

**Cooperative Research and Extension  
Lincoln University  
Jefferson City Missouri**

**Annual Report of Accomplishments and Results**

**Fiscal Year  
2000**

## Introduction

As we celebrate a new millennium, a new decade, and a new year, we are proud of what we have accomplished and even more excited about our possibilities. Our greatest achievements have been those that benefit and impact the clientele we are mandated to serve. Our research programs in nutrition, plant science, and animal science, and our extension programs in Minority Aging and Health, Youth Development, 4-H, Outreach Technical Assistance (2501 Program) and the Small Farm Family Program are just a few of the areas in which we have made significant impacts and contributions.

As we take a long look forward we have committed ourselves to working toward strengthening long term impacts, program accountability and sustained programmability. We will remain dedicated, committed and unrelenting in our quest to establish bright-line standards of achievement and shared vision. Increased public involvement, expanded educational opportunities, expanded extramural funding and a deepened sense of collective commitment will all be a part of our expanded touchstones.

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## **AREERA FY 2000 Accomplishment Report**

### **GOAL 1: An Agricultural System that is Highly Competitive in a Global Economy**

Programs conducted under this goal addressed the following key themes: Agricultural Profitability, Small Farm Viability, and Agricultural Competitiveness.

#### **Small Farm Family Program**

The Program continued to meet the informational and educational needs of the small family farmers in 22 southern counties of the state. To accomplish the performance goal, assistance was given by providing written and oral information in the following program areas:

Insect-pests on fruit trees and control measures

Living and working with physical disability

Preparing "show" animals for competition

Feeding and marketing of goats

Breeding and raising dogs for supplemental income

Community gardening for the low income families

Insect control for vegetable gardens

Weatherization of homes

Health care information

Canning and freezing of garden produce

Pasture improvement

Animal health

Selling garden-fresh fruits and vegetables through farmers' markets

Advised on adding values to farm products before selling

## Forming a Beekeepers' Association

The above list is not meant to be exhaustive. This shows the range of questions and requests that the SFFP Education Assistants attend to on a regular basis. Several innovative activities implemented by the EAs deserve special mention here. With active involvement of LUCE's (Lincoln University Cooperative Extension) State Marketing Specialist, the Program assisted African-American small farmers to launch a "pastured poultry" operation in the Southeast area of the state. One collaborator raised and sold more than 400 birds last year generating income for his family. In the Southwest part of the state, another EA helped a small farm family start a small fruit operation. This operator now has an established orchard where the buyers come and "pick their own," or walk into the family store and purchase freshly picked berries and/or fruit preserves. The centerpiece of the Program's many success stories last year must have been the "Green Kids Gardening Project." One SFFP-EA and a UO/E 4-H Regional Specialist conceived the idea, and with financial support from LUCE and volunteer support from the participating communities, the Project was implemented in Butler County. Four community gardens were established, one in each collaborating community, in which more than 150 individuals participated (90 percent belonging to age group 5-14). The communities were predominantly African American, and overwhelming majority of the participants came from the low-income minority families. In addition to gardening activities, the participating kids were able to attend a summer camp, which was probably a first and only opportunity for many of them. This Project will continue in 2001 with increased community participation.

Sheep cheese production as a value added product was introduced to several Missouri Sheep producers. One such farmer is now a certified sheep cheese producer. Work is being done to expand this needed niche market so that they will be able to sustain themselves economically. Contracts were made with 15 possible market outlets in northwest Missouri for expanding the market.

A third annual Missouri Goat Marketing Conference was held to provide educational materials to small-scale producers. Information at the 2000 Conference concentrated on production practices without the use of hazardous chemicals. In the course of presentations at conferences for vegetable, goat, and sheep producers, attendees were presented with the implications of the present global economy and market to what they are producing in agriculture. Efforts to explore the opportunity of growing and packaging vegetables for external markets are continuing with a group of 25 farmers being helped to develop expanded vegetable and pastured poultry operations

During FY2000, the horticulture programs at Lincoln University distributed the Vegetable Production Newsletter to more than 2300 growers and stakeholders in the vegetable industry in Missouri. The fourth annual Great Plains Vegetable Conference was held in St. Joseph, Missouri with more than 450 growers, marketers and others related to the vegetable industry in attendance. This conference is the joint effort of vegetable specialists at Lincoln University and within Missouri and others within the states of Kansas, Nebraska and Iowa. The crop nutrition program has worked with more than 200 fruit and vegetable growers within the state. Growers on this program report increased yield, quality and consistency of produce, and increased profits. For

example, one peach grower in southeast Missouri reported that his return per acre was \$500 greater than at any time in the history of the orchard, and the orchard has been in business for more than 30 years. Lincoln University has contributed significantly to the Master Gardener Program in Missouri by offering training and assisting with the coordination of the programs statewide and especially in collaboration with the Missouri Botanical Garden in St. Louis. This Master Gardener program alone has more than 200 volunteers that assist with horticulture needs in the greater St. Louis area.

Six new video titles were developed and used as a training tool for small limited resource farmers in the areas of sheep husbandry and value added wool production

An additional 5 guide sheets were produced on subjects relating to sheep and goat production.

