

2008 Lincoln University of Missouri Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Missouri ranks second only to Texas in the number of farms. Of these almost 108,000 farms, approximately 82,000 are considered small farms. 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 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 will be as self-contained as possible and will 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 experiential learning, energy use and labor requirements.

Busby farm will be the 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 will complement our extension urban family and youth development programs in Jefferson City, Kansas City, St. Louis 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 will be exposed to agricultural practices at Busby and will be provided the opportunity to assist the manager. This will be 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.

Approval was received from USDA to plan for the development at Busby Farm. Initial stages of the planning process have been completed. The plan that was developed is being presented to groups of stakeholders for input and suggested modifications.

Individual research projects will continue at Carver farm. These projects will 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.

Animal science

Ruminants:

The primary emphasis in animal science will continue to be with goat production systems, but will include 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. There is a .5 professional FTE involved in this project. 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. Since this was just approved, effort reporting will begin in next years report. Third, Lincoln is evaluating the feasibility of developing a real-time biosensor for LH using nanotechnology derived components.

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 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, there must exist an extensive and thorough knowledge of the life cycle and ecology of these arthropods. A recently approved project will examine the biology of mosquitoes from the viewpoint of interactions between mosquito populations and the ecosystems in which they live, 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, and information from ongoing and future studies will be made available for use by extension personnel at Lincoln University and at the University of Missouri. 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. This program was initiated based upon strong support for starting aquaculture research for Missouri producers. Research is needed that is specific to Missouri because the state has such wide climatic variation.

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.

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.

Human Nutrition and Food Safety

Basic, as well as applied, studies will continue in this area examining the causes and impacts of obesity and hypertension in minority populations.

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.

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 and the Bootheel will continue. Expansion of programs in Kansas City will occur through acquisition of property and construction of a facility near the downtown area. Property has been purchased and an architectural firm chosen. 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 and 5) Urban Gardening.

Total Actual Amount of professional FTEs/SYs for this State

Year:2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	23.0	0.0	25.0
Actual	0.0	22.0	0.0	23.0

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 that they follow the plan of work and complement/integrate with the extension programs. Proposals are then submitted to scientists for evaluating scientific merit. Reviews of the scientists are returned to the research director. The names of reviewers are removed and the research 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 recommended by the Associate Director to the Director. The Director then approves the submission to CSREES.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- 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
- Targeted invitation to selected individuals from general public
- 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 listserves, 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-lingually (English and Spanish).

Trainings and other events for traditional and non-traditional stakeholders were offered at the stakeholder's convenience (date, time and location) to address their specifically expressed needs.

For seminars targeting minorities, we: sent personal invitations, visited churches, advertised on appropriate radio stations, used bilingual newspapers and contacted community leaders.

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
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (Face-to-face conversations, telephone conversations, responding to e-mail questions from individuals.)

Brief Explanation

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.

For seminars specific to minorities we sent personal invitations, visited churches, sent invitations to appropriate radio stations, and bilingual newspapers. We also contacted community leaders.

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 with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals

Brief Explanation

Individual opinions were solicited and received on issues affectng stakeholders.

Surveys were used to collect information.

3. A statement of how the input was considered

- To Identify Emerging Issues
- In the Staff Hiring Process
- To Set Priorities

Brief Explanation

The input was used to strengthen and focus our efforts in needed areas. The input was also used to adjust Extension activities and 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. 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, environment improvement, and landscaping with native plants.

Many times minority stakeholders are difficult to reach and may not be 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.

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	2663517	0	2793650

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	1396500	0	2387643
Actual Matching	0	1528885	0	1980913
Actual All Other	0	142474	0	678
Total Actual Expended	0	3067859	0	4369234

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	0	560796	0	2387643

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Animal Science
2	Family and Youth Development
3	Community and Leadership Development
4	Environmental Science
5	Human Nutrition
6	Plant Science

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Animal Science

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals		10%		12%
302	Nutrient Utilization in Animals		10%		13%
303	Genetic Improvement of Animals		15%		25%
304	Animal Genome		5%		0%
305	Animal Physiological Processes		5%		0%
306	Environmental Stress in Animals		5%		0%
307	Animal Management Systems		10%		25%
308	Improved Animal Products (Before Harvest)		3%		0%
311	Animal Diseases		10%		12%
312	External Parasites and Pests of Animals		2%		0%
313	Internal Parasites in Animals		20%		13%
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals		2%		0%
315	Animal Welfare/Well-Being and Protection		3%		0%
Total			100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.5	0.0	4.0
Actual	0.0	1.3	0.0	4.8

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	107988	0	1171916
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	723492
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. Conducting research utilizing herbs to control internal parasites in small ruminants.
- . Practice the use of artificial insemination in large and small ruminants to improve the genetics of herds and flocks to reduce cost.
- c. Develop sunfish cultivars for distribution to the industry.
- d. Determine nutritional requirements of sunfishes.
- e. Develop optimal production dynamics for sunfishes.
- f. Provide aquaculture fish health services for stakeholders.
- g. Use of real- time ultrasonograph to examin pregnant sheep and goat does for gestation.
- h. Reduce mosquito population responsible for transmitting the causative agents for cattle and humans.

