

PROJECT ACTIVITY NUMBER: NCR-206

DURATION: October 1, 2003 through September 30, 2008

TITLE: Nutrition and Management of Feedlot Cattle to Optimize Performance, Carcass Value and Environmental Compatibility

STATEMENT OF ISSUE AND JUSTIFICATION

An NCR committee dedicated to nutritional and pre-harvest management issues of cattle feeding will focus research efforts and disseminate information in service to a key component of the beef cattle industry. Cattle feeding in the North Central Region contributes significantly to the agricultural economy in the U.S. The states represented by this committee account for 60% of cattle on feed and 45% of feeder cattle in the U.S. (1). The revenues from the sale of cattle in these states represent a billion dollar industry, and in many cases is the major agricultural commodity in the state.

This committee is unique among NC and NCR committees in directing research interests toward beef cattle nutrition issues facing the U.S. cattle feeding industry. The major focus of this committee will be the development of nutritional and management strategies that address current issues facing the cattle feeding industry, such as environmental compatibility, beef quality and safety, and economic sustainability. This focus clearly distinguishes the research efforts of this group from other NC or NCR committees in which scientists are focused on dairy production, utilization of animal manure and organic residues, grazing systems, cow-calf management, and molecular mechanisms regulating growth of muscle and adipose tissue. The research goals of this committee are supportive of all five research goals of CSREES.

The committee has and will continue to work diligently to discover, disseminate, and implement technology that improves efficiency of producing beef as well as enhancing the quality of beef. A purpose of this committee will be to promote scientific exchange, stimulate cooperation and collaboration among scientists at different institutions, and to minimize duplication of research effort.

A major focus will be the development of management strategies that facilitate production of beef in an environmentally sustainable manner. One approach will be to improve the utilization of by-product feeds in diets for feeder cattle in order to allow a potential waste product to be recovered in edible, high quality protein foods. The feedlot industry is the major utilizer of byproducts from the food and grain processing industries, which are abundant in the North Central region. Optimizing capture of the nutrients from the byproducts of these industries has important environmental and economic implications(2,3). This is particularly true in light of the proliferation of ethanol production facilities in this region. The second approach in this realm will be to conduct beef cattle nutrition and management research to limit N and P losses to the environment(4,5). New EPA regulations and societal concerns regarding the impact of confinement of livestock on the environment provide ample justification of our research thrust in this area.

Coordinated research also will be planned to investigate effects of nutrition and pre-harvest management on the quality and safety of beef. Maintenance of a safe and wholesome food supply continues to be a major challenge in the U.S. The presence of *E. coli* 0157:H7 in feedlot cattle and on beef carcasses continues to contribute to safety concerns(6). Alternative feeding programs will be evaluated as a means of controlling pathogenic microorganisms, like *E. Coli* 0157:H7. Other food safety issues such as the use of genetically modified grains by beef cattle will be investigated. Likewise, research will target enhancement of important beef quality issues such as tenderness and marbling(7).

This committee will plan and conduct beef cattle nutrition and management research to enhance cattle health, well-being, performance and carcass value. These issues are critical to profitability as the industry moves to a value-based marketing system and the formation of alliances within the industry(8,9).

The beef industry continues to rely on the expertise of this committee to discover, develop and evaluate new technology prior to its adoption by the feedlot industry. In order to accomplish this task, it is critical that committee members meet annually to identify strengths and weaknesses of our knowledge of cattle feeding. Collaboration among members has and continues to develop new feeding programs to improve production efficiency, reduce the impact of confinement beef production on the environment, and to enhance beef quality and safety. The interaction of these committee members is crucial in conducting unbiased research projects for the benefits of the beef industry and consuming public.

LITERATURE CITED

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4. Galyean, M. L. 2000. Environmental stewardship in the future: Nutrient management issues and options for beef cattle feeding operations. Available at: <http://www.asas.org/jas/symposia/proceedings>.
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6. Hancock, D. D., T. E. Besser, and D. H. Rice. 1998. Ecology of *E. coli* 0157:H7 in cattle and impact of management practices. In: J. B. Kaper and A. D. O'Brien(ed.) *Escherichia coli* 0157-H7 and other shiga toxin-producing *E. coli* strains. P. 85. Am. Soc. Microbiol. Press, Washington, DC.
7. Montgomery, T. H., P. F. Dew, and M. S. Brown. 2001. Optimizing carcass value and the use of anabolic implants in beef cattle. *J. Anim. Sci.* 79:E296-306.
8. Mader, T. L. and K. F. Lechtenberg. 2000. Growth promoting systems for heifer calves and yearlings finished in the feedlot. *J. Anim. Sci.* 78:2485-2496.

9. Loerch, S. C. and F. L. Fluharty. 1999. Physiological changes and digestive capabilities of newly received feedlot cattle. *J. Anim. Sci.* 77:1113-1119.

OBJECTIVES

1. To discover and develop management strategies that facilitate feedlot cattle production in an environmentally and economically sustainable manner.
2. To enhance the quality and safety of beef through development and application of emerging technologies.
3. To investigate alternative feeding programs and management strategies to enhance cattle health, well-being, performance, and carcass value.

ACCOMPLISHMENTS OF THE PAST FIVE YEARS: See Appendix 1.