### **Outreach Technical Assistance Program (2501)**

Through our project's endeavors, one of Missouri's minority owned banks extended its interest in lending through the FSA Guaranteed Program, to more African-American farmers in the Bootheel. Our farmers were made aware of this lending opportunity and consider this source crucial for options in agricultural lending. Through a meeting with Lincoln University, Gateway National Bank, and the USDA Office of Outreach Review Team, new ideas and opportunities were spawned with Rural Development programs and Lincoln University Cooperative Extension that will bring new rural housing and value added agriculture opportunities to Southeast Missouri.

Project staff serves as advisory committee members to a collaborative-formed woman's agricultural group. Outreach to this 60-member organization is targeted in the form of Lincoln University's position on the committee. Three presentations on LU Extension programs and outreach effort were given, as well as updates in the monthly meetings. The group now looks to LU for University Extension support and is made aware of the many programs available. Many women who participate are actually "operating" their farm including one member who became New Madrid County, "Farmer of the Year." Groundwork for a second Agri-women project is being developed by the Dunklin County NRCS staff.

Meetings with the faith-based "Adopt-A-Farm-Family" Coalition have opened opportunities to assist farm families with financial assistance and advise in areas of farming such as lending, tax information, legal matters and such. Project staff has a position on the board of the organization. In addition, farm families in need of "living monies" are referred to this group.

Our staff has successfully enriched our clients by bringing them together to attend conferences and workshops. Participation in the USDA Agricultural Marketing and Outreach Conference proved successful as a networking opportunity, as well as providing new information and programs for our farmers to bring home. USDA staff at the Memphis, Tennessee Farmers Conference commented on our farmer's awareness and education on agricultural issues, which lead to a local paper printing an article on LU's farmers.

Office of Outreach conducted a review of our project that proved successful and merited praise from the agency. The review team consisted of representatives from RD, FSA and NRCS. Through the review, successes were outlined that reflected on the project's initiation of the NRCS Vegetable Cooperative as well as our unique collaboration with Gateway National Bank.

## **GOAL 2: To provide a safe and secure food and fiber system**

Programs conducted under this goal addressed: Food Quality, Food Handling, Food Accessibility and Affordability.

Nine hundred thirty-two (932) home visits were conducted by nutrition paraprofessionals working in the six counties of southeastern Missouri (Bootheel). As a result of these home visits: 131 participants indicated that they practiced safe food handling practices more often than before the visits, including hand washing before handling food, refrigerating food promptly after meals, and keeping raw meats separate from other foods.

Ten (10) cooking classes were conducted in Jefferson City, Missouri, emphasizing the importance of eating fruits and vegetables and preparation of delicious low-fat, low-sugar meals and snacks. A sample of those attending volunteered that they would try these recipes at home and asked for copies to give to family members.

Twenty five (25) workshops and conferences were held on methods to develop a secure food and fiber system.

## **GOAL 3: To achieve a healthier, more well-nourished population**

Programs conducted under this goal addressed the following themes: Human Health and Human Nutrition.

Workshops on after school nutritious snacks and activities related to the Food Guide Pyramid were conducted with 88 youth in after school programs. In one program, the youth drew pictures depicting what they had learned. Most of the pictures indicated that they understood the importance of eating more fresh fruits and vegetables. When they have a chance to make these kinds of snacks themselves, youth are more likely to eat them.

The Food Stamp Nutrition Education Program (FSNEP) staff reached 124 adults through-group presentations. The groups consisted primarily of African Americans, ranging in age from 19 to 88, with an emphasis on grandparents raising or providing day care for grandchildren. It is important to work with this group because of their influence on the diets of the young children in

their care. In addition to home visits and the group presentations mentioned above, the FSNEP paraprofessionals staffed a booth at several health fairs and handed out relevant nutrition information as well as literature about the FF-NEWS program

In FY 2000, the Specialist presented talks on "Trends in the American Diet," "Health at Every Size," and "Cooking for Health." Participants volunteered that they found the information presented useful in helping them to make dietary changes.

There were 25 workshops given in the area of food and nutrition to 300 participants.

There were 300 fact sheets distributed.

One hundred fifty program participants demonstrate having the knowledge, skills and ability to be well nourished.

One hundred twenty-one program participants showed much progress with food preparation skills.

#### **GOAL 4: To achieve greater harmony between agriculture and the environment**

Programs conducted under this goal addressed the following key theme: Sustainable Agriculture.

Pastured poultry operation began in Neelyville, MO in June 1999. The Lincoln University Cooperative Extension marketing program, the small farm program, and the extension unit as a whole undertook this effort. The practice of pastured poultry, apart from its enhancement of the economic well being of the small farmer, prevents any adverse impacts that ongoing indoor mass production of chicken may have on the environment.

Within this fiscal year, the farmers have produced five batches of chickens totaling, approximately, 1,000 birds. A profit of \$4.00 is made per chicken weighing an average of 6 lbs.

#### **GOAL 5: To enhance economic opportunities and the quality of life between families and communities**

Programs conducted under this goal addressed the following key themes: Agricultural Financial Management, Impact Change on Rural Communities, and Supplemental Income Strategies, Children, Youth and Families at Risk, Communications Skills, Jobs/Employment, Leadership Training and Development, Promoting Business Programs, Workforce Preparation for Youth and Adults, and Youth Development/4-H.

