

2010 Lincoln University of Missouri Combined Research and Extension Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

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 would be as self-contained as possible and would provide a location for numerous extension, research and community activities. Other potential areas that can be evaluated at this location include: impact of farming practices on human health, human and family interaction, the environment, student 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.

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. Second, embryonic and fetal mortality are large sources of economic loss in the livestock industry. Although average ovulation rates are sufficient, a significant economic loss results from a large percentage of those oocytes not resulting in live offspring. A recently approved project will involve real-time ultrasonographic examination of pregnant does throughout gestation in order to discover how much embryonic and fetal loss occurs in goats and when these losses occur. Third, Lincoln is evaluating the feasibility of developing a real-time biosensor for LH using nanotechnology derived components.

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.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	37.0	0.0	39.0
2011	0.0	37.0	0.0	39.0
2012	0.0	37.0	0.0	39.0
2013	0.0	37.0	0.0	39.0
2014	0.0	37.0	0.0	39.0

II. Merit Review Process**1. The Merit Review Process that will be Employed during the 5-Year POW Cycle**

- 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 Associate Director. The names of reviewers are removed and the Associate Director returns the comments to the investigator(s) for their response. If the response is satisfactory and/or if satisfactory modifications are made to the proposal it is then submitted by the Director to CSREES. Programs within extension and research will be evaluated for overall direction, progress and cohesiveness by a panel that contains program leaders, directors and non-university stakeholders. Family, youth and community programs will also solicit input from stakeholders located near the satellite offices maintained by Lincoln University in St. Louis, Kansas City and the Bootheel region.

III. Evaluation of Multis & Joint Activities**1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?**

Multi-state programming -The Change Agent States project is a catalytic step in beginning the transformation of the Land Grant system. It is a consortium of land grant institutions in fourteen states bringing the needed technical skills and training to each of the member states. Through this multistate approach, the consortium is developing successful models and systemic change strategies to support greater diversity and welcoming climates throughout the system.

Numerous joint activities with the University of Missouri include: coordination of agricultural research and extension needs as determined by stakeholder input as described in detail in a memorandum of understanding between the two universities. Lincoln University will expand efforts in aquaculture, small ruminants, horticulture (vegetable production) and small farms program.

Plans are underway to develop nanotechnology capabilities to assist in programs such as animal science and environmental science. In this collaboration LU will provide salary support for research and teaching activities for two physics faculty and UMC and Lincoln will provide facilities and equipment for conducting the research projects.

Research, extension and teaching personnel that are implementing these programs at LU interact with UMC field staff for assistance with activities and disseminating information throughout the state. Information obtained at LU will be disseminated both electronically and in print to UMC staff. Community development, 4-H and Youth development components of our

programs utilize the infrastructure provided by UMC for assistance.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

Collaborative efforts with 4-H, Youth and community development allow Lincoln University to provide UMC greater access to minority and underserved populations in regions such as the bootheel, St. Louis and Kansas City. Lincoln University also benefits through the infrastructure support that UMC provides.

One of the targets of the goat program will be with Hispanic populations in the state since one of the main products from Hispanics in the southern portions of Missouri is goats. Collaboration with UMC and Missouri State University will enhance our ability to target this population.

3. How will the planned programs describe the expected outcomes and impacts?

The primary outcomes anticipated by efforts at Lincoln University are to improve the quality of life and/or assist under-represented and under-served individuals in living with a sustainable income in an environment of their choosing. This environment could be in urban regions, at the rural/urban interface, or in isolated rural areas.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

These programs will result in greater integration of activities within LU and between LU and other Universities within Missouri. The MOU between Lincoln and UMC will also assist in sharing knowledge and activities to a greater degree and will allow LU to concentrate efforts on fewer research programs for meeting the needs of clientele throughout the state.

IV. Stakeholder Input

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

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

Brief explanation.

The listed actions do not occur in each program. Most programs do not use all the methods listed above to seek stakeholder input. All programs, however, use at least two of the above actions, and multiple programs use four of the above methods.

In general, stakeholders are invited to events and provided with information using mail lists, newsletters, association publications, presentations at stakeholder meetings, workshops and personal interactions. New releases inform and invite the general public. Efforts are evaluated and the results are used to modify and/or redirect formats as needed.

2(A). A brief statement of the process that will be 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 External Focus Groups
- Use Surveys
- Use Advisory Committees

- Needs Assessments

Brief explanation.

Targeted tools include a needs analysis, and surveys. Surveys are conducted at Lincoln University for selected programs. The University of Missouri also shares their statewide survey results database.

2(B). A brief statement of the process that will be 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
- Meeting specifically with non-traditional groups
- Survey of traditional Stakeholder individuals
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation

Some of the non-traditional and traditional groups includes vegetable producers organizations, aquaculture organizations, organic farmers, as well as with sheep and goat association members.

3. A statement of how the input will be considered

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

Brief explanation.

Advisory groups with individuals targeted from specific populations of stakeholders will receive an invitation once each year to hear research/extension activities and they will be asked to make recommendations for the coming years priorities.

V. Planned Program Table of Content

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

V(A). Planned Program (Summary)**Program #1****1. Name of the Planned Program**

Animal Science

2. Brief summary about Planned Program

Lincoln University, Cooperative Research and Extension Animal Sciences Program (ASP) investigates production practices for economically important livestock species. The species chosen are of value to limited resource farmers. Stakeholder input is based on local livestock associations (North Central Regional Aquaculture Center, Missouri Aquaculture Association, Missouri Sheep and Goat Producers, and Missouri Cattleman's Association), market trends and direct requests.

Small ruminant production will address parasite management (sheep and goats) with medicinal herbs as well as commercial dewormer and the FAMACHA deworming being adopted to help control internal parasites in sheep and goats. Workshops and programs will be completed on co-grazing sheep, goats and cattle to improve land use efficiency, artificial insemination in sheep, goats and cattle, shearing school, fitting school and herd and flock health programs. The need to increase profits from wool, mohair and angora fibers produced from sheep, goats, rabbits, llamas and alpacas is great. Educational programs are being delivered and are being expanded. A value-added fiber program helps small farmers with learning new technologies and marketing.

The animal science program is conducting studies in ruminants in: parasite management (sheep and goats) with medicinal herbs (de-wormers), co-grazing systems (cattle, sheep and goats) land use efficiency, biosensors (cattle or goats) to facilitate artificial insemination; real-time ultrasonographic examination of pregnant does for sheep and goats throughout gestation in order to discover how much embryonic and fetal loss occurs in goats and when these losses occur. The animal science program includes food-fish production research in the areas of: nutrition (bluegill and crappie), genetics (sunfishes), production dynamics (sunfishes), pest management and fish health.