2. Brief description of the target audience

Limited resources audiences
 Small farmers
 Farmers with unsuitable land for row-crop farming.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	2100	80000	400	2000
2008	2450	20000	1500	2000

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	6	2	8

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Research Projects Completed* Year Aquaculture Small Ruminant Large Ruminant 2008 0 1 0 2009 4 1 0 2010 0 1 0 2011 2 1 1 2012 2 1 1 *Projects reported only in year of completion Presentations Year Aquaculture Small Ruminant Large Ruminant 2008 6 2 0 2009 6 2 0 2010 6 2 0 2011 6 2 0 2012 6 2 0 Manuscripts Year Aquaculture Small Ruminant Large Ruminant 2008 4 1 0 2009 4 1 0 2010 4 1 0 2011 5 2 0 2012 5 2 0

Year	Target	Actual
2008	14	32

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultivar. Identify viable production systems for sunfishes. Make available a fish health protocol. Small Ruminants- Assess the use of herb cultivars for control of internal parasites. Investigate new cultivars of grasses and legumes for potential improvement of weight gains in lambs and kids. Develop optical or biosensor to determine optimum breeding time. Large Ruminants- Develop optical sensor or biosensor for determining optimum breeding time.
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.

Outcome #1**1. Outcome Measures**

Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultivar. Identify viable production systems for sunfishes. Make available a fish health protocol. Small Ruminants- Assess the use of herb cultivars for control of internal parasites. Investigate new cultivars of grasses and legumes for potential improvement of weight gains in lambs and kids. Develop optical or biosensor to determine optimum breeding time. Large Ruminants- Develop optical sensor or biosensor for determining optimum breeding time.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	2557	850

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Commercial fish farmers
Small farm owners who wish to start aquaculture farming

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.

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 where ploidy can be determined with the Coulter Counter.

Success was attained in reducing the larval brine shrimp feeding time to 7 days. Survival of the fish tested on the new larval feed was near 99%.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
313	Internal Parasites in Animals
311	Animal Diseases
302	Nutrient Utilization in Animals
307	Animal Management Systems
303	Genetic Improvement of Animals
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
315	Animal Welfare/Well-Being and Protection
312	External Parasites and Pests of Animals

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	Quantitative Target	Actual
2008	1215	50

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Commercial fish farmers
Small farm owners

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.

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
303	Genetic Improvement of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
301	Reproductive Performance of Animals
313	Internal Parasites in Animals
311	Animal Diseases
305	Animal Physiological Processes
315	Animal Welfare/Well-Being and Protection
312	External Parasites and Pests of Animals
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

Outcome #3**1. Outcome Measures**

Farmers adopt new technologies for increased and sustainable production.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	1215	50

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.

Results

30% of the 50 producers who participated stated they would be willing to change management practices and try new ideas.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Competing Programmatic Challenges

Brief Explanation

A new faculty position which was planned to be filled during 2008 FY- did not take place and this affected some of the outcome in this area.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Case Study

Evaluation Results

Key Items of Evaluation

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Family and Youth Development

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%		5%
801	Individual and Family Resource Management		5%		5%
802	Human Development and Family Well-Being		25%		25%
803	Sociological and Technological Change Affecting Individuals, Families and Communities		5%		5%
805	Community Institutions, Health, and Social Services		6%		6%
806	Youth Development		45%		45%
901	Program and Project Design, and Statistics		4%		4%
903	Communication, Education, and Information Delivery		5%		5%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	22.0	0.0	0.0
Actual	0.0	13.5	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	926217	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	1034976	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	100544	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Design, implement and evaluate educational programs for youth-at-risk. Program implementation will include club member retention, workshops, camps and after school programs.

Examples of specific activities 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 First Program: 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 Teen Talk Abstinence Program, offered in Charleston Junior High School, for girls to learn the advantages of remaining abstinent.

-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 be 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, Earl Nance Sr. Elementary and Baden Elementary. 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. The current lot is located in Baden, called the Baden Triumph Garden. Plans are being implemented and resources are being sought for this location.

-Black History Programs in Charleston, Caruthersville, and Sikeston. Lincoln University staff and youth team up with the Suzanna Wesley Center, Caruthersville School District, and Gloryland Community Center. For youth (K-12) in the school districts.

-Health and Fitness Classes

-Health fair designed to educate youth on nutrition, fitness, and the dangers of alcohol, tobacco, and other drugs.
eat Activities

Field Day - a culmination of educational workshops on a variety of topics, talent show, and entertainment for all ages.

-Black History Program, an educational program on the accomplishments and struggles of African-Americans.

-Fall into Fall, a back-to-school rally to prepare students for the upcoming school year.