The marketing programs were designed to improve the prices farmers were receiving for their farm products. These have proved successful and farmers are very happy to increase their share of the dollar that a consumer pays at the marketplace. With the prospect of increasing their

income, producers are eager to now expand production for economic sustainability on the farm. The areas of marketing include Internet auction sales of Missouri goats and community-assisted pastured poultry marketing.

Eight workshops were designed to provide development of careers and/or life skills. Participants gained knowledge and skills need to promote economic opportunity for the disadvantaged in Missouri. Output indicators indicated more than 300 youth and adults completing programs and providing feedback on the programs.

Seventy learners participated in Lifeskills workshops offered to FUTURE clientele.

Eighty clients participated with Weed and Seed's "Never Too Late" workshop designed to increase self-esteem and encourage effective parenting.

Bootheel youth participated in 121 workshops in the area, and across the state designed to provide career development and Lifeskills including self-esteem, alcohol and drug prevention, sexual abstinence, conflict resolution, decision making, etc.

More than 6,955 program contacts were made to 1500 youth and families.

Forty youth participants learned that jail is not a place that they would want to ever go.

One thousand five hundred youth learned that abstinence and safe sex are ways to prevent unwanted pregnancy and STDs.

One thousand five hundred youth and adults acquired knowledge about the negative impact of alcohol and drug usage.

Fifty eight youth and adult participants acquired knowledge relating to business development and entrepreneurship.

One thousand youth were exposed to college and career exploration workshops.

Eleven youth acquired hands on experience in gardening.

### **Accomplishments for the Community Development Program (CDC)**

Selection of an Advisory Board.

Obtained 501 C (3) Status.

Conducted Needs Assessment and Development of a 5-year strategy plan.

Identified potential jobs and organize training to match jobs.

Eight (8) residents received their "Lead Abatement" license from the State of Missouri; several loan applications; have been made by qualified homeowners in Hayti Heights through the Partnership of the CDC, the Home Loan Mortgage Corporation (HLMC) and the City of Hayti Heights.

Project pending implementation included the establishment of a local office of HLMC, thereby creating jobs in Hayti Heights.

Worked with North Lilbourn community to provide residents with affordable housing.

### **Missouri Institute on Minority Aging**

The Annual Missouri Institute on Minority Aging is a cooperative agreement between the Missouri Department of Social Services, Division of Aging (DA); Department of Health, Office of Minority Health (DOH); Department of Mental Health (DMH); Office of Administration, Office of Equal Employment Opportunity (OA); and Lincoln University of Missouri (LU). The Minority Institute is in the form of a conference consisting of educational workshops, speakers, and programs focused on minority aging and health issues. In 2000, more than 200 state and local agency professionals in the fields of aging and health; academic professionals with a focus on aging and health-related topics; and aging consumers received training by minority health professionals and Lincoln University Cooperative Extension specialists. The majority (63)% of participants were social workers from the Division of Aging and represented 35 counties in the state. Workshop topics included diversity training; improving diabetes care for seniors and high-risk populations; race, age, and the 2000 census; chronic disease issues and challenges for minority elderly populations in Missouri; outreach with diverse populations and groups; dental care for minority aging populations; and, how senior centers can help minority aging populations.

As a result of attending the Lincoln University Cooperative Extension sponsored training, 90% of participants reported feeling that the Minority Institute extended their knowledge of the social, economic and health issues impacting older minority individuals, as well as resources available in the state for older minorities. The knowledge gained by participants has the potential to improve the delivery of health care services and/or improve the quality of life for minority older individuals. In every workshop, more than 75% of participants reported that the content of the workshop provided them with information helpful to their work. Comments such as "I will go back home with more good news to share" and "I learned something that I can take back to my city" were common in evaluations.

In addition, the Minority Institute impacted the racial attitudes of the participants. The great majority of participants (85%) reported that the diversity training was helpful to their current work and report feeling more knowledgeable of ways to communicate with different cultures. The potential to change racial attitudes is reflected in the following comment made by a participant: "I'm on the diversity training committee at work and also supervise a team of African American staff. It has been a confrontation between what I believe and what I do. The (diversity

training) really helped me to understand where my /our difficulties in communicating arise. I will share the information with a lot of people."

## **COMPUTER LITERACY AND ENTREPRENEURIAL TRAINING PROJECT**

A cooperative agreement between Lincoln University Cooperative Extension's Missouri Center on Minority Health and Aging and the Missouri Department of Social Services, Division of Family Services makes it possible to build human capital resources by providing computer literacy and entrepreneurial training to TANF recipients, underemployed and unemployed persons in Cole County. Low-income, single mothers, and African American males are key audiences targeted by this program.

In 2000, more than 120 individuals from Cole County received computer literacy training by Lincoln University Cooperative Extension staff. Approximately half the individuals served are unemployed while an additional 40% are under employed. African-Americans represent 40% of those who are considered under employed.

The computer literacy training is a ten-week course and covers introductory lessons on Microsoft Office and its applications. An additional 33 individuals received entrepreneurial training. Of those served, the majority is female and one third are African American.