Outcomes are to improve production efficiency and increase opportunities with new strategies regarding livestock and fish production. These results are essential to enable sustainability of diversified production for small and limited resource farmers.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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		12%		12%
302	Nutrient Utilization in Animals		13%		13%
303	Genetic Improvement of Animals		25%		25%
307	Animal Production Management Systems		25%		15%
311	Animal Diseases		12%		12%
313	Internal Parasites in Animals		13%		13%
721	Insects and Other Pests Affecting Humans		0%		10%
	Total		100%		100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Missouri has 82,000 small farms. The state is experiencing a shift in its size of farms, with the intermediate size operations in decline. The heads of households in the majority of small farm families are employed outside the home. These families need alternative agricultural options to sustain their way of life. The prevailing climate and geology combined with geography provide unique opportunities and challenges to Missouri farmers. Missouri is the second largest cow-calf producer of in the United States and improved efficiency of production is needed to maintain this status. The alternatives to cattle for small farm operators include sheep and goats which are easy to handle and can browse and consume forbs, neither preferred by cattle. Sheep and goats are increasing in popularity and profitability.

Missouri is the number 2 aquaculture producing state in the Midwest. It is an important industry to support since it is second only to oil in contributing to the U.S. trade deficit. Fishery harvests are in decline, yet demand for fishery products is increasing. There is a need for increased seafood production and aquaculture can provide an alternative supply for seafood products. Sunfishes, native to Missouri, are highly regarded as food fishes and have been identified as potential aquaculture taxa for the North Central region. However, there are critical factors limiting their economic and sustainable production. The nutritional requirements of sunfish need to be defined; fast-growing and pure cultivars need to be developed; production dynamics need to be improved; and health issues resolved.

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 encephalitides. A variety of environmental factors - both biotic and abiotic - contribute to the growth and development of larval mosquitoes and to the consequent production of adults from individual larval habitats. These factors include physical and chemical water regime in the aquatic habitats, water temperature, quantity and quality of food available to larvae, and intensity of predation and parasitism. By examining 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. The objectives are: 1) Careful examination of existing populations in a small geographic region to determine cooperation and competition in habitats and hosts for mosquito species. 2) Utilization of a controlled laboratory setting to modify biotic and abiotic factors; including climate, population densities, resource availability and species composition, in order to collect data on developmental responses in larval mosquitoes. 3) Collection and maintenance of a variety of mosquito strains from varying geographic locales for observation of variation in phenotypic plasticity within and between these strains. 4) Phenotypic and genetic analysis of any variation among these strains from different geographic locales. 5) Utilization of molecular techniques to investigate possible genetic loci associated with variation.

2. Scope of the Program

- In-State Research
- Integrated Research and Extension
- In-State Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

- Adequate administrative support
- Adequate personnel
- Adequate knowledge base
- Adequate facilities and equipment
- Adequate funding
- Adoption of techniques by targeted audience
- Partnerships

2. Ultimate goal(s) of this Program

•To improve quality of life for limited resource farmers in Missouri through disease prevention, and livestock and aquaculture production.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	1.5	0.0	4.0
2011	0.0	1.5	0.0	4.0
2012	0.0	1.5	0.0	4.0
2013	0.0	1.5	0.0	4.0
2014	0.0	0.0	0.0	4.0

V(F). Planned Program (Activity)

1. Activity for the Program

- 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. Using real-time ultrasonographic examination of pregnant goat does throughout gestation in order to discover how much embryonic and fetal loss occurs and when these losses occur.
- d. Develop sunfish cultivars for distribution to the industry.
- e. Determine nutritional requirements of sunfishes.
- f. Develop optimal production dynamics for sunfishes.
- g. Provide aquaculture fish health services for stakeholders.
- h. Reduce mosquito populations responsible for transmitting the causative agents of some of the most widespread and prevalent infections of humans.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Other 1 (Field Days) ● Demonstrations ● Other 2 (Undergraduate Research) ● One-on-One Intervention ● Workshop 	<ul style="list-style-type: none"> ● TV Media Programs ● Newsletters ● Web sites ● Other 1 (Festivals and Fairs)

3. Description of targeted audience

Limited resources audiences

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	2300	80000	400	2000
2011	2400	80000	400	2000
2012	2400	80000	400	2000
2013	2400	80000	400	2000
2014	2400	80000	400	2000

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	2	0	2
2011	3	2	5
2012	3	3	6
2013	3	4	7
2014	4	4	8

V(H). State Defined Outputs

1. Output Target

- Projects completed, presentations and manuscripts

2010 :14 2011 :17 2012 :11 2013 :17 2014 :19

V(I). State Defined Outcome

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 Target**

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. Outcome Type : Change in Knowledge Outcome Measure**2010** 3575**2011** :4085**2012** :4085**2013** #085**2014** :4085**3. Associated Institute Type(s)**

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Production Management Systems
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals

Outcome #2**1. Outcome Target**

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

2. Outcome Type : Change in Action Outcome Measure**2010** :1530**2011** :1640**2012** :1640**2013** :1640**2014** :1640**3. Associated Institute Type(s)**

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Production Management Systems
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals

Outcome #3**1. Outcome Target**

Farmers adopt new technologies for increased and sustainable production.

2. Outcome Type : Change in Condition Outcome Measure

2010 :1530

2011 : 1640

2012 : 1640

2013 :1640

2014 :0

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Production Management Systems
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals

V(J). Planned Program (External Factors)**1. External Factors which may affect Outcomes**

- Competing Programmatic Challenges
- Public Policy changes
- Economy

Description

A major factor regarding the aquaculture program are energy costs for maintaining facilities at proper temperature, as well as water quality issues. For the Small ruminant program, it will be dependent upon the ability to find and acquire appropriately trained personnel and long-term demand for goat meat.

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

- After Only (post program)
- Case Study

Description

Many of these programs at the current time are still at the level of determining appropriate research methods. The economics of these will be determined and if the program appears to be economically feasible, then it will be transferred and evaluated under field conditions as case studies.

2. Data Collection Methods

- Sampling
- Case Study
- Unstructured

Description

Those producers receiving the updated information and incorporating it into the program will be evaluated for their perceptions including labor, economics and marketing.

V(A). Planned Program (Summary)

Program #2

1. Name of the Planned Program

Community and Leadership Development

2. Brief summary about Planned Program

The Community and Leadership Development (CLD) planned program will include: community and organizational-based workshops, meetings, trainings, curriculum implementation, community assistance, organizational development, fund development, community and organizational planning, information exchange, etc, to communities and organizations that help improve the overall quality of life and standard of living for those communities and enhance the efficiency and effectiveness of those organizations. The CLD program creates, applies and transfers multidisciplinary knowledge to help people understand community change and identify opportunities in a collaborative manner.