-HIV/AIDS/STD Awareness Day

-Summer Camp, a partnership with YMCA, Mission Missouri, Weed & Seed, and DAEOC 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.

-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 (increasing utilization of eHealth Medline Plus website).

-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.

-Provision of culturally specific parenting education classes.

-Family and community empowerment experiences to assist parents helping their children close the educational achievement gap.

2. Brief description of the target audience

Minority and other under-represented families and youth in urban St. Louis, Kansas City and selected locations in Southeast Missouri. Minority and under-represented populations in Central Missouri, especially those living in housing developments.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	575	0
2008	440	250	2160	1060

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	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	Target	Actual
2008	120	350

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 5) increased 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, 4) Better social standards, 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 5) increased life skills.

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	300	850

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Lack of availability of services and resources to the underserved minority populations to reduce health disparities and inequities in access to health-related care and literacy.

Limited resource and underserved minority youth and families in Southeast Missouri 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 program, 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 that participate in afterschool reading program have increased their scores by two grade levels, as evidenced by test scores.

4. Associated Knowledge Areas

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

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, 4) Better social standards, and 5) Better life choices.

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	300	850

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increased the number of people who have adopted at least one healthier lifestyle change.

Minority and underserved youth and families in Southeast Missouri with limited resources.

What has been done

Information was compiled from monthly health educational sessions, health screenings conducted, 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 prep.

Results

Participants indicated adopting one health behavior (eg. 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.

4. Associated Knowledge Areas

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

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	Quantitative Target	Actual
2008	300	750

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Participants reported feeling healthier and better able to manage their personal health.

Minority and underserved youth and families in Southeast Missouri with limited resources.

What has been done

Survey results of participants indicated 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.

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

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Community and Leadership Development

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		40%		40%
802	Human Development and Family Well-Being		10%		10%
803	Sociological and Technological Change Affecting Individuals, Families and Communities		10%		10%
805	Community Institutions, Health, and Social Services		30%		30%
806	Youth Development		10%		10%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	0.0
Actual	0.0	2.0	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	27490	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	66249	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

For strengthening 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, and thinking strategically, basic leadership skills, work planning and goal setting, customer/resident relations, effective communication skills, budgeting, funding accounting and grant administration, managing "troubled" and "problem" employees, and negotiations.

2. Brief description of the target audience

Small towns, community organizations and agencies.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	75	100	50	60
2008	150	50	0	0

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- ### of informational sessions # of workshops # of presentations # of participants Evaluation forms Anecdotal responses Changed behavior and procedures of participants and organizations

Year	Target	Actual
2008	75	50

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Development or update of plan Increased participation and diversity Awareness of need to develop or update plan Awareness of need for increased participation and diversity.
2	Increased partnerships and resources Plan/project implementation Local officials take actions that increase citizen participation. Increased civic engagement in deliberating public issues Increased knowledge, understanding & skills
3	Evidence of community goal attainment Increased capacity to deal with future issues Change in community practice Improved community fiscal and economic performance Citizens of varying cultures increase their participation and engagement in local government and in the community Sustained capacity for informed local decision making Group or organizational sustainability

Outcome #1**1. Outcome Measures**

Development or update of plan Increased participation and diversity
 Awareness of need to develop or update plan Awareness of need for
 increased participation and diversity.

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	75	50

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Community stakeholders lacked adequate facilities to convene community meetings and conduct after school programs.

What has been done

Lincoln University Cooperative extension assisted with facility applications and feasibility studies for constructing new community centers and establishing community resource rooms for after school programs and other community projects.

Results

One of the community's Lincoln assisted, has constructed and furnished a community center. There is a Lincoln University resource room in the facility. The resource area is equipped with computers and has access to the internet. Extension program specialists will be able to deliver education programs after school and on weekends.

4. Associated Knowledge Areas

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

Outcome #2**1. Outcome Measures**

Increased partnerships and resources Plan/project implementation Local officials take actions that increase citizen participation. Increased civic engagement in deliberating public issues Increased knowledge, understanding & skills

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	75	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Community leaders lacked leadership skills and knowledge to identify and address community needs.

What has been done

Community leaders and stakeholders have been trained to become more effective with community implementation of projects and collaborating with other organizations.

Results

Stakeholders have been trained to become self-sufficient, to prepare policies and procedures and to promote positive change within their communities. Stakeholders have become more involved in the planning process of the community's future. Stakeholder's participation has raised the community awareness and people are more empowered to engage in community strengthening activities.

4. Associated Knowledge Areas

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

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 Citizens of varying cultures increase their participation and engagement in local government and in the community Sustained capacity for informed local decision making Group or organizational sustainability

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	75	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Community stakeholders lacked the qualitative and quantitative assessment tools to assess community issues and create a formal structure to address them.

What has been done

Stakeholders have become trained to implement qualitative methods to identify issues that impact the community.

Results

Community stakeholders are self-sufficient and participating in the decision making on a local and state level that affect their community.