Over (100) individuals thus far have completed the ten-week computer literacy training and earned a certificate of completion. As a result of attending the Lincoln University Cooperative Extension sponsored training, limited resource individuals have gained relevant job skills and vocational training in computers. Specific skills have been gained in Microsoft Office word-processing, databases, and navigating the worldwide web. Participants report feeling more confident using computers, as well as interest in attending more training. The course also has the potential of increasing self-confidence of welfare-to-work participants, as expressed in the following statement submitted with evaluations: "You all have helped me so much and I'm proud of myself thanks to you." Three (3) individuals who completed the entrepreneurial training wrote a business plan and were successful in starting their own business.

### **Youth at Risk**

Over 350 youth-at-risk and underserved adults participated in the National Youth Entrepreneur Symposium hosted by Lincoln University and held in St. Louis this program year. Youth learned the knowledge and skills needed to be a success in business. They participated in over 18 workshops, skill development seminars, model programs, business exhibits, panel presentations, mentoring programs, and hands-on practical experience.

During the 2000-2001 program year, the focus of the parenting education efforts was to support a Father's Rites of Passage program in St. Louis, Missouri. Approximately 45 fathers participated in parenting programs provided by Lincoln University through a partnership with the Urban

Male Resource Center.

Two hundred (200) youth ages 5-16 participated in 46 sustained educational non-school hour programs in public housing and Juvenile Detention.

Thirty-two (32) youth gained knowledge in food safety and the prevention of food borne illnesses

Four (4) youth gained leadership skills, serving in youth leadership roles.

Twelve (12) youth gained skills and knowledge in understanding the differences between love and infatuation. This is a critical step in the reduction of teen pregnancy.

### **Lincoln University Region, School-to-Careers**

Lincoln University Region School-to-Careers Coordinator continues to work with the 36 school districts within the designated eight county region. Much of the work for the 2000 fiscal year has been orienting many of the schools to the benefits of the School-to-Careers program.

Programs continue to be offered to schools within the Lincoln University Region. The most popular program in 2000 was the collaboration between Lincoln University and Linn State Technical College who provided educators the opportunity to participate in teacher internships. Approximately 59 educators participated in this program. Educators are offered a \$1,000.00 stipend and college credit for this internship. Educators are then required to submit lesson plans detailing how they will implement what they learned while completing the internship. This lesson plan is utilized in the classroom to allow students the opportunity to learn from actual work experience.

Job Shadowing has been another popular activity for students to gain hands on information as to how their schoolwork applies in the field of work. On February 2, 2000 there were 706 students who were hosted by 328 businesses within the Lincoln University Region School-to-Careers program.

The Lincoln University Region has also had the opportunity to support professional development for teachers within the region. Most recently the Lincoln University Region sponsored a speaker to attend the Jefferson City Public Schools Staff Development Day. In an effort to provide teachers with strategies to support students at risk of failure, programs were conducted that address youth at risk issues.

# 1890 Cooperative Research Programs Lincoln University

*Jefferson City, Missouri*

## Annual Report of Accomplishments and Results

The 1999-2000 research program at Lincoln University focused on four main areas: animal science, crop science, human nutrition, natural resources and agricultural economics. The 1999 Plan of Work approved projects addressed the following broad national goals adopted by the National Agricultural Research, Extension, Education, and Economics Advisory Board:

Goal 1: An agricultural system that is highly competitive in the global economy.

Goal 3: A healthy, well-nourished population

Goal 4: An agricultural system which protects natural resources and the environment.

All but two of the projects reported here reached their five year completion dates in 1999 and 2000. The remaining two will end September 30, 2001. A revised five year plan of work follows this report.

### **Goal 1: An agricultural system that is highly competitive in the global economy**

Research conducted under this goal addressed the following key themes: Agricultural Profitability; Animal Health; Animal Production Efficiency Plant Production Efficiency, Aquaculture and Small Farm Viability.

At least five manuscripts have been published in professional journals related to this goal area.

#### ***MOX-OC94-610* Fungicide and Soil Interaction Effects on Plant Growth and Development**

#### Accomplishments and Results

The influence of fungicides on soil microbes and plant growth was evaluated in experiments conducted from 1994 to 1999. It was found that certain fungicides reduce the Biodiversity (i.e., reduce the number of different types) of microbial populations in the rhizosphere (i.e. the soil close to the roots of plants). In addition to reducing the diversity of soil microbes, the percentage and number of phytotoxic microbes, primarily bacteria, increase with the use of certain fungicides. Phytotoxic microbes may have the potential to inhibit normal growth and

development. These non-target effects of these fungicides strongly suggest that there may be major concerns with the repeated and continuous use of pesticides that can alter soil microbial populations, especially if these prove to be long-term effects. This work also gives possible explanations for reduced productivity reported in tropical and subtropical crops where pesticides are applied year round. While fungicides are designed to target specific pathogens, their impact on microbial communities may have unexpected consequences. This work indicates the need for not only evaluating pesticides for the efficacy to control target pests, but also their other effects on the environment, especially soil microbial communities.