The targeted audience will be underserved and underrepresented communities. No limitation on gender, ethnic, religious diversity, or lifestyle choice. Also targeted among adults will be those who are currently serving in a leadership role or in an agency, organization, neighborhood, club, community, business or aspire to serve.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

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 (Situation and Scope)

1. Situation and priorities

Priority I Improving small towns and community organization efficiency through teaching and improving leadership and management skills of will be emphasized. Due to the rapid growth of small towns and the numerous laws associated with

managing them, many community leaders have requested training to assist them in executing their duties. The LUCCLD has developed a series of workshops and training sessions to help them administer better. Critical skills areas include: Leadership, Community Resource Planning, Negotiation Skills, Planning and Development, Communication Skills, Youth Development, and General Community and Organizational Skills.

Training will help participants become more effective within their organizations and ultimately enhancing the quality of life and standard of living within the communities they serve.

Priority II Provide Leadership and Organizational Development Training for Small Towns and Communities in Missouri.

Many of the training sessions and workshops will be based on the cohort model, meaning that the same group of individuals will participate in a series of sessions from start to finish (two-nine sessions). Program sessions will focus on such topics as self-awareness, understanding and leading people, getting results, and thinking strategy.

Priority III General Community and Organizational Skill Building Leadership Programs.

Communities reap rewards when residents become involved, raise their awareness of issues, and improve their leadership skills. Building a community where people want to live, work and play has its long term rewards. In light of this, the LUCCLD has launched efforts aimed at empowering citizens with information and skills to heighten awareness and deepen civic involvement. The goals of these workshops and training are to improve participant's skills in working with others, to increase citizen involvement in and of effective decision-making and effective ways to affect change.

The sessions often focus on leadership skill development, laws, rules, and regulations that affect small towns and communities. Additionally, sessions will focus on the effects of educational processes, governmental administration, business and economic development, public health and human services and how they interact with and for small town and community processes.

Priority IV Preparing Small Town and Community Leaders to Work more Effectively with the Public.

Small towns and community leaders are often unprepared for their roles in administration and management, especially when it comes to expending tax payer's money. The goals of this training are to assist individuals in dealing more effectively with problem employees, communicate with citizens and employees in a more professional manner.

Many small towns and community leaders find that their administrators, officers, supervisors and managers have not had any formal training in the responsibilities or expectations for these positions. Lack of skills results in the individual either replicating "what we've always done" or asking other supervisors, who also may not be trained, what to do.

Unprepared supervisors, officers, and managers can result in lost time and production due to grievances and poor employee/membership relations. While it is essential to improve the efficiency and effectiveness of frontline supervisors, few small towns and community organizations are large enough or have the internal resources to provide training.

Training and workshops in this area aims to better prepare supervisors and officers for their position and responsibilities. Workshop topics are Basic Leadership Skills, Work Planning and Goal Setting, Customer/ Resident Relations, Effective Communication Skills, Budgeting, Fund Accounting and Grant Administration, "Nuts and Bolts" of Personnel Management, Managing "Troubled" and "Problem" Employees, and Negotiations.

Priority V Many organizations and agencies are finding their managers/officers have not had formal training in how to manage organizations, other people and/or the public. As a result, there are often miss-steps and time lost as these individuals learn "on the job."

When officers or administrators in small towns or community organizations don't have the skills needed to manage projects, it costs the organization in efficiency and effectiveness - affecting profitability, membership and poor public relations. Many organizations don't have the internal resources to provide training in many of these needed areas of administration. They are constantly looking for affordable experts at the university to provide applicable skills in a format useful to the learner.

Priority VI Training and Skills that Improves Small Town, Community and Organizational Efficiency and Effectiveness.

Keeping up with thousands of laws and processes is not easy for the small town administrators in Missouri. The LUCCLD has developed training sessions and workshops in leadership and administrative management that help participants work more effectively with village, town, and city boards; communicate with citizens; and establish policies that use local resources wisely. The program also helps participants build a professional network for continued learning and support.

Hundreds of small town administrators in the state of Missouri are entrusted with managing the day-to-day affairs of their communities, from issuing permits and licenses, to handling local elections, to collecting taxes. These persons must comply with a variety of local and state laws and ordinances set forth by elected officials at all levels of government, as well as answer to their local constituents. They need training in how to manage their responsibilities and to keep up with constantly changing policies.

Leadership Management Skills for Improved Efficiency and Human Relations.

2. Scope of the Program

- In-State Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

1) Everyone is a leader, and citizens from all walks of life need to accept responsibility for problem solving, 2) Leadership is not innate, it can be learned, 3) A flexible dispersed leadership pattern is an element of community entrepreneurship (Flora and Green), 4) Healthy Communities generate leadership everywhere (Coalition for Healthier Cities and Communities), 5) Successful and sustainable communities enhance human and social capital by increased use of the skills, knowledge and ability of local people (NCRCRD), 6)Community leadership is one component of an effective community (National Civic League), 7) Effective communities have a unique way of understanding how the community educates itself in the community's business (Kettering Foundation), 8) Involving and working with people is important to accomplishing work that needs to be done, 9) An influence relationship is important among leaders and collaborators who intend real changes that reflect their mutual purposes,10) Leadership development is a process, not a quality. Results come from combined efforts and commitment of all in the community and/or organization.

2. Ultimate goal(s) of this Program

- Community goal attainment
- Increased capacity to deal with future issues

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	2.0	0.0	0.0
2011	0.0	2.0	0.0	0.0
2012	0.0	2.0	0.0	0.0
2013	0.0	2.0	0.0	0.0
2014	0.0	2.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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 administrations, managing "troubled" and "problem" employees, and negotiations.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● One-on-One Intervention ● Workshop ● Group Discussion ● Education Class 	<ul style="list-style-type: none"> ● Web sites ● Newsletters ● Other 1 (Word of mouth and announcements)

3. Description of targeted audience

Small towns, community organizations and agencies.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	250	100	25	50
2011	300	120	50	75
2012	350	130	100	100
2013	400	130	100	100
2014	400	400	100	100

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0

V(H). State Defined Outputs

1. Output Target

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

2010 60

2011 75

2012 75

2013 75

2014 75

V(I). State Defined Outcome

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

Outcome #1**1. Outcome Target**

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

2. Outcome Type : Change in Knowledge Outcome Measure

2010 :75

2011 : 75

2012 : 75

2013 :75

2014 :75

3. Associated Institute Type(s)

•1890 Extension

4. Associated Knowledge Area(s)

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

Outcome #2**1. Outcome Target**

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

2. Outcome Type : Change in Action Outcome Measure

2010 :75

2011 : 75

2012 : 75

2013 :75

2014 :75

3. Associated Institute Type(s)

•1890 Extension

4. Associated Knowledge Area(s)

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

Outcome #3**1. Outcome Target**

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

2. Outcome Type : Change in Condition Outcome Measure

2010 :75

2011 : 75

2012 : 75

2013 :75

2014 :75

3. Associated Institute Type(s)

•1890 Extension

4. Associated Knowledge Area(s)

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

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

All these factors may affect our planned outcomes, directly, and indirectly.

