long-term decisions on healthier choices and increased physical activities.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health officials, food processors and handlers. Low-income and under served populations. Safe, clean food is necessary to help prevent illnesses, and lower health care costs.

What has been done
Early testing of sensor to more readily identify bacteria and other food pathogens. Early experiments indicate that the testing device is very sensitive with positive results so far.

Results
Early elimination of contaminated food to prevent human illnesses and costly market recalls. Experiments are still being conducted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Changes in any of these external factors could ultimately impact funding dollars that are necessary to continue with the project.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

To be determined.

Key Items of Evaluation

Project will decrease the evaluation time to detect E. coli and other bacteria and food pathogen. This detection and evaluation method will reduce the detection time and provide timely identification prior to the food being sold to consumers. An early determination of contamination will prevent the food from being sold, will prevent people from becoming ill, and will prevent costly food recalls.

Positive response from those contacted in regards to keeping food clean of bacteria and proper cooking methods.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships		0%		10%
111	Conservation and Efficient Use of Water		0%		10%
131	Alternative Uses of Land		0%		5%
132	Weather and Climate		20%		5%
133	Pollution Prevention and Mitigation		20%		10%
141	Air Resource Protection and Management		10%		0%
402	Engineering Systems and Equipment		20%		0%
403	Waste Disposal, Recycling, and Reuse		20%		5%
404	Instrumentation and Control Systems		10%		0%
511	New and Improved Non-Food Products and Processes		0%		55%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	2.0
Actual Paid Professional	0.0	1.0	0.0	2.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	0	103261
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Proposed studies are designed to fully develop, evaluate, and demonstrate the capabilities of the innovative technology for economical and efficient production of algae-derived oils for use as the source of biofuel. To achieve the overall goal, the proposed work will be performed in two major areas: 1). Micro-algae cultivation and harvest, and 2). Algae oil extraction and transesterification.

Second project: The ultimate goal of this project is to maximize the bioenergy (biomethane, and bio-oil) production from switchgrass with producing biochar as a valuable soil amendment. To achieve this goal, experiments along with energy and mass balance models will be combined to optimize the net energy production from two conversion systems including integrated biochemical and thermochemical conversion processes. Microalgae will be used as an amendment to adjust the C: N ratio and moisture content of switchgrass prior to the biochemical conversion processes.

A third study will evaluate the application of biochar to soil as a novel approach to establish a long-term sink for atmospheric carbon dioxide in the terrestrial ecosystem. The application of biochar to soil has the potential to improve soil fertility and and increase crop production. This project will address whether carcinogenic polycyclic aromatic hydrocarbons (PAHs) are formed int the process of slow pyrolysis of air-dried biomass, and if so, how the process could be modified and standardized to reduce or eliminate the possibility of PAHs formation. A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

2. Brief description of the target audience

- Undergraduate/graduate students
- Small Farmers
- Local Electric Cooperatives
- Scientists and other Researchers
- Extension workers
- Policy makers/ Regulatory Agencies
- Local Citizens/Community Leaders
- Engineers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	5	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Short term output measures are: Abstracts, presentations, training students, and workshops. Intermediate output measures are publications

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Identify high yielding, hardy pest resistant microalgae strains.
2	Develop commercial cultivation system for mass production of algal biomass
3	Educate stakeholders on research status for environmental solutions
4	Educate farmers, scientists, and engineers about the economic feasibility of biomass production.
5	A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

Outcome #1

1. Outcome Measures

Identify high yielding, hardy pest resistant microalgae strains.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farmers, electric cooperatives, community leaders, citizens all have a vested interest in evaluating alternative fuel sources.

What has been done
Collection of many micro-algal species, specifically native species that adapt well, has been established

Results
Two private companies have already shown an interest in the test evaluations of their proprietary processes using selected algae species. The project has been expanded to develop a microalgae cultivation system that can utilize carbon dioxide in the flue gas from the fossil-fuel power plant.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

Develop commercial cultivation system for mass production of algal biomass

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farmers, Community leaders, Electric cooperatives.

What has been done
Working on the new transesterification method for the economical production of biodiesel from oil-bearing crops, including microalgae.

Results
Two private companies have shown an interest in the test evaluations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment

403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Educate stakeholders on research status for environmental solutions

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farmers, Community leaders, Electric cooperatives.

What has been done
Working on the new transesterification method for the economical production of biodiesel from oil-bearing crops, including microalgae.