EXPECTED OUTCOMES AND IMPACTS

The development of technology and evaluation of feeding programs that improve efficiency and adds value to the finished product will strengthen this viable and important sector of agriculture. Since this committee uniquely represents the cattle feeding sector in the North Central Region, its members have a key role to play in developing feeding programs and new technology for the 21st century. Members of this committee have been and continue to be committed to addressing challenges facing the cattle feeding sector. In the past 20 years, the research stations represented by this committee have collectively made a commitment to discover, develop, and evaluate new technology utilized by the beef cattle industry. Past objectives contributing to important breakthroughs for the industry include optimal utilization of agricultural byproducts, alternative feeding programs that improve cattle health and meat quality, and development of new hormone implant strategies. Each of these management programs (and many other discoveries) has impacted the efficiency of producing beef and/or added value to the meat for the consumer. These efforts have and will continue to be achieved through the coordinated research planning and collaborations among members of this regional committee. Progress in accomplishing project objectives will be documented in committee minutes and reports and on our web page. Areas of assessment will be participation in committee meetings, quantity of collaborative research projects among committee members, quantity and impact of publications (particularly those resulting from collaborative efforts), and presentations of regional research findings at beef industry meetings. Coordinated and collaborative research projects will be conducted to achieve all three objectives of this committee. Discoveries will be documented in NCR Station Reports and other publications. Assessment of progress will be based on impact of research discoveries that: 1) reduce contribution of feedlots to N and P accumulation in soil water and air, 2) reduce food borne pathogens in beef through preharvest intervention and increase carcass value by manipulation growth processes to improve intramuscular fat accretion and retail yield, and 3) improve cattle health, reduce the need for antibiotics, enhance carcass value, and improve production efficiency and profitability. Stakeholders are beef producers, allied industry, and the scientific community.

INTERNAL AND EXTERNAL LINKAGES: See Appendix 2.

EDUCATIONAL PLAN

Members of the committee will have close working relationships with stakeholders in the commercial feed and feedlot industries through extension meetings, research publications, departmental reports, and our existing NCR Feedlot Cattle website. Our membership is very active in regional and national education activities. Half of our members have official extension appointments and all of our members are active in beef extension activities. The NCR Feedlot Cattle website provides public availability of our discoveries. Electronic exchange via our List Serve allows rapid response to industry problems through sharing of resources and expertise among committee members. We share our expertise and research findings in multi-state meetings, symposia, and short-courses. Through our relationships as members of this NCR committee, we have generated a significant track record of inter-state presentation of our research to universities, producers, and allied industry personnel. This effort will continue and will be documented..

GOVERNANCE: Standard

BUDGET: Travel expenses only

AUTHORIZATION:

NCA COMMITTEE REVIEW:

/s/ Administrative Advisor Recommending Approval:

/s/ Chair, NCRA

APPENDIX 1 – ACCOMPLISHMENTS OF THE PAST FIVE YEARS

In each of the past five years this committee has met in March (Midwest American Society of Animal Science Meetings) and in May to discuss plan, and coordinate research activities. Attendance and participation at these meetings has been excellent. Members from 11 states in the North Central Region and one member from the Western Region (Colorado) consistently attend the committee meetings. Additional members attend from Iowa and Ohio. In the past, guests from Intervet, Inc., Purina Mills, VetLife, Land 'O' Lakes/Farmland, Alpharma, Texas Tech Univ., and Oklahoma State Univ. have attended. There is ample evidence of previous planning and coordination of research and education activities. Several members of the committee have conducted collaborative studies on the nutritional management of early-weaned calves and its effect on performance and carcass characteristics. Members from 4 states (IN, OH, IL, and MI) conducted a joint study investigating the effect of ionophore type on performance of early-weaned calves. Committee members from IL and OH conducted a 3-year study investigating nutrient requirements of early-weaned calves. Several members of the committee (NE, OH) have coordinated research projects to reduce stress and enhance adaptation of calves to feedlot environment. The use of programmed gain feeding, supplemental Cr, and

vitamin E have been examined for their effects on performance and carcass characteristics of feedlot cattle. A number of institutions evaluated strategies that facilitate sustainable production of beef in an environmentally friendly manner. Other members of this committee (NE, MO) developed management strategies to overcome heat-stress in cattle. Several members of committee have coordinated research to evaluate the impact of implant strategies on performance and carcass characteristics of feedlot cattle in order to produce a product that is acceptable to consumers. Joint efforts were undertaken to develop a database of all current research that has been published on the use of implants. A website was created ([HTTP://idb.asft.ttu.edu](http://idb.asft.ttu.edu)) to summarize these data for public use. Members from Illinois and Wisconsin have worked together on the project evaluating the effects of prenatal androgenization on performance and carcass quality. Researchers from NE and IL have coordinated and are jointly publishing research on genetically modified corns for feedlot cattle. Members from NE and MO submitted a NRI proposal entitled “Dynamic responses of feedlot cattle exposed to cold stress” for funding in 2001-2003. A joint effort involving committee members from IN, IL, OH, and MI resulted in the successful funding of an IFAFS Proposal (5-State Beef Initiative). A website was created ([HTTP://www.exnet.iastate.edu/Pages/ansci/feedlot/ncr.html](http://www.exnet.iastate.edu/Pages/ansci/feedlot/ncr.html)) in order to inform scientists, consultants, and producers of the research and activities of this committee.

An e-mail list serve of committee members was created. This has facilitated communications among committee members throughout the year. This has been a successful method to achieve rapid scientific exchange and to enhance the timeliness and quality of response in regards to emerging issues facing the Beef Industry.

Members of this committee have generated a significant number of research publications on beef cattle nutrition and management during the past five years. Much of this effort was enhanced by the scientific critique, exchange and planning that occurred due to regional committee actions/activities.

APPENDIX 2 – INTERNAL AND EXTERNAL LINKAGES

Project Activity Number:

Title: Optimizing Nutrient Utilization by Feedlot Cattle for Growth Carcass Value and Environmental Concerns

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