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

1. Evaluation Studies Planned

- Retrospective (post program)

Description

Since the majority of our programming will come as the result of invitations from small towns and organizations for specific programming, behavioral modifications and anecdotal evidence will comprise the majority of our programming evaluations.

2. Data Collection Methods

- Unstructured
- Observation
- Other (Testimonials)
- On-Site
- Sampling

Description

On-site surveys will be through evaluation forms.In addition to the above methods, there will be program reviews.

V(A). Planned Program (Summary)**Program #3****1. Name of the Planned Program**

Family and Youth Development

2. Brief summary about Planned Program

The needs of families today are complex and require many skills to become or maintain self-sufficiency. The focus of the programs and activities will promote positive human development. Activities will extend knowledge to participants and convey a sense of belonging, teach life skills, and provide opportunities for mastery, competence and independence. This work also includes a focus on the educational, social, health, and emotional development of program participants.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

In the United States, more than one-third (37%) of youth live in low-income families. This means the parents of these children made less than 200% of the poverty guidelines established by the federal government. The statistics concerning children living in poverty are again rising after a 10-year period of decline (National Center for Children in Poverty, 2004).

According to The National Center for Children in Poverty (NCCP), minority children are more likely to live in poverty than those from the majority population. These minority children are also the group that leads the recent statistics showing increases of children in poverty. Low income families tend to have high mobility rates. High rates of mobility create instability and turmoil associated with issues such as the increasing educational achievement gap in low income and minority children.

Looking at The National Assessment of Educational Progress (NAEP), also known as "the Nation's Report Card," data, the Education Trust concluded that, "By the time (minority students) reach grade 12, if they do so at all, minority students are about four years behind other young people. Indeed, 17 year-old African American and Latino students have skills in English, mathematics and science similar to those of 13 year old white students." Another way to measure the achievement gap is to compare the highest level of educational attainment for various groups. Here too there are gaps at all levels. Hispanic and African-American high school students are more likely to drop out of high school in every state. Of these high school graduates, college matriculation rates for African-American and Hispanic high school students remain below those of white high school graduates – although they have risen in recent years. Furthermore, of those students enrolling in college, Hispanic and black young adults are only half as likely to earn a college degree as white students.

Findings in the NAEP primer suggest that the most successful policy initiatives recognize the critical role that parents and communities play in the care and education of young children. These efforts also encourage integration of existing programs, services, and funding streams into a flexible and comprehensive system of supports for children and families.

Difficulties in school typically result in fewer youth graduating which results in a cycle of poverty because about two-thirds of children, whose parents have no high school diploma, live in low income families.

Consistent with targeting requirements of the Older Americans Act (OAA), the Paula J. Carter Center on Aging places emphasis on services to persons with the greatest social and economic need, including members of racial and ethnic minority groups. Among the OAA Title III service recipients, 21.8 percent were members of racial and ethnic minority groups.

The efforts of Lincoln University's extension programs are concentrated in areas of Kansas City, St. Louis and Southeast Missouri where poverty levels exceed 50%. Lincoln University provides services in and around the Jefferson City area. In Jefferson City, many of the families residing in public housing are from the large urban areas of Kansas City and St. Louis. About 50% of the parents in this housing have not graduated from high school (JCHA, 1999). These statistics reflect the critical educational needs of this audience as well as the opportunity to share life development skills.

In an effort to meet the needs of this diverse audience of low income children, families, and elders, various programs must be developed and implemented that offer a level of success that has measurable outcomes. The needs for this audience are complex and generally have not been met adequately by existing programs. New ways of "reaching, teaching and inclusion" for this audience must be developed and discovered. Traditional methods are not adequate.

Priorities of these programs are to: 1) develop leadership skills 2) improve the literacy rate of minority and under-represented groups, 3) and provide a learning environment for after school enrichment, including school homework assistance. Leadership development programs will provide guidance in volunteerism, sense of belonging, development of social skills and mentoring skills.

Many poor families are devastated by the incarceration of a parent. When a parent returns from prison, the problems do not decrease but tend to exacerbate dysfunction in families. Extension staff will develop programs to address incarcerated parents and ex-offenders reentry in to the community.

The special health, psychological and social needs of the minority and underserved older adults are only partially being met. As Missouri's population continues to age, it reflects the faces of many races and cultural lifestyles. The implications of these demographic changes for current barriers still exist that precludes entry into the healthcare system. Not only will these systems have to accommodate a vastly larger number of older persons in the new millennium, but, those whose needs are more diverse and more complex.

There is a lack of accessibility, adequate training and affordability that affect the already overworked healthcare system. An increased awareness of cultural needs, diversity, and disparity can serve as a benefit to the growing number of underserved. For Missouri to advance into a working multicultural system, all residents and providers of the State must have access to information to insure that health management occurs.

2. Scope of the Program

- In-State Extension
- Multistate Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

a) There is adequate financial support and human resources available.
) Continued concentrations of efforts in 4 regions of the state, includes Central Missouri, Kansas City, St. Louis and the Southeast region.c) The objectives of the program remain consistent with the University’s Mission.

d) Additional personnel increases will result from increased success in obtaining extramural funding.

e) The clientele served are motivated to implement what they learn

2. Ultimate goal(s) of this Program

To decrease poverty, in the minority and under-represented population that have received our services. Ultimately, the decreased poverty should be no higher than the averages throughout the state of Missouri.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	22.0	0.0	0.0
2011	0.0	22.0	0.0	0.0
2012	0.0	22.0	0.0	0.0
2013	0.0	22.0	0.0	0.0
2014	0.0	22.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Workshop ● Demonstrations ● Group Discussion ● Education Class 	<ul style="list-style-type: none"> ● TV Media Programs ● Web sites ● Newsletters

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	0	0	725	0
2011	0	0	725	0
2012	0	0	725	0
2013	0	0	725	0
2014	0	0	725	0

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0

V(H). State Defined Outputs

1. Output Target

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

2010 :120 **2011** :130 **2012** :130 **2013** :130 **2014** :130

V(I). State Defined Outcome

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 Target

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. Outcome Type : Change in Knowledge Outcome Measure

2010 300 **2011** : 300 **2012** : 300 **2013** 300 **2014** :300

3. Associated Institute Type(s)

•1890 Extension

4. Associated Knowledge Area(s)

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

Outcome #2

1. Outcome Target

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. Outcome Type : Change in Action Outcome Measure

2010 300 **2011** : 300 **2012** : 300 **2013** 300 **2014** :300

3. Associated Institute Type(s)

•1890 Extension

4. Associated Knowledge Area(s)

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

Outcome #3

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2010 :300

2011 : 300

2012 : 300

2013 300

2014 :300

3. Associated Institute Type(s)

- 1890 Extension

4. Associated Knowledge Area(s)

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

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Numerous external factors can have a profound influence on outcomes. These include factors such as long-term support of the programs, personnel available, public funding changes due to changes in priorities, etc.