4. Associated Knowledge Areas

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

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

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)

Evaluation Results

Key Items of Evaluation

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Environmental Science

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		20%		25%
112	Watershed Protection and Management		10%		10%
123	Management and Sustainability of Forest Resources		5%		5%
136	Conservation of Biological Diversity		10%		10%
141	Air Resource Protection and Management		5%		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		5%		10%
403	Waste Disposal, Recycling, and Reuse		30%		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 professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	7.0
Actual	0.0	0.0	0.0	13.0

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	668594
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	713744
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. Geospatial Studies: The specific objective of the geospatial studies is to create a geospatial digital database for the Big Oak Tree Park and the surrounding areas within the Lower Mississippi River watershed. Such a product would provide the basis for natural resource inventory, environmental monitoring and modeling through the use of geographic information systems (GIS). The database will play a major role in designing field sampling strategies, plotting sample locations, conducting spatial analysis and modeling of analytical data.

The primary task of the geospatial team is to locate and assemble relevant geospatial data from the various state and federal agencies for the Big Oak Tree Park and surrounding areas. The database will consist of various layers including digital elevation models, land use/land cover, geology, soil, hydrology, wetlands, floodplains, agricultural statistics, remote sensing data (satellite and air photo), etc. The Missouri Spatial Data Information Service will be the primary data source. Other state agencies including the Missouri Department of Natural Resources, Missouri Department of Conservation, etc. will also be targeted for data. Federal agencies such as the USDA's Natural Resources Conservation Service, United States Geological Survey, Environmental Protection Agency are other potential data sources.

B. Soil Chemical Studies: The specific objective of the soil chemistry studies is to evaluate the interactions between native wetland and agricultural ecosystem and to determine soil's role in reducing non-point source pollution of agricultural chemicals and in sustaining ecosystems. Non-point source pollution resulting from applications of fertilizers and pesticides in agricultural land is well known to affect water and air quality. Soil is a vital component in ecosystem buffering, attenuating, or degrading agricultural chemicals for safeguarding humans and protecting the environment from contamination. Specific tasks to be executed by the soil chemistry team include:

- i) Characterize soil physiochemical and biological properties and establish soil baseline of agricultural chemicals within specified ecosystems;
- ii) Determine temporal and spatial variability of agricultural chemicals in soil in the area;
- iii) Investigate the interactions between soil and agricultural chemicals and identify soil conditions for maximum reduction of non-point source pollution;
- iv) Evaluate the chemical and biological processes of soil buffering or attenuating agricultural chemicals and determine the soil maximum loading capacity;
- v) Create a GIS-based model for predicting potential of agricultural chemicals in soil to water pollution and guiding agricultural management of fertilizer and pesticide application.

C. Air Quality Studies: The specific objective of the air quality studies is to investigate the effect of gaseous emissions from agricultural operations such as fertilizer application and commercial animal rearing on surrounding farms on the overall health of the Big Oak Tree State Park. Recent studies, including the US National Research Council report provide convincing evidence that changes in agricultural crop production and animal activities are increasing the emissions of trace gases (e.g., carbon dioxide, sulfur, nitrogen, hydrocarbon species, etc.) to the atmosphere. All of these emissions can perturb the environment with a host of beneficial and detrimental effects such as increased crop yields from nitrogen loading or decreased visibility from increased aerosol production. Gaseous deposition from both crop and animal operations contributes to eutrophication and acidification of some downwind ecosystems. Major tasks to be undertaken by the air quality team are:

- i) Analyses of gaseous chemical species being emitted by agricultural land and natural forest/swamp.
- ii) Determination of gas emission as affected by agricultural practices.
- iii) Impact of emitted gases on wild life and vegetation in the Big Oak Tree State Park as a downwind ecosystem.
- iv) Development of management strategy for minimizing greenhouse gas emission

D. Water Quality Studies: The overall objective of the water quality studies is to determine the historical and current impact of agricultural activities on the park's water quality in terms of chemical and bacteriological characteristics. To accomplish this objective the team will partner with the Missouri State Park officials, the Missouri Department of Natural Resources and the Missouri Department of Conservation to carry out the following tasks:

- i) Determine the temporal and spatial variability of water quality in the natural and artificial water systems in the park in terms of bacterial species and numbers, nutrient concentrations, and presence of organics and metal contaminants.
- ii) Determine the historical record of possible water contaminants by examining sediment cores collected from the park and other areas within the watershed.
- iii) Determine the stability of potential nutrient pollutants through the assessment of major, minor, and trace elements in sediments.
- iv) Determine the possible impacts of non-point source pollution on aquatic species through tissue analysis for heavy metals.

- v) Use collected water quality data in computer modeling programs to project potential impacts of non-point source pollution on similar natural habitats.
- vi) Provide research experiences for students and to conduct educational and informational workshops for stakeholders and area communities on Water Quality Issues related to the watershed.