## **MOX-OC94-611 Sweet Potato Production in Central and Southeast Missouri**

### **Accomplishments and Results**

Field plots were established in Southeast Missouri to investigate the effects of soil applied nitrogen fertilizer, irrigation and time of harvest on sweet potato (*Ipomea batatas*) growth and development. Four rates of urea fertilizer, five irrigation periods and five sweet potato varieties were arranged in a completely randomized split-split-split plot design at Lilbourn, Missouri. Sweet potatoes were transplanted on or about May 15 of each year of the study. Plant samples were taken at 90 and 120 days of growth. Field data collected included rainfall air temperature, soil temperature, soil moisture, leaf area, and fresh weight of vines and roots. Root and vine dry matter, percent leaf nitrogen, marketable root yield and number of roots were determined in the laboratory. Total amount of water supplied during each period of irrigation was measured. Data preparation and statistical analyses are underway at this time.

### **Overall Program Impact**

This research investigation was conducted on a farm site owned by the Delmo Cooperation in Southeast Missouri. It not only provided an opportunity to collect information of value to producers and consumers, it also served as an education resource and demonstration for people in the surrounding communities. We are aware that at least one farmer decided to grow sweet potato crops as a result of his exposure to this research. The Cooperative Extension Service often used the site for demonstration. The Principal Investigator conducted numerous

tours of the site for different groups during the course of the study. Upon completion of the data analyses, we will be able to provide farmers and extension personnel with better information on management practices, yield expectations, water use efficiency and product quality. The sweet potato is more attractive as a crop to the small-scale farmer than the large-scale farmer.

### **MOX-OC95-612 Influence of Farming Systems on Selected Soil Quality Parameters**

#### **Accomplishments and Results**

Experiments were repeated for 3 years (1996-1999) at Lincoln University Carver Memorial Farm using silty clay loam soil to study the influence of different herbicides, in combination with tillage systems, on soil quality parameters. Soybean and corn cultivars commonly used in central Missouri were planted and were treated with pre- and post-emergence herbicides during the growing season. Selected chemical and microbiological characteristics of soil samples taken from experimental plots were measured. There was consistent decrease in soil pH with depth but no significant change due to tillage or herbicide applications. However, results indicated significant reduced activity for several important soil enzymes (glucosidases, phosphatases, urease, and sulfatase). Our findings complemented studies by other researchers in using soil enzyme activities as an index to monitor soil quality in relation to pesticide pollution of soils.

### **MOX-OC97-613 Improving Seedling Performance of Warm Season Vegetables at Low Temperatures**

Project MOX-OC97-613, Improving Seeding Performance of Warm Season Vegetables at Low Temperatures was completed on December 31, 1999 and the accomplishments as outlined in the AD-421 termination report were as follows.

Tissue culture studies were conducted with two warm season vegetables to facilitate their improvement. Cotyledons of young cowpea (*Vigna unguiculata*) embryos from four genotypes were tested for their ability to produce somatic embryos. Several media combinations using 2, 4-dichlorophenoxyacetic acid (2,4-D) and Murashige and Skoog basal salt mixture (MS) with B5 vitamins were tested. The cotyledons produced shoots and several somatic embryos following subculture. Most of the embryos were at the globular stage and did not mature. Other cultures of cotyledons of mature seeds grown on Gamborgs medium with benzylaminopurine produced shoots. Globular somatic embryos were produced from okra (*Abelmoschus esculentus*)

cotyledons and hypocotyls cultured on MS with 2,4-D. Cowpea genotypes evaluated at 14/10<sup>0</sup>C, 15/10<sup>0</sup>C and 16/10<sup>0</sup>C, day/night temperatures varied in seed germination and seedling characteristics.

### **Overall Program Impact**

This project provided information to facilitate the improvement of seedling performance at unfavorable chilling temperatures.

*MOX-OP96-416* Effect of Chlortetracycline on Postpartum Fertility & Pregnancy Rate in Early Postpartum Ewe

### **Accomplishments and Results**

Reproductive efficiency is a problem in small ruminants. To achieve two lamb crops per year the ewe must be bred within thirty-five days after lambing. When ewes are bred naturally before thirty-five days postpartum fertility and lambing rates are very low. However, when day 32 postpartum ewes are intrauterine inseminated, fertility rate increased to 60% thus demonstrating other factors adversely affect sperm transport when the day 32 postpartum ewe is bred naturally. Research at Lincoln University has shown that fertility increases as the length of the postpartum interval increases. Decreasing the postpartum interval will provide the small ruminant producer an opportunity to increase production in a shorter period of time.