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

1. Evaluation Studies Planned

- During (during program)

Description

Extension administrators, as well as, advisory groups will be used to monitor progress of the programs and make recommendations regarding any changes that need to be made.

2. Data Collection Methods

- Unstructured
- Observation

Description

Data will be collected by specialists that are providing the services. This will be primarily through observations, one-on-one interviews and sampling from those that are receiving out services.

V(A). Planned Program (Summary)

Program #4

1. Name of the Planned Program

Environmental Science

2. Brief summary about Planned Program

2. Brief summary about Planned Program

The overall goal of the plan is: 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.

"Risk characterization" which includes:

- 1) Survey of impaired soils, lands and waters in Missouri;
- 2) Identify major contaminants that threaten human health and ecosystem;
- 3) Characterize physical and chemical properties of contaminated sites;
- 4) Determine the degree and extent of contamination and geospatial distribution of contaminants;
- 5) Investigate the environmental behaviors and fates of contaminants.

"Integrated Risk Assessment" which includes:

- 1) Determination of the health and toxicological effects of identified contaminants;
- 2) Evaluate the ecological impacts of contaminants on water quality, microbial community vegetation, wildlife, etc.

"The Cost-effective and environmental-friendly" remedial technology development which includes:

- 1) In-situ chemical immobilization (metals/soil);
- 2) Phytoremediation (metals and organics/soil);
- 3) Bioremediation (organics/soil-water);
- 4) Nanotechnology (metals-organic/waters).

"Integrated Risk Management" which will include:

1.) Evaluation of long-term efficacy of remedial technology for ecological and health risk reductions; field testing and validation and field restoration.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Water Quality Studies:

Missouri region is one of several areas in the United States having confined animal feeding operations (CAFOs) under various animal units' classifications. Water quality of streams near CAFOs may deteriorate due to inputs of Escherichia Coli (E. coli), nitrogen (N), phosphorus (P), and antibiotic drugs from animal wastes. Acquiring knowledge on the effects of animal wastes from CAFOs on streams especially under local conditions, are important in understanding water quality changes and how it affects native fish species. Also understanding the distribution and fate of pollutants from animal wastes in environmental media (soil, sediment, surface and groundwater) and the potential public health risks are necessary. Protection of water resources is important for human, aquatic and environmental health. The hypothesis to test is that there are significant

contributions of N, P, E. coli and antibiotic drugs from runoffs/seepage from cattle and swine wastes on water quality of two Missouri streams. Potential impact of this research include: possible changes in farm practices leading to water quality improvements; knowledge transfer to students and scientists; and enhancement of collaborative efforts and overall quality of life of Missouri citizens.

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

Elevated metals in environment have been identified as a human health and ecological threat. In Missouri, there are thousands acres of lands that have been contaminated by various toxic metals such as Pb, Cr, Cd, due to mining activities, inappropriate waste disposals, industrial discharges, etc. Such contaminations have caused human health problems and ecological disaster. Remediation of Pb-contaminated soil for reducing the risk to human health is a national priority. In-situ immobilization is being tested and emerging as a potential cost-effective remedial alternative for safeguarding human and environment from metal-contamination. The efficacy of soil treatment using phosphate-based materials for health and ecological risk reduction of metal-contaminated mining wastes is largely unknown and little studied. In order for a large-scale implementation of phosphate remedial technology in mining-contaminated site, a site-specific or mining waste-specific assessment of in situ phosphate treatment is needed. It is hypothesized that in situ soil treatment through phosphate-based amendments could effectively reduce lead bioavailability and mobility in the tailing-contaminated areas, which helps re-establish vegetation cover and protects human and environment from contamination. The proposed study is designed to substantiate the hypothesis. If successful, results from this project will provide a site-specific assessment of phosphate treatment effectiveness on tailing remediation and scientific evidence that can support large-scale implementation of phosphate-based treatment in similar contaminated sites nationwide.

Geospatial Studies:

The abandoned mines in the Central District are spread over four watersheds, namely Lake of the Ozarks, Lamine, Lower Missouri-Moreau, and Lower Osage. To date no significant work has been done to investigate the level of environmental disturbance and contamination that may have resulted from these abandoned mines. A watershed-based multidisciplinary study that integrates geospatial, geologic, hydrologic, geochemical, and ecological disciplines will be conducted in the Central District to assess the impact of the abandoned mines on the water quality and ecosystem. The objectives are To generate scientific data that characterizes the nature and magnitude of contamination and the level of environmental disturbance. The tasks include:

- To identify and map abandoned mines in a watershed context
- To identify and map contaminations that may arise from the abandoned mines

The activities include:

- Generation of a watershed based geographic information database
- Collection of water, soil, and plant samples
- Interpretation and modeling of analytical results

Air Quality Studies:

The atmospheric concentration of CO₂, CH₄ and N₂O is ever increasing and good deal of research has been conducted to estimate emissions of these greenhouse gases from soils. Although numerous measurements have been made, emissions from soils still show variability based on a number of controlling factors. In fact, differences in soil type, moisture, temperature, season, crop type, fertilization, and other agricultural practices apparently all play a part in emissions from soils. Within a particular soil type, static soil characteristics and dynamic soil properties all affect greenhouse gas emissions, but the relationship between these properties is still poorly understood. In addition, our knowledge is also still insufficient on how soil management practices impact soil static characteristics and dynamic soil properties and how in turn they affect greenhouse gas emissions. This project seeks to clarify the relationship between soil static characteristics and dynamic soil properties or fluxes. It seeks to develop as soil quality index for assessing the relationship between soil properties and gas fluxes. It finally seeks to improve methods to measure, monitor, quantify and predict greenhouse gas fluxes and soil properties. These objectives are related to the long-term goals of sustaining US agricultural production while maintaining or improving soil and environmental quality in crop, forest and rangelands system. that has ultimately led to surface and groundwater pollution. A variety of methods, biological, chemical, and physical have been used for degradation and detoxification of pesticides in soil. Most of the studies dealing with pesticide dissipation and degradation concentrated on laboratory experiments using pure active ingredients. In practice, formulated pesticides are applied in the field and formulating agents can modify pesticide behavior by direct interactions with pesticides or by soil modifications. Surfactants are specialized additives formulated to improve the performance of herbicides in spray solution. They are, by far, the most commonly used adjuvant for postemergence herbicides. Surfactants improve pesticide performance as a result of modifying one or more of the following spray solution characteristics: mixing, or emulsifying and dispersing oil-soluble and water-soluble molecules; coverage, or spreading and wetting or sticking on leaf surfaces; spray retention; and absorption, or penetrating properties. There is lack of information about the effect of different surfactants on soil enzyme activities and role on nutrient cycling. This project will investigate 1) the changes in soil microbial

- consortia as affected by different surfactant;. 2) Determine the effect of different surfactants on plant nutrient uptake;
- 3) Measure the activities of enzymes involved in the cycling of C, N, P

Behavior of Select Surfactants in Soil: Interactions with Physicochemical and Microbial Properties:
 Contamination of agricultural soils with pesticides has become a serious environmental problem

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.