Alternative energy sources: Research and Development Program for Micro-Algae Cultivation, Oil Extraction and Conversion to Biodiesel:

A recent article titled The end of cheap oil in National Geographic magazine highlights a well-known fact that the world is in the twilight of plentiful petroleum oil and alternative sources of energy and raw material must be developed. Biofuel in the form of biodiesel offers one of the most attractive direct replacements of fossil fuel. Significant efforts in this area are already underway as evident from the increasing number of newly installed biodiesel plants in Missouri and around the world. The most common process for producing biodiesel is through the transesterification reaction of vegetable oil or animal fat with an alcohol and a catalyst. Micro-algae are the fastest growing photosynthesizing unicellular organisms and can complete an entire growing cycle every few days. Some algae species have high oil content (up to 60% oil by weight) and can produce up to 15,000 gallons of oil per acre per year under optimum conditions. The need for an efficient process for the extraction of oil from cultivated algae will be met by developing an economical, safe, and environment-friendly solvent system that can selectively recover triglycerides and efficiently convert them to fatty acid methyl esters for use as the biodiesel fuel and the source of bio-plastic resins.

2. Brief description of the target audience

- (a) Farmers
- (b) Engineers
- (c) Policy makers
- (d) Students
- (e) Community leaders
- (f) Local citizens
- (g) Extension workers
- (h) Scientists & other Researchers
- (i) Regulatory Agencies

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	20	50	10	20
2008	250	300	110	30

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	15	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Short term output measures are: Abstracts (7), presentation (7), Training students (10) and Workshop (1)
Intermediate output measures are publications (7) Long-term: Will be felt after five years

Year	Target	Actual
2008	37	155

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Chemical and biological characterization of the ecosystems Contribution to understanding of interactions between human practices and natural ecosystems Enhanced stakeholders knowledge and understanding of environmental issues
2	Expected change in agricultural practices from farmers Better management of agricultural and natural ecosystems complex.
3	Environmental sustainability Improved quality of life

Outcome #1**1. Outcome Measures**

Chemical and biological characterization of the ecosystems Contribution to understanding of interactions between human practices and natural ecosystems Enhanced stakeholders knowledge and understanding of environmental issues

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	4	192

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Environmental pollution has increased as a result of increased waste in landfills. The chemical and toxic leachates, pathogens, biological organisms can negatively impact public health and ground water and streams.

Green areas are decreasing in urban areas and farms are being developed in rural areas.

What has been done

Education programs on recycling and composting have been conducted to reduce waste to landfills and convert waste to useful products such as compost for amending soils.

During workshops and hands-on demonstrations, conservationists from LU and collaborating agencies discussed the importance of growing native plants in rural and urban areas.

Results

Reduction of waste and pollution in landfills. Compost has improved soil quality, fertility, crop production and increase farmer's incomes.

More natural areas will be created or protected in urban and rural areas.

4. Associated Knowledge Areas

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

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	3	8

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Lead contamination causing serious health problems for children.
Pollution of soil and water by application of pesticides is of big concern to society.

What has been done

Soil samples varying in texture and chemical properties were taken using a hand-held soil auger. Physicochemical properties of soils such as texture, soil solution pH (H₂O), Cation Exchange Capacity (CEC), organic matter (OM) content, neutralizable acidity (NA), and chemical constituents were determined. Surfactants used included : Nonionic - Activator Crop oil concentrate - Agridex Nitrogen-surfactant blend - Thrust Esterified seed oil - Amigo Organo-silicone - Sillwet-77. A greenhouse experiment was conducted to examine soil/plant nutrient uptake/surfactant relationships. Air dried soils were combined with sand in pots at the following rate: 2000 grams soil/1000 grams sand. The above soil mixture from each site was placed in 8 inch, 2 gallon pots. Each pot was fertilized with .6 grams of Greenskeeper's Secret; 20-10-10 (T and N Inc., 615 HWY T, Foristell, MO, 63348) and arranged randomly. Hybrid sweet corn (Incredible, Tri Star Seed Co., Spring Hill, KS) was planted in each pot and after germination, 3 plants were left to grow for the period of 6 weeks. Visual observations were recorded during the experiment. Some nutrient deficiency symptoms were noted.

Activities included: 1) in situ metal immobilization (Pb, As) to reduce human exposure and ecological risks of contaminated soils and mine wastes; 2) phytotechnologies to enhance rhizodegradation of explosives (TNT, RDX) in soil; 3) nanotechnology to remove aqueous metal ions (Hg, Pb) from contaminated water; and 4) fluorescent emission spectroscopic technique to assess the formation potential of disinfection-by-products (DBP) in water.

Workshops were offered to increase awareness about the importance of establishing native plants to provide habitat for native pollinators.