Recently, it has been demonstrated that feeding chlortetracycline (CTC) to beef heifers with reproductive-tract infections (1.1 mg/kg/day) for 30 days prior to the breeding season or to beef cows (.5g/head/day) starting at 42 days postpartum for 14 days resulted in an increased pregnancy rate. Sows that were fed low levels (.4 g/day) of CTC from 1 week before the initiation of the breeding season to 15 days after the breeding season and high levels (1.2 g/day) of CTC from 110 days of gestation through lactation improved overall reproductive performance. Feeding CTC seems to improve reproductive performance in other species, but it is not known what effect CTC has on fertility and pregnancy when fed to small ruminants during the first twenty days postpartum. The objectives of the following experiments were to determine the effect of chlortetracycline (CTC) on fertilization rate (Experiment 1) and embryo survival in the early postpartum uterus of ewes (Experiment 2). Postpartum ewes were divided into the following treatments: 1) fed a grain ration without CTC (controls); and 2) fed CTC (500 mg/animal/day) six weeks prior to lambing until day 22 postpartum. Ewes received a vaginal sponge (40 mg of progesterone) on day 9 postpartum . Nine days after receiving vaginal sponges, they were removed and ewes were given an injection of 750 IU PMSG to induce estrus. Ewes were checked for estrus twice daily beginning 36 hours after PMSG injection. At estrus or 48 hrs post PMSG injection, ewes were inseminated with .2 ml of mixed semen, collected from two rams, into the tip of the uterine horns. Two days post estrus or 4 days post PMSG injection, ewes were laparotomized and oviduct(s) on the side of ovulation were flushed for ova recovery. Ova were recovered from 84% of CTC ewes (n=56) and 75% from the controls (n=60). Of the ewes from which ova were recovered (CTC= 47; controls= 45), 72% of CTC ewes had fertilized ova (P<.05) compared to 31% of control ewes. In Experiment 2, thirty-two ewes were divided

equally into the same treatments as in Experiment 1. Twenty-five days post insemination, ewes were checked for pregnancy with an ultrasonic scanning monitor. Ewes were allowed to go to term. The percentage of CTC ewes (50%) that were pregnant at day 25 post insemination was not different ( $P>.05$ ) from controls (33%). By day 30 post insemination none of the ewes maintained their pregnancy. These data suggest that fertilization rate is improved in ewes on postpartum day 20 by feeding CTC during late gestation and early lactation and CTC had little effect on embryonic survival in the early postpartum uterus.

### **Overall Program Impact**

Fertilization rate of the early postpartum ewe can be increased by feeding chlortetracycline, but the number of pregnant early postpartum ewes still remains low. Determining different mechanisms or factors involved with fertility and pregnancy in the early postpartum small ruminant will provide ways to increase reproduction. This will allow the producer to increase their production by having

## **MOX-OP97-417 Activation and Atresia of Primordial Follicles**

### **Accomplishments and Results**

Improved understanding of the early stages of follicular growth would allow more effective utilization of the approximately 100,000 oocytes found in a single ovary of mature cows. Current technology allows use of only a fraction of these oocytes which impedes rapid genetic improvement by exceptional females. Development of *in vitro* techniques to manipulate growth of these follicles has been disappointing, with the majority of primordial follicles disappearing and few follicles progressing beyond the primary stage of development. The hypothesis tested this year was that ovaries could be removed from heifers and transplanted into SCID mice, for continued development. Successful transplantation of ovaries into mice would also allow examination of bromodeoxyuridine (BrdU) uptake into granulosa cells of follicles. BrdU could then be used to determine how long follicles remain in early stages prior to growth.

Ovaries were successfully transplanted and were healthy for the 28 days that they remained in the SCID mice. However, results were disappointing because essentially all primordial follicles disappeared by the end of the transplantation period. The majority of follicles remaining in the ovarian sections were early primary (a mixture of squamous and cuboidal granulosa cells in a single layer) and primary (only cuboidal granulosa cells in a single layer). It was promising that the remaining follicles continued to grow following transplantation and some advanced as far as the secondary follicle stage. The surviving small follicles (early primary and primary) were healthy and showed growth and division of granulosa cells as measured by incorporation of BrdU into the DNA. In conclusion, these results demonstrate that ovarian sections can be transplanted successfully under the kidney capsule and follicles will continue to grow. However, due to loss of primordial follicles, and the expense of purchasing and maintaining SCID mice, alternative methods for study of small follicles in bovines should be pursued.

## **Overall Program Impact**

It was demonstrated that there continues to be significant technical barriers that must be eliminated before it is possible to successfully manipulate the 100,000+ small follicles contained in ovaries of cattle. Once a procedure is successfully developed, oocytes can be matured in vitro, fertilized with the appropriate semen, then stored frozen until used. This provides a method that limited resource individuals can upgrade the genetics of their herd.

*MOX-OP92-803* Establishing a Research Support Capacity at Lincoln for Missouri Aquaculture Producers

### **Accomplishments and Results**

*Current Situation:* Missouri leads the north central region of the United States in sales of fish. Currently, however, there is no formalized aquacultural research program within the state. There is tremendous potential for expansion of this industry in Missouri. The reasons include the central location of Missouri within the United States and the fact that the state is a major site for aquacultural production. There are also fewer legislative restrictions in Missouri than in other states.

The objective of this project is to build capacity to conduct aquaculture research at Lincoln University. The project involves surveying production problems; conducting on-farm evaluation of bird and mammal predation problems and determining effects of federal and state policy issues related to aquaculture.

A survey instrument was developed and sent to eighty-four aquaculture producers in the state. At this point forty-six have been returned and entered into a database. A statistical analysis has been completed. The survey results indicated that 79% of aquaculture producers had problems with bird depredation and 66% had problems with mammal depredation. State fish hatcheries were also surveyed and showed that 100% of the hatcheries had problems with bird or mammal depredation. At this time eleven private producers have gone out of business in the past three years.