2. Scope of the Program

- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

- (a) That the program is assured of continuous funding
- (b) That farmers will be motivated to change their management practices
- (c) That policy makers will be persuaded to enact appropriate legislation
- (d) That people will accept training opportunities offered to them by the program
- (e) That information supplied by the program will result in awareness and knowledge of environmental issues their management practices

2. Ultimate goal(s) of this Program

This studies are carried out to:

- (a) Provide baseline data on which relationships between human activities and natural ecosystems could be analyzed, and comprehensive management strategies developed.
- (b) Train future caretakers of the environment
- (c) Raise awareness on major consequences of improper human activities on our cherished natural resources
- (d) Improve environmental quality and sustainability
- (e) to develop alternative energy sources

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	0.0	0.0	7.0
2011	0.0	0.0	0.0	7.0
2012	0.0	0.0	0.0	7.0
2013	0.0	0.0	0.0	7.0
2014	0.0	0.0	0.0	7.0

V(F). Planned Program (Activity)

1. Activity for the Program

Water Quality Studies:

The overall objective of this study is to ascertain the contributions of N, P, E. coli and antibiotic drugs from runoffs/seepage from cattle and swine wastes on water quality of two Missouri streams. The specific objectives of this research project are: 1) to establish baseline data, evaluate practices at CAFOs identified sites, and quarterly determine the concentrations of E. Coli, nitrates, nitrites, ammonia, total nitrogen, phosphorus, and antibiotics in lagoon/holding tanks, during manure applications, in CAFOs runoffs, and in streams and compare data obtained with natural systems; 2) to evaluate rainfall events and possible water quality changes due to Escherichia Coli, nitrates, nitrites, ammonia, phosphorus, and antibiotic drugs in streams and leachates from identified CAFOs; analytical data obtained in water quality modeling to better predict water quality near a CAFOs site; and finally 6) to provide BMPs that will assist in water quality improvements near identified CAFOs in Central Missouri.

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

Specific tasks include:

- i) Characterize the physical/chemical properties of the tailings and determine the spatial variability of metal contamination in the areas. This objective will focus on the collection of soil and water samples within the study site, the analyses of metal concentration and metal species in samples, and the determination of the extent or degree of the contamination and spatial distribution of contaminants. This study will provide base information of the site for selecting in situ treatment.
- ii) Assess the efficacy of in situ soil treatment using various phosphate-based amendments, including phosphoric acid, phosphate rocks, enriched-P biosolids or composts. In order to determine whether the soil treatment reduce health risk of metals and whether stabilization of metals is achieved, the assessment will include the evaluation of reduction of metal bioavailability of the tailings upon phosphate treatments, the determination of metal and phosphate chemical fractionation in phosphate-treated tailings, and the measurement of the mobility or leachability of metals and added phosphate in the treated tailings. The assessment will provide an inside information of metal immobilization processes and help select the most effective treatment.
- iii) Evaluate the treatment methods under field conditions and identify the most effective method for metal stabilization. This study will be performed in a small contaminated area. Soil, plant, and water samples will be collected from the field and analyzed. Plant growth and water quality upon the treatment method will be evaluated, and the treatment method that is most effective in reducing the bioavailability and stabilizing the metals will be determined.
- iv) Examine the treatment effects on soil microbial properties upon the in-situ phosphate amendments. This study will provide information whether the in-situ soil treatments are environmental-safe and the impacts on soil ecology are minimal, which will be important for evaluating if the technology will be publicly acceptable and widely applied.

Geospatial Studies:

The specific objective of the geospatial studies is to create a geospatial digital database for the Lake of the Ozarks, Lamine, Lower Missouri-Moreau, and Osage watersheds. The database will play an integral role in designing field sampling strategies, plotting sample locations, conducting spatial analysis and modeling of analytical data. The primary task is to locate and assemble relevant geospatial data from the various state and federal agencies. The database will consist of various layers including digital elevation models, land use/land cover, geology, soil, hydrology, mine locations, wetlands, floodplains, and remote sensing data (satellite and air photo). 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, will also be targeted. Federal agencies such as the USDA's Natural Resources Conservation Service, United States Geological Survey, and Environmental Protection Agency are other potential data sources.

Air Quality Studies:

The specific objectives of this study are to investigate (i) how soil pore space and thermal properties indices (pore tortuosity factor, relative gas diffusion coefficient and thermal conductivity, diffusivity and resistivity) relate to greenhouse gas fluxes from soils under agricultural fields, forest and pasture, (ii) how pore space indices vary in these soils with different vegetation types, (iii) how pore space indices, soil thermal properties (thermal diffusivity, conductivity and resistivity), greenhouse gas fluxes and other dynamic soil properties relate to static soil characteristics such as texture and bulk density in soils under agricultural fields, forest and pasture, and finally (iv) how the use of geo-spatial technologies (GPS, GIS and Geostatics) in our sampling strategies improve the estimation of greenhouse gas fluxes, static soil characteristics and dynamic soil properties. Sampling sites for this project are Freeman Farm (Agricultural site) where corn, soybean and cotton fields were grown; Carver Farm (Grassland site) where a field plot was set on a permanent pasture, Busby Farm (forest site) where two plots were set inside the forest, Lincoln University-Lilbourn research site and in a farmer cotton field in the Bootheel. Experimental plots at each of Lincoln University sampling sites were mapped using global positioning sites (GPS). Thermal properties were directly measured and soil

samples were collected for analysis of initial soil chemical and physical properties. Twenty-four sampling chambers were installed in each of corn and soybean fields at Freeman Farm, 16 at Carver Farm and 12 chambers at Busby Farm. We will be sampling for air in our experimental sites and analyzing for it CO₂, CH₄ and N₂O at the Dickinson Research Center Laboratory.