Results
Two private companies have shown an interest in the test evaluations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management

402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes

Outcome #4

1. Outcome Measures

Educate farmers, scientists, and engineers about the economic feasibility of biomass production.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
All stakeholders have an interest in finding viable environmental solutions.

What has been done
Numerous presentations, publications, and workshops have informed all targeted audiences about the present research status.

Results
A more informed and interested stakeholder audience.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Changes to any or all of these external factors could have a substantive impact on continued research. Research is dependent upon funding, which is a product of the economy, government regulations, and changes in public policy and appropriations.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

More testing is still needed with the micro-algal studies. Private companies do show an interest, but more information needs to be evaluated to determine the economic feasibility of both projects. Biochar studies have just been started and more information is needed to present an in-depth evaluation.

Key Items of Evaluation

There is real interest from stakeholders in the future potential of alternative fuel sources. Stakeholders are willing to look to the future and maintain an open mind with regards to potential energy sources that are economically useable.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
701	Nutrient Composition of Food		0%		25%
702	Requirements and Function of Nutrients and Other Food Components		0%		25%
703	Nutrition Education and Behavior		0%		25%
704	Nutrition and Hunger in the Population		5%		0%
724	Healthy Lifestyle		15%		25%
801	Individual and Family Resource Management		5%		0%
802	Human Development and Family Well-Being		10%		0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities		5%		0%
805	Community Institutions, Health, and Social Services		5%		0%
806	Youth Development		30%		0%
901	Program and Project Design, and Statistics		15%		0%
903	Communication, Education, and Information Delivery		10%		0%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	2.0
Actual Paid Professional	0.0	2.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	66924	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Optimal nutrition is important to the health and well-being of all people. Previous studies have shown that diet is a factor in 6 of the 10 leading causes of death in the U.S. Improved nutrition will increase quality of life, productivity, and reduce health care costs in populations throughout the nation. Lincoln University is continuing to focus their efforts on relationships between nutrition and health, and on establishing optimal nutrient requirements for diverse populations. Programs are designed to ensure that nutritious foods are affordable and available, and provide guidance so that individuals and families are able to make informed, science-based decisions about their health and well-being.

Specific areas of focus include the role of diet and exercise on the development of obesity, hypertension and type 2 diabetes and their subsequent contribution to development of cardiovascular diseases. Focus is also placed on education of public for prevention of these chronic diseases by life-style modification (healthy eating and increased physical activity). There are plans to study the biochemical and physiological basis for regulation of body weight and body fat distribution using a diet-induced obese animal model. While this research is relevant for all people, emphasis is primarily on specific subpopulations including African-Americans, low-income populations and other underrepresented groups.

Lincoln University Encore Steppers (LUES) is a teen leadership, team building fitness program designed to teach team skills, good decision making skills, and to stay physically fit. The statewide "Show me the Ropes" obesity reduction /double dutch competition was initiated. This is an 8-week nutrition and fitness program combined with the activity of jumping rope for health. Other workshops, conferences, and after school programs focused on nutrition, staying fit, and making healthy choices.

2. Brief description of the target audience

African-Americans, low-income families and other underrepresented groups in St. Louis, Kansas City, the Bootheel, and Jefferson City areas in the State of Misssouri.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	434	640	522	487

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publications, presentations,workshops, and contacts.

Year	Actual
2013	24

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase knowledge of good nutrition measured by surveys pre- and post-nutrition education. Increased awareness about relationship between nutrition and physical activity and chronic diseases measured by periodic surveys. increase nutrition knowledge, awareness, and importance of nutrition for prevention of chronic diseases.
2	Number of citations of publications by other scientists in scientific papers. -Use of research results by nutrition extension and health care specialists. Improvement of eating behavior and physical activities. -Decrease in percentage of overweight and obesity in research and extension participants. Medium-term: 2010 - measurable weight reduction (1-5%) in overweight and obese subjects and clientele. Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). measurable weight reduction (1-5%) in overweight and obese subjects and clientele 2011 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2012 - Same as 2011. 2013 - Same as 2012 and number of citations of publications = 10 2014 - Same as 2013 and number of citations of publications = 15
3	measureable improvements in public health and reduction in health care costs for specific populations, such as minorities, low-income families and other underrepresented groups. Expect 80% positive response of those contacted.
4	Short-Term: enhanced academic productivity, improved rate ofcommuniy volunteerism, development of leadership skills, increased knowledge, and increased life skills.
5	Medium Term: Completion of current grade adn promotion to the next, increased graduation rates from high school, reduced probability of acts of crime, increase in self esteem, better social standards, and better life choices.
6	Long Term: Improved education levels, increased standard of living, and improved quality of life.