All state and federal regulations effecting aquaculture producers have been reviewed. The number of agencies and sub-agencies alone give reason for confusion. There are also county and local regulations that effect aquaculture farmers. All of these areas need to be addressed and controlled, however, compliance with all the regulations can be costly, time consuming, and distracting to the typical aquaculture farmer.

A document of the policies, regulations, and permits pertaining to aquaculture farmers in Missouri has been developed along with a flowchart to assist farmers in understanding their obligations concerning federal and state regulations. The documents and flowchart allows for assistance on any individual aquaculture farm in Missouri. Publication of this information will be

very helpful to our clientele.

### **Goal 3: A healthy, well-nourished population**

Research conducted under this goal addressed the key themes of Human Health and Nutrition.

Two manuscripts have been published in professional journals and seven professional presentations related to this goal area have been made. One presentation will be made on April 2, 2001 at the annual Experimental Biology Conference in Orlando Florida.

#### **MOX-OH98-528 Dietary Fat, Antioxidants and Lipid Peroxidation**

##### **Accomplishments and Results**

The effects of dietary fats and antioxidants on blood pressure and plasma lipids were investigated in spontaneously hypertensive rat model. Animals were fed diets containing 10% fish oil or 10% beef tallow with three different antioxidant levels. The control diets (both fish oil and beef tallow diets) contained 50 mg vitamin E and 2 mg beta carotene per kg. The medium antioxidant diets contained 400 mg vitamin E, 200 mg vitamin C and 200 mg beta-carotene per kg. The high antioxidant diets contained 800 mg vitamin E, 400 mg vitamin C and 400 mg beta-carotene per kg. Diets and water were provided ad libitum for 12 weeks. Increases in systolic blood pressure significantly attenuated in rats fed the fish oil diets as compared with rats fed beef tallow diets. Dietary antioxidant supplementation reduced blood pressure only in rats fed the fish oil diets. Plasma triglycerides, total cholesterol and HDL-cholesterol were significantly reduced in rats fed the fish oil diets as compared with rats fed the beef tallow diets. Dietary antioxidant supplementation did not affect plasma lipid levels. It is concluded that dietary fish oil is effective in lowering blood pressure and plasma lipids. Dietary antioxidants appears to enhance the hypotensive effects of fish oil.

##### **Overall Program Impact**

Essential hypertension is a major health problem in the United States, affecting more than 23 million adult Americans. It is of particular concern to certain minority population such as African-American. It is estimated that one-third of the African-American adults have high blood pressure.

The information generated from the hypertension project can be used for diet modification to prevent development of hypertension in people at high risk and can be applicable as an adjunctive therapy for hypertension because of their safety and considerable economic savings.

#### **MOX-OH97-525 Dietary Protein Restriction, Running Activity, and the Development of Obesity**

##### **Accomplishments and Results**

The primary focus of this project was to examine how diet composition influences voluntary running activity in obese and non-obese animal models. The study confirmed our previous work demonstrating that reduced protein intake blocked development of obesity in an obese animal model, the hypothalamic obese rat. The results suggested that this was not due to increased physical activity in this obese animal model. In contrast, dietary protein restriction caused increased running activity in non-obese rats and the results indicated that this response was gender specific, occurring in males but not in females. These results suggested that energy balance responses to different dietary protein levels is gender specific, and that different dietary recommendations for weight reduction and prevention of obesity and other eating disorders may be necessary for males and females.

### **Key Program Components**

- The influence of diet on energy metabolism, obesity and eating disorders.
- The influence of diet-induced obesity on hypertension.
- The influence of antioxidants on lipid peroxidation.
- The influence of vitamin A and carotenoids on health of minority populations.
- The influence of fat intake on health of elderly.

### **Overall Program Impact**

Results of this study have identified dietary factors involved in development of obesity and will contribute to dietary recommendations for prevention and treatment of obesity. Reduced incidence of obesity in the United States will reduce total economic costs and direct medical costs associated with obesity-related chronic health problems such as hypertension, type II diabetes, and cardiovascular diseases. Currently, these annual costs are \$99.2 billion and \$51.6 billion, respectively.

## **MOX-OH97-527 Development of Culturally-Sensitive Carotenoid Database for African Americans**

### **Statement of Issue(s):**

The higher incidence of mortality rates for cancer in African Americans than in white Americans or members of other minority groups have been well documented. Despite the higher risks of dying from cancer, few data on diet and cancer in African Americans are available. Carotenoids in dark green and yellow fruits and vegetables have shown health benefits to humans by inhibiting cancer development. Using the database developed by this project should provide a better understanding of the role of carotenoids in cancer development in African Americans.

### **Objectives**

1. To explore traditional African American diet and food practices through focus group interview.
2. To analyze carotenoids in foods which are unique to African Americans and lacking reliable data in the USDA carotenoid database.