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

The specific objectives of this study are: 1. Study the changes in soil microbial consortia as affected by different surfactants. Knowledge of the natural evolution of microorganisms in the soil will be crucial to successful study of the fate of these chemicals and possible bioremediation design schemes.

2. Determine the effect of different surfactants on plant nutrient uptake. This objective will investigate the possible interactions of surfactants with macro-and micronutrient uptake by plants.

3. Measure the activities of enzymes involved in the cycling of C, N, P and S in the presence of different surfactants. Surfactants can interact with microbial enzyme activity.

Biofuel Studies

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

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Demonstrations ● Workshop 	<ul style="list-style-type: none"> ● Web sites ● Newsletters

3. Description of targeted 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(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	25	60	15	30
2011	30	70	20	40
2012	35	80	25	50
2013	35	80	25	50
2014	35	80	25	50

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	6	0	6
2011	10	0	10
2012	12	0	12
2013	14	0	14
2014	15	0	15

V(H). State Defined Outputs

1. Output Target

- Short term output measures are: Abstracts, presentations, Training students and Workshops. Intermediate output measures are publications. Long-term: After five years

2010 #7 2011 52 2012 .52 2013 52 2014 52

V(I). State Defined Outcome

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

Outcome #1**1. Outcome Target**

Chemical and biological characterization of the ecosystems.

2. Outcome Type : Change in Knowledge Outcome Measure

2010 :4 2011 : 4 2012 : 4 2013 :4 2014 :4

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

Outcome #2**1. Outcome Target**

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

2. Outcome Type : Change in Action Outcome Measure

2010 :3 2011 : 3 2012 : 3 2013 :3 2014 :3

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

- 403 - Waste Disposal, Recycling, and Reuse
- 511 - New and Improved Non-Food Products and Processes
- 723 - Hazards to Human Health and Safety

Outcome #3

1. Outcome Target

Environmental sustainability; Improved quality of life

2. Outcome Type : Change in Condition Outcome Measure

2010 :1 **2011 :** 1 **2012 :** 1 **2013 :** 1 **2014 :**1

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

Outcome #4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2010 :4 **2011 :** 4 **2012 :** 4 **2013 :** 4 **2014 :** 4

3. Associated Institute Type(s)

- 1890 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management

- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 403 - Waste Disposal, Recycling, and Reuse
- 511 - New and Improved Non-Food Products and Processes
- 723 - Hazards to Human Health and Safety

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Natural disasters: this will change the overall outlook of the results and will limit our ability to collect the needed samples.

Public policy change: currently, areas designated as state parks are protected from direct human activities like residential and commercial real estate. A change in public policy that removes this restriction will make the Big Oak Tree Park vulnerable to human activities. Thus, the project will automatically come to a halt.

Government Regulations: If a new government regulation removes access to the park for all categories of people, it will be impossible for this program to continue since most of the samples for the study are expected to come from the park, the focus of the study.

Appropriation changes: The funding for this program comes from legislative appropriation. Any changes in appropriation that removes this program as a funding priority could shut down this program since the existence of the program is dependent on funding.

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

1. Evaluation Studies Planned

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

Description

Biological, chemical, and microbiological analysis will be carried out on the samples. Results obtained will be statistically compared with those obtained from the surrounding environments. Both intra and inter-parametric interpretations will be given to obtained statistics. This will form the basis of recommendations for appropriate management strategies to be put in place.

2. Data Collection Methods

- Sampling
- Observation

Description

Soil, water, plants, and air samples will be collected from the different sites using standard methods. The collected samples will be analyzed using appropriate standard chemical, microbiological and other analytical methods. Results obtained will be recorded and organized into data.

V(A). Planned Program (Summary)**Program #5****1. Name of the Planned Program**

Human Nutrition and Food Safety

2. Brief summary about Planned Program

Optimal nutrition is important to the health and well-being of all people. Previous studies have shown that diet is a factor in 6 of the 10 leading causes of death in the USA. Improved nutrition will increase quality of life and productivity, and reduce health care costs in populations throughout the nation. The Human Nutrition Research Unit at Lincoln University is continuing to focus their efforts on relationships between nutrition and health, and on establishing optimal nutrient requirements for diverse populations.

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

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. They have been used for nearly one century as the official food screening procedure established by Food and Drug Administration (FDA). These methods are time consuming (5-7 days), labor intensive and, therefore, are not suitable to monitor food quality and to provide timely response to possible risks. By the time the *E-coli* is detected in the raw material, the product will be sold out and consumed (Swaminathan and Feng, 1994; Yang, Bashir, 2008; Vasavada et al., 1997). The slow response of these biosensors has prompted numerous groups in the last decade to develop other techniques to reduce the detection time. The objectives 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.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

Nutrition-related chronic diseases are common in the State of Missouri and in the United States. Poor nutrition contributes to five of ten leading causes of death (heart disease, cancer, stroke, type 2 diabetes and arteriosclerosis) costing the US economy an estimated \$250 billion annually. Nutrition research and education will improve the quality of the American diet and reduce health care costs.

The priorities of nutrition research will be finding the mechanism how obesity contributes to the development of cardiovascular disease and finding reliable biomarkers for diagnosis of cardiovascular disease. The priority of nutrition extension will be prevention of nutrition-related chronic disease through nutrition education for improvement of nutrition and increased physical activity.

Escherichia coli O157:H7 is clearly one of the deadliest food borne pathogenic bacteria. It causes an estimated 73,000 cases of infection and 61 human deaths in the United States each year (Centers for Disease Control and Prevention, 2006). This bacterium has been linked to hemolytic uremic syndrome and hemorrhagic colitis. These illnesses may cause diarrhea, seizure, stroke, kidney failure and even death (Food and Drug Administration, 2008). They are often misdiagnosed, resulting in expensive medical testing before they are correctly diagnosed. In addition, E- coli has the potential to cause enormous national and international economical devastation due to medical costs and product recalls, as recently occurred with the recall of tomatoes due to E. coli O157:H7 contamination. It can also be found in vegetables, unpasteurized milk, juice and unchlorinated water. Contamination can have a significant impact on businesses such as the beef -industry. E. coli O157:H7 can be found on most cattle farms and can live in the intestines of healthy cattle. Thus, the meat can become contaminated with E. coli O157:H7 during slaughter. Testing for the bacteria requires extensive analysis which has to meet certain challenging criteria. Sensitivity and response time for the analysis are imperative factors related to the usefulness of microbiological testing. An extremely selective detection methodology is also required because low numbers of pathogenic bacteria are often present in a complex biological environment along with many other nonpathogenic organisms. 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. The increased surface area will enhance the sensitivity of impedance detection. Each IDE biosensor consists of 100 pairs of gold electrode "fingers" with a length of 0.5 mm. The IDE array will be designed with spaces between the interdigitated electrodes nearly the size of the bacteria in order to detect a single or a few bacteria cells.