Outcome #1

1. Outcome Measures

Increase knowledge of good nutrition measured by surveys pre- and post-nutrition education. Increased awareness about relationship between nutrition and physical activity and chronic diseases measured by periodic surveys. increase nutrition knowledge, awareness, and importance of nutrition for prevention of chronic diseases.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The prevalence of high blood pressure, diabetes, and obesity in the minority and limited resource audiences (both children and adults) served by LU Extension.

What has been done
Classes were provided for children and parents. Creative methods to increase activity for children were provided. Double Dutch Jumping competitions were held. All competitors were involved in health and nutrition classes.

Results
Over a majority of the people surveyed indicated that they have made at least one positive change in their eating or exercise experience.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of citations of publications by other scientists in scientific papers. -Use of research results by nutrition extension and health care specialists. Improvement of eating behavior and physical activities. -Decrease in percentage of overweight and obesity in research and extension participants. Medium-term: 2010 - measurable weight reduction (1-5%) in overweight and obese subjects and clientele. Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). measurable weight reduction (1-5%) in overweight and obese subjects and clientele 2011 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2012 - Same as 2011. 2013 - Same as 2012 and number of citations of publications = 10 2014 - Same as 2013 and number of citations of publications = 15

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Obesity is a serious nutritional problem in the United States. The prevalence of obesity is currently estimated at over 20% of the population.

What has been done
Numerous workshops and presentations were given to school age children and adults.

Results
The vast majority of the participants recognized the need to live healthier and to eat healthier and to get regular exercise. People are generally very receptive to new ideas on food and exercise.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

measureable improvements in public health and reduction in health care costs for specific populations, such as minorities, low-income families and other underrepresented groups. Expect 80% positive response of those contacted.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Obesity is a serious nutritional problem in the United States. The prevalence of obesity is currently estimated at over 20% of the population.

What has been done
Numerous workshops and presentations were given to school age children and adults

Results
The vast majority of the participants recognized the need to live healthier and to eat healthier and to get regular exercise. People are generally very receptive to new ideas on food and exercise.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Short-Term: enhanced academic productivity, improved rate ofcommuniy volunteerism, development of leadership skills, increased knowledge, and increased life skills.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Childhood obesity has become a growing problem in the U.S. Young people continue to face challenges with their overall health and activity levels.

What has been done
Youth were involved in physical activities (jumping rope)in a positive atmosphere where they were taught the basics of healthy eating choices and nutrition. EFNEP offers individual and family nutrition education, recreational and fitness programs. LUES students are taught healthy lifestyles and leadership skills while being active.

Results
Participants have learned basic and advanced skills in a health activity which promotes longer life by increasing cardio vascular efficiency, muscle tone, endurance, and agility.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development
901	Program and Project Design, and Statistics

903 Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Medium Term: Completion of current grade adn promotion to the next, increased graduation rates from high school, reduced probability of acts of crime, increase in self esteem, better social standards, and better life choices.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Young people around the State of Missouri continue to face challenges with their overall health and activity levels. Unhealthy lifestyles and behavioral choices have continues to cause an increased mortality rate, propensity toward criminal activity, and addictive/destructive behaviors.

What has been done
Participants have learned basic and advanced skills in a health activity, which promotes long life by increasing cardio vascular efficiency, muscle tone, endurance, and agility.

Results
Most participants were inspired and setting personal goals that would incorporate healthy choices, nutrition, and overall better health. Precise long-term graduation rate increases have not yet been determined.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and

	Communities
805	Community Institutions, Health, and Social Services
806	Youth Development
901	Program and Project Design, and Statistics
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

Long Term: Improved education levels, increased standard of living, and improved quality of life.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Extreme weather conditions in Southeast Missouri increased the joblessness situation in an already hard hit area. Overall, the economic situation has made it more difficult on families in underserved areas. State budget cuts have had a huge impact in some areas, resulting in more stress and tension in families and communities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre and post program surveys will be utilized to measure educational and change results.

Key Items of Evaluation

Consistency with participants in following through with program events, goals, and plans.