Results

Results would substantially contribute to our understanding of mechanisms of the surfactant-soil interactions and lead to development of the best management practices of surfactant application while sustaining soil and environmental quality and crop production.

studies have substantially improved our fundamental understanding of the contaminant-environment interactions near surface ecosystem and would potentially lead to sustainable solutions to the environmental problems. Project is generating new knowledge on the spatial distribution of greenhouse gas fluxes and their controlling factors in our ecosystems. Our students have gained awareness in this issue of global warming and the impact of greenhouse gases on the climate. They have learned new techniques in sampling air from soil and measuring CO₂, CH₄ and N₂O using gas chromatography.

4. Associated Knowledge Areas

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

123	Management and Sustainability of Forest Resources
511	New and Improved Non-Food Products and Processes

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	Quantitative Target	Actual
2008	0	440

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The majority of soil in Missouri is low in organic matter. Compost can enrich soil with organic matter providing both fast and slow releasing nutrients and an environment to sustain soil microbes, earth worms, and plant growth.

Pollution is high in the cities and is increasing in rural areas, minorities are not usually aware of related risks.

What has been done

Education programs with hands-on demonstration of setting aerobic and worm composting bins and providing information on composting principals, facility design, operational and monitoring techniques, quality evaluation, and problem diagnosis and solutions.

Bilingual-Spanish/English workshops and seminars were offered during outdoor presentations and field days about native plants, their establishment in gardens and fields, and their effect on pollution.

Results

Composting workshops and trainings were conducted on LU farms and on farms of interested organic farmer groups. The trainees are more confident. Attendees have started composting operations and have produced compost to sustain garden and agriculture practices. They have also realized an increase in farm income. The waste stream to landfills has been reduced. Compost has also improve field vegetation, minimized soil erosion and improved environmental qualities.

4. Associated Knowledge Areas

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

Brief Explanation

Lack of expertise in the area -- namely, environment microbiologist - unable to fill the position.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals,group,organizations) and non-participants

Evaluation Results

Key Items of Evaluation

Program #5

V(A). Planned Program (Summary)

1. Name of the Planned Program

Human Nutrition

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%
702	Requirements and Function of Nutrients and Other Food Components		50%		25%
703	Nutrition Education and Behavior		25%		25%
724	Healthy Lifestyle		25%		25%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.5	0.0	2.5
Actual	0.0	2.1	0.0	1.5

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	66787	0	45171
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	14045	0	404346
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	41930	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

We recruited twenty Caucasian women and 40 African-American women to study the differences in cardiovascular risk factors associated with obesity. This project also conducted an intervention study for obesity in African-American women since they have greater incidence of obesity and obesity-associated health problems. Half of the African American women participated in a weight-loss program and the other half was used as the control group. The weight-loss program included 12-week "slim-eating" nutrition education and tread-mill exercise program. African-American women had higher plasma triglyceride level. The blood pressure, plasma glucose and cholesterol were not affected by race. The participants who consistently participated in eating-slim nutrition education and exercise reduced body weight. The biochemical analysis of blood samples for cardiovascular risk factors will be reported later.

The objectives of the second project are: 1. Designing and fabricating MEMS based impedance biosensor system. The device will consist of two arrays of 3-D interdigitated electrodes (IDE) and a fluidic channel with an inlet and outlet. Each IDE array will consist of 100 pairs of gold electrode fingers fabricated using surface micromachining and photoresist sacrificial layer. 2. Immobilizing the antibody using the Self-Assembled Multilayer (SAM) process. We will use the Self-Assembled Multilayer (SAM) process to immobilize the antibodies onto the IDE. This stage will provide the binding between bacteria and antibodies due to the high affinity between them. 3. Testing the device using impedance measurements. We will analyze the biosensor for the detection and selective identification of *E. coli* O157:H7 in beef when used in conjunction with the immobilized antibodies, and determine the magnitude and phase of the impedance of the bacteria effect alone. The effect of frequency on impedance measurements will be monitored and analyzed.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	200	500	100	200
2008	300	160	400	100

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- 1) Number of publication 2) Number of presentation 3) Number of workshops 4) Number of contacts 2007: number of presentation: 2 number of workshops: 6 number of contacts (direct & indirect): 1,000 2008: Number of publication:1 Number of presentation, workshops and contacts : Same as in 2007 2009: Same as in 2008 2010: Same as in 2008 2011: Same as in 2008

Year	Target	Actual
2008	1007	300

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 in research subjects and other clientele. increase nutrition knowledge and awareness of importance of nutrition for prevention of chronic diseases by 90% of participants in direct contacts and 70% of indirect contacts.
2	-Number of citations of publications by other scientists in scientific papers. -Use of research results by nutrition extension and health care specialists. I-mprovement of eating behavior and physical activities. -Decrease in percentage of overweight and obesity in research and extension participants. Medium-term: 2007 - measurable weight reduction (1-5%) in overweight and obese subjects and clientel. 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 2008 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2009 - Same as 2008. 2010 - Same as 2008 and number of citations of publications = 10 2011 - Same as 2008 and number of citations of publications = 15
3	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.

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 in research subjects and other clientele. increase nutrition knowledge and awareness of importance of nutrition for prevention of chronic diseases by 90% of participants in direct contacts and 70% of indirect contacts.