2. Scope of the Program

- In-State Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

- 1)Funding will be secure throughout the course of the project.
- 2)Extramural funds can be obtained to assist in expanding efforts with this project.
- 3) Maintain adequate number of personnel with the appropriate skills to complete the work.

2. Ultimate goal(s) of this Program

Measurable improvements in public health by modifying dietary practice and lifestyle changes and reduction of health care costs for specific populations such as African-Americans, low-income and other under-represented groups.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	0.5	0.0	2.5
2011	0.0	0.5	0.0	2.5
2012	0.0	0.5	0.0	2.5
2013	0.0	0.5	0.0	2.5
2014	0.0	0.5	0.0	2.5

V(F). Planned Program (Activity)

1. Activity for the Program

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

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● One-on-One Intervention ● Workshop 	<ul style="list-style-type: none"> ● Web sites ● Other 1 (Nutrition education materials)

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	200	500	100	200
2011	200	500	100	200
2012	200	500	100	200
2013	200	500	100	200
2014	200	500	100	200

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of publication, presentations, workshops and contacts.

2010 :1007 2011 :1007 2012 :1007 2013 :1007 2014 :1007

V(I). State Defined Outcome

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: 2010 - 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 2011 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2012 - Same as 2011. 2013 - Same as 2012 and number of citations of publications = 10 2014 - Same as 2013 and number of citations of publications = 15
3	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 Target**

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. Outcome Type : Change in Knowledge Outcome Measure

2010 :700

2011 : 700

2012 : 700

2013 :700

2014 :700

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

Outcome #2**1. Outcome Target**

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

2. Outcome Type : Change in Action Outcome Measure

2010 :3

2011 : 10

2012 : 15

2013 :15

2014 :15

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

Outcome #3**1. Outcome Target**

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. Outcome Type : Change in Condition Outcome Measure

2010 :0

2011 : 0

2012 : 80

2013 :80

2014 :80

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes

Description

Planned research and extension activities are sole supported by USDA Evans-Allen Program. Therefore, appropriations changes will directly affect the planned activities. The changes in US economy may affect the living standard and opportunities for education of clientele and eventually influence the outcome of research and extension activities.

V(K). 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

Description

Surveys will be conducted before and after each research and workshops to evaluate impact of research and extension activities.

2. Data Collection Methods

- On-Site
- Whole population

Description

Surveys will be conducted for subjects selected by random sampling or for whole population on site depending on the nature of survey and size of the population before and after each research and extension activities.

V(A). Planned Program (Summary)

Program #6

1. Name of the Planned Program

Plant Science

2. Brief summary about Planned Program

The Small Farm Research and Extension program has the objectives of supporting the 1890 Mission through research on crop production problems, aimed at improving the economic and social wellbeing of underserved rural and urban residents with limited resources.

The program also emphasizes collaborative team effort in areas of fruits and vegetables crops as well as herbs and spices. It will continue to strive for the goal of reaching more stakeholders with quality innovative research that impacts their economic well-being.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships		5%		5%
111	Conservation and Efficient Use of Water		25%		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		15%		15%
405	Drainage and Irrigation Systems and Facilities		5%		5%
503	Quality Maintenance in Storing and Marketing Food Products		5%		5%
601	Economics of Agricultural Production and Farm Management		15%		15%
604	Marketing and Distribution Practices		10%		10%
	Total		100%		100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Missouri has a large number of small Farms. Small Farms account for 75% of the total number of farms in the state. The 1988, almost eight out of every ten Missouri farms were classified as small (gross sales of less than 40,000 per farm). The program priorities over five year period will be:

- To identify the needs and expectations of small farmers in Missouri. We will utilize information from small farms survey conducted in 2001.
- To restructure the small family program in cooperative extension with an emphasis on the need of deserved small farmers.
- To increase the capability for controlled environmental research at the University.
- To increase the use of value added products and the marketing f new crops.

2. Scope of the Program

- In-State Research
- Integrated Research and Extension
- In-State Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

•The administration will provide the necessary resources to implement program objectives. •the objectives of the program are consistent with the University Mission •There will be continuity in the funding of the program objectives over the stated period of time. •The program will continue to have sustained and continued Stake Holder participation. •There will be stability in the administration, faculty and staff over the stated period.

2. Ultimate goal(s) of this Program

To improve the viability and profitability of small farms and the quality of life of people in rural and urban Missouri.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2010	0.0	4.5	0.0	4.0
2011	0.0	4.5	0.0	4.0
2012	0.0	4.5	0.0	4.0
2013	0.0	4.5	0.0	4.0
2014	0.0	4.5	0.0	4.0

V(F). Planned Program (Activity)

1. Activity for the Program

- 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. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● TV Media Programs ● Public Service Announcement

3. Description of targeted audience

Low-Income, limited resources farmers and ranches and underserved population in rural and urban communities.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2010	1000	3000	100	300
2011	1000	3000	100	300
2012	1000	3000	100	300
2013	1000	3000	100	300
2014	1000	3000	100	300

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

Expected Patent Applications

2010 :0 2011 :0 2012 :0 2013 :0 2014 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0
2014	0	0	0

V(H). State Defined Outputs

1. Output Target

- Peer reviewed publications

2010 2 2011 3 2012 2 2013 2 2014 3

V(I). State Defined Outcome

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 Target**

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. Outcome Type : Change in Knowledge Outcome Measure

2010 :150

2011 : 150

2012 : 150

2013 :150

2014 :150

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

Outcome #2**1. Outcome Target**

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

2. Outcome Type : Change in Action Outcome Measure

2010 :5000

2011 : 5000

2012 : 5000

2013 :5000

2014 :5000

3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 132 - Weather and Climate
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 216 - Integrated Pest Management Systems
- 405 - Drainage and Irrigation Systems and Facilities
- 503 - Quality Maintenance in Storing and Marketing Food Products

- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

Outcome #3

1. Outcome Target

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. Outcome Type : Change in Condition Outcome Measure

2010 5000	2011 :4250	2012 :4250	2013 4250	2014 :4250
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3. Associated Institute Type(s)

- 1890 Extension
- 1890 Research

4. Associated Knowledge Area(s)

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

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Federal Government’s agricultural policy
 Federal Government’s economic policy
 Local and State Government’s agricultural and economic policy
 Stake Holders expectations
 x National disasters

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

1. Evaluation Studies Planned

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

Description

The program will undergo annual evaluations and a comprehensive evaluation at the end of the five year period.

2. Data Collection Methods

- Mail
- Tests
- Sampling
- On-Site
- Structured
- Observation

Description

Send survey instrument to a random sample of the targeted population.