### **Accomplishments and Results**

The purpose of this project was to develop a culturally-sensitive carotenoid database containing specific entries for traditional foods consumed by African Americans. The USDA-NCI Carotenoid Database was used as a blueprint. Data of the focus group in Southeast Missouri showed that greens, corn, tomatoes, cabbage, and green bean were the most frequently mentioned vegetables. A survey of the fruit and vegetable consumption pattern of 58 African Americans living in the Bootheel and St. Louise areas of Missouri was conducted. Preliminary analysis of the survey data indicated that mustard greens, turnip greens, collards, green beans, baked beans, corn, tomatoes, fried and baked potatoes, mixed vegetables, and green salad were the frequently consumed vegetables. Bananas, apples, oranges, and watermelon (in season) were the frequently consumed fruits. Berries (except strawberries) such as blueberries, blackberries, raspberries were seldom consumed. Spinach, alfalfa sprouts, cauliflower, and brussels sprouts were those vegetable seldom consumed. These preliminary findings shed some lights about the fruit and vegetable consumption patterns of African American in Missouri.

### **Key Program Components**

The USDA-NCI Carotenoid Database developed by the USDA Human Nutrition Research Center at Beltsville; minority groups, the elderly, low income populations, and other under-represented populations.

### **Overall Program Impact**

Results from this study provided valuable information for developing more effective intervention programs that promote healthy dietary habits and reduce risks of cancer development.

## **Goal 4: An Agricultural system which protects natural resources and the environment.**

Research conducted under this goal addressed the key theme of nutrient management. Three professional presentations related to this goal have been made.

### **MOX-OP98-418 Nitrogen & Phosphorus Excretion in Growing Pigs: Effect of Phase Feeding Fiber & Phytase**

#### **Accomplishments and Results**

A study involving three week-old pigs (n= 84) was conducted to evaluate the efficacy of intrinsic phytase (IP) enzyme from wheat middlings, and the combined effects of phytase, dietary fiber, and phase-feeding of dietary proteins on fecal ammonia (NH<sub>3</sub>), and volatile fatty acids (VFA) emission, and weight gain of growing pigs. The pigs were housed in groups of 7/pen, with dietary treatments randomly assigned to pens (3 pens/diet) with pens serving as experimental units. The diets used were: corn soybean meal-based control diet (D1), D1 plus microbial phytase (MP; Natuphos, 1,200 PU/g; D2), D1 plus intrinsic phytase (IP; D3), and IP and MP combination (D-4). The diets were also designated as low (1 and 2), or high (3 and 4) fiber diets. Feed was offered once/d on a regular (D1, D3) or, phase-fed (D2, D4) basis with free access to water. Individual pig weight, and pen feed consumption were measured weekly. Fecal samples collected from each pen were used for VFA, and NH<sub>3</sub> analysis. Results from the study indicated that pigs that were fed diets containing phytase enzyme consumed more feed (P< .05), gained faster (P<.05), and were more efficient (14.5%) than the pigs that were fed control diet. Total, and individual VFA in feces from pigs fed low fiber diets were higher (P<.05) than with high fiber diet fed pigs. Concentration of NH<sub>3</sub> in feces from pigs fed low fiber diets was higher (47.6%; P<.05) than in feces from pigs fed high fiber diets. However, the level of NH<sub>3</sub> within each fiber category was not affected by the treatment. Microbial phytase supplement of the corn soybean meal-based diets (2.5 kg/ton), or substituting 25% wheat middlings for an equal part corn in the corn soybean meal-based diet resulted in improved feed intake, feed efficiency, and growth performance of pigs, and significantly reduced the concentrations of ammonia, and VFA in feces.

#### **Overall Program Impact**

Knowledge concerning hind-gut fermentation in pigs is relatively scarce and most of what is know today is extrapolated from ruminant animals. Also, in the face of the ever growing public concern regarding swine odors, the fermentation processes in the hindgut especially when non-conventional feedstuffs are fed, or when feedstuffs are manipulated to improve efficiency, need to be thoroughly investigated.

Substituting 25% of the corn in the corn soybean meal-based diet of growing pigs with wheat middlings did not adversely affect feed intake, or feed efficiency of pigs but average daily weight gain was significantly reduced. The mechanism for the improved feed intake and feed efficiency is not clear. However, the increased availability of phytate bound calcium and phosphorus from the diet, and the potential for the development and maintenance of a healthier gut tissue that may have resulted from the inclusion of fiber in the diet, and the consequential improvement of nutrient absorption by the wheat middling fed pigs may have contributed to the improvement. Results from the study suggest that the comparable animal performance observed between phytase supplemented low-fiber, and high-fiber diet fed pigs may have been the result of the additional intrinsic phytase from wheat middlings, which may have contributed to the improved fermentation capacity of the microorganisms in the hindgut and the overall growth performance of the pigs. The results of our trial have also clearly indicated that ammonia (NH<sub>3</sub>), and volatile fatty acids (VFA) emission in feces from pigs fed 25% wheat middling was significantly reduced. This may not only indicate a degree of improved nutrient utilization by pigs but a significant reduction of the potential odor producing organic compounds in feces. Therefore, partial substitution of the diet of growing pigs with wheat middling can reduce production of organic compounds generally associated with swine odor but weight gain of pigs will be reduced if the energy value of the diet is not increased. Wheat middlings is a relatively cheap feed ingredient, and the improvement in N and P utilization, as reported in earlier studies, and the superior growth performance of pigs fed diets supplemented with 25% wheat middlings with/without microbial phytase in the current study may serve as an economic incentive to include it in the diet of growing pigs. However, more research is needed to define the optimum levels of wheat middlings that can be included in the diet of growing pigs.