2. Associated Institution Types

•1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	700	100

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The prevalence of high blood pressure, obesity in the minority and limited resource audiences served by LU Extension.

What has been done

Classes were provided to children and parents. Creative methods for increasing activity in children were provided. For example, Double Dutch Jumping competitions were held in Kansas City and Southeast Missouri. Finalists participated in a statewide Jump Off on LU's campus. All jump rope competitors were involved in health and nutrition classes.

Results

Of the 100 people responding to a survey, 67% indicated having made at least one change in eating or exercise behavior as a result of their learning experience.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
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: 2007 - 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 2008 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2009 - Same as 2008. 2010 - Same as 2008 and number of citations of publications = 10 2011 - Same as 2008 and number of citations of publications = 15

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	3	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 adult population. Overweight individuals add another 40%, such that two thirds of the adult population is at risk of developing overweight or obesity-related health problems including hypertension, insulin resistance and lipid abnormality.

What has been done

Recruited twenty White Caucasian women and 40 African-American women to study the differences in cardiovascular risk factors associated with obesity. This project also conducted an intervention study for obesity in African-American women since they have greater incidence of obesity and obesity-associated health problems. Half of the African American women participated in a weight-loss program and the other half was used as the control group. The weight-loss program included 12-week 'slim-eating' nutrition education and tread-mill exercise program. African-American women had higher plasma triglyceride level. The blood pressure, plasma glucose and cholesterol were not affected by race. The participants who consistently participated in eating-slim nutrition education and exercise reduced body weight. The biochemical analysis of blood samples for cardiovascular risk factors will be reported later.

Results

The results of this study indicated that dietary fat plays an important role for obesity and exercise can reduce body fat. This animal model can be used for further pathological and biochemical studies associated with obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
703	Nutrition Education and Behavior
702	Requirements and Function of Nutrients and Other Food Components
402	Engineering Systems and Equipment

Outcome #3**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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	0	80

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 adult population. Overweight individuals add another 40%, such that two thirds of the adult population is at risk of developing overweight or obesity-related health problems including hypertension, insulin resistance and lipid abnormality.

Detection and identification of bacteria and food pathogen is an essential step in food safety inspection. This step will provide valuable information to consumers which could be used to prevent health problems. The current conventional methods used to detect and identify bacteria in food are reliable for ensuring food safety.

What has been done

Established a rat obese model gaining 30% more weight by feeding a high fat, high energy diet. This diet-induced obesity is comparable to human obesity. To induce obesity in rats, six-week-old male Sprague-Dawley rats (185 \pm 2 g, mean \pm sem) had unlimited access to high-fat diet (38% kcals from fat) for 12 weeks. Rats from greatest and least weight gain quartiles (445 \pm 5 and 334 \pm 4 g) were assigned to diet induced obese (DIO) and non-obese, diet-resistant (DR) groups, respectively. For 10 weeks, DIO and DR rats had unlimited access to high-fat (38% of kcals) or low-fat (12% of kcals) diet and were exercised or kept sedentary in a 2 x 2 x 2 design (obesity x diet x exercise). Exercise consisted of treadmill running with weekly increases in speed and duration to values of 15 m/min and 1 hr/day for the final 2 weeks.

In a second project, traditional methods for the detection of bacteria are not available in the time scale desired in a clinical laboratory. In response to this problem, a number of instruments have been developed using various principles of detection, such as flow cytometry polymerase chain reaction, immunomagnetic separations, bioluminescence and mass spectrometry. These methods, however, are still time consuming and expensive. The proposed project will develop a novel 3-dimensional (3-D) interdigitated microelectrode array (IDE) based impedance biosensor. This biosensor will be capable of rapid detection and selective for accurate identification of *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.

Results

Exercise reduced ($p < 0.05$) weight gain and total carcass energy (22% and 24%) but did not affect energy intake of DR rats fed low-fat and high-fat diets. In DIO rats, exercise and low-fat diet reduced weight and energy intake (12%) but did not affect ($p > 0.05$) carcass energy. Exercise reduced epididymal fat weight by 42% and 31% in DR (both diets) and by 25% in DIO rats fed low-fat diet only. Moderate exercise more effectively reduced carcass energy and fat in DR rats than in DIO rats. Rats fed the high fat diet had greater blood pressure than those fed the low fat diet. Plasma lipids were not significantly affected by dietary fat levels and exercise. The results of this study indicated that dietary fat play an important role for obesity and exercise can reduce body fat. This animal model can be used for further pathological and biochemical studies associated with obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
402	Engineering Systems and Equipment

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Competing Public priorities

Brief Explanation

One faculty retired effective January 2009.
Faculty position in Extension program did not get filled.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Before-After (before and after program)
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation

Program #6

V(A). Planned Program (Summary)

1. Name of the Planned Program

Plant Science

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		8%		5%
111	Conservation and Efficient Use of Water		5%		25%
132	Weather and Climate		5%		5%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants		10%		10%
204	Plant Product Quality and Utility (Preharvest)		5%		5%
216	Integrated Pest Management Systems		10%		15%
405	Drainage and Irrigation Systems and Facilities		2%		5%
503	Quality Maintenance in Storing and Marketing Food Products		2%		5%
601	Economics of Agricultural Production and Farm Management		20%		15%
604	Marketing and Distribution Practices		33%		10%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	3.5	0.0	3.5
Actual	0.0	3.5	0.0	4.0

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	268018	0	501962
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	413615	0	139331
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	678

V(D). Planned Program (Activity)

1. Brief description of the Activity

Workshops
 Organized instate conferences and meeting for small farmers
 Training and educational opportunities for small farmers
 Introduction and evaluation of new crops
 Improved cultural practices and crop management
 Abstracts and Publications
 Grants Approvals
 Publications in Referred Journals
 Research Bulletins Published

2. Brief description of the target audience

Disadvantaged, low-income, limited resources farmers and ranchers, underserved population in rural and urban communities, traditional stakeholders and professionals in the areas of Economics and Business.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1000	3000	100	300
2008	1900	4600	50	180

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Publications Abstracts Refereed Journals Bulletins Years 2007-2008 primarily abstracts and bulletins Year 2009 transition year and years 2010-2011 primarily scientific manuscripts

Year	Target	Actual
2008	6	8

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Develop educational programs to encourage minority youth to get involved in farming. 2007: Increase the number of minority farmers by 200. Adoption of environmental sustainable crop production practices. 2008: Increase the number of farms adopting production practices by 150.
2	Improve small and minority farms income 2009: Increase the average small farm gross income by \$5, 000
3	Enhanced viability of rural communities. Enhanced profitability of Small Farms. 2010: Increase Farm growth income by \$5, 000 2011: Increase Farm retention rate by 4, 250

Outcome #1**1. Outcome Measures**

Develop educational programs to encourage minority youth to get involved in farming. 2007: Increase the number of minority farmers by 200. Adoption of environmental sustainable crop production practices. 2008: Increase the number of farms adopting production practices by 150.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	150	50

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; community gardening and high-tunnel greenhouse vegetable production trainings; and launching of the Innovative Small Farms' Outreach Program (ISFOP).

Brochures, publications and handouts. Meetings and conferences were held, online journal publications, abstracts and articles were published in a referred hard bound journal.

Development of cultural and management systems to improve the adaptation of sweet potato and watermelon in central Missouri, and assessing the economic implications of these practices.

Results

More small farmers have learned seasonal extension techniques with high-tunnels. More educators have learned on 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.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Improve small and minority farms income 2009: Increase the average small farm gross income by \$5, 000

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	0	70

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.

Results

Increased/extended supply of freshly produced vegetables and small fruits.

Farmers' income increased by approximately \$6,000 annual rate. Farmers gained invaluable knowledge of computers for purposes other than record keeping.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Enhanced viability of rural communities. Enhanced profitability of Small Farms. 2010: Increase Farm growth income by \$5, 000 2011: Increase Farm retention rate by 4, 250

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	0	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Small Farmers/growers
Nutrient balance for plant growth is important.

What has been done

The two fertilizer treatments consisted of 1) optimum N (200 mg N/liter), and 2) low N (100 mg N/liter). While the pH of the recirculating nutrient solution for both treatments was maintained at about 6.0, mean electrical conductivity (EC) was 2.29 mS/cm at optimum N compared with 1.23 mS/cm at low N (Table 2). Average day/night ambient temperature was 39.1 oC and 32.8 oC, with a mean of 30.5 oC, and day/night relative humidity (RH) was 81.3 % and 55.0 %, respectively. Two-week old lettuce seedlings transferred into NFT troughs (Figs. 1a and 1b) at the first true-leaf stage were harvested 30 days later

Results

Marketable yield (mean fresh weight [g/head of lettuce]) decreased by 30.5 % at low N compared with optimum N, consistent with 43.5 % and 17.5 % decrease in dry weight and dry weight ratio (dry weight/fresh weight), respectively.

These findings improve grower knowledge about hydroponic nutrient solution composition and use, which represents the greatest challenge to all hydroponic/soilless growers. A soundly based understanding of nutrient solution management, on which literature information is most limited, is as important to successful hydroponic culture as the lists of nutrient formulas, preferred reagent sources and the weights and measures often published in textbooks. Better plant nutrient management through the supply of optimum rather than excess or suboptimum levels in NFT systems can improve profitability through 1) increased lettuce yield and quality 2) reduction of plant nutrient costs, and 3) reduction in losses by enhancing root nutrient uptake, which can also minimize environmental pollution.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)**External factors which affected outcomes**

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

Brief Explanation

The spring and summer of 2008 were extremely wet in Missouri.

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)

Evaluation Results

Key Items of Evaluation