ANIMAL SYSTEMS
(Formerly Animal Production and Animal Protection Portfolios)
PORTFOLIO INTERNAL ANNUAL REVIEW REPORT
2007

I. BACKGROUND

This report was developed by the Animal Systems team of the Plant and Animal Systems (PAS) in collaboration with the Office of Planning and Accountability of the Cooperative State Research, Education, and Extension Service (CSREES), U.S. Department of Agriculture (USDA). The document describes a wide variety of programs related to animal production and protection, which are operated and managed under the new Animal Systems portfolio. As recommended by the first Portfolio Review Expert Panel (PREP), the Animal Systems portfolio combines two formerly separate portfolios (Animal Production and Animal Protection) to better integrate mission-critical activities.

The Animal Systems portfolio is broad and reflects the mission of the agency as well as the needs of our partners and stakeholders. The portfolio encompasses basic and applied research, education, and extension activities across animal species and commodities. The products of these animals represent billions of dollars in farm-gate sales and several times that in retail sales.

The CSREES research, education, and extension portfolio for Animal Systems is defined and classified into Knowledge Areas (KAs): 301-308; 311-315; 721-722 (see titles below); and the extension programs that relate to and support those KAs. An important activity supported by the portfolio is the National Animal Health Laboratory Network. Animal Production and Protection, as defined, does not include KAs directly related to food safety, processing, storage, or marketing. However, the animal production portfolio indirectly supports and complements research, education, and extension programs included in those related KAs through interdisciplinary and collaborative efforts among university faculty, cooperating scientists, and educators.

- **The following primary knowledge areas (KAs) are included in the Animal Systems Portfolio:**
  - 301 REPRODUCTIVE PERFORMANCE OF ANIMALS
  - 302 NUTRIENT UTILIZATION IN ANIMALS
  - 303 GENETIC IMPROVEMENT OF ANIMALS
  - 304 ANIMAL GENOME
  - 305 ANIMAL PHYSIOLOGICAL PROCESSES
  - 306 ENVIRONMENTAL STRESS IN ANIMALS
  - 307 ANIMAL PRODUCTION MANAGEMENT SYSTEMS
  - 308 IMPROVED ANIMAL PRODUCTS (BEFORE HARVEST)
  - 311 ANIMAL DISEASES
  - 312 EXTERNAL PARASITES AND PESTS OF ANIMALS
  - 313 INTERNAL PARASITES IN ANIMALS
  - 314 TOXIC CHEMICALS, POISONOUS PLANTS AND NATURALLY OCCURRING TOXINS AND OTHER HAZARDS AFFECTING ANIMALS

- 315 ANIMAL WELFARE, WELL-BEING, AND PROTECTION
- 721 INSECTS AND OTHER PESTS
- 722 ZOONOTIC DISEASES AND PARASITES AFFECTING HUMANS

- **The following secondary knowledge areas (KAs) are included in the Animal Systems Portfolio to show linkages to topics primarily assessed in other portfolios:**
  - 501 NEW AND IMPROVED FOOD PROCESSING TECHNOLOGIES
  - 503 NEW AND IMPROVED FOOD PRODUCTS
  - 711 ENSURE FOOD PRODUCTS FREE OF HARMFUL CHEMICALS, INCLUDING RESIDUES FROM AGRICULTURAL AND OTHER SOURCES
  - 712 PROTECT FOOD FROM CONTAMINATION BY PATHOGENIC MICROOGANISMS, PARASITES, AND NATURALLY OCCURING TOXINS

- **Portfolio reviews:**

External Reviews:
2004 (Animal Production)
2005 (Animal Protection)

Internal Reviews:
2006 (Animal Production)
2006 (Animal Protection)

- **Portfolio score from the PREP in 2004:**

81 Animal Production
95 Animal Protection

Since the new Animal Systems portfolio is comprised of the former Animal Production and Animal Protection porfolios, which were assessed previously as separate portfolios, the following table shows the separate scores for the Animal Production and Protection portfolios as well as Animal Systems scores.

Criteria	**Panel Score**		**2006 Score**		**2007 Score**
	Production	**Protection**	**Production**	**Protection**	**Animal Systems**
Relevance					
1. Scope	(3)	(3)	(3)	(3)	3
2. Focus	(3)	(3)	(3)	(3)	3
3. Emerging Issues	(3)	(3)	(3)	(3)	3
4. Integration	(1)	(2)	(2)	(2)	2
5. Multi-disciplinary	(2)	(3)	(2)	(3)	3
Quality					
1. Significance	(2)	(3)	(2)	(3)	2.5
2. Stakeholder	(3)	(2)	(3)	(2.5)	3

3. Alignment	(3)	(3)	(3)	(3)	3
4. Methodology	(2)	(3)	(2)	(3)	3
Performance					
1. Productivity	(2)	(3)	(2)	(3)	2.5
2. Comprehensiveness	(2)	(3)	(2)	(3)	2.5
3. Timeliness	(2)	(3)	(2)	(3)	3
4. Agency guidance	( )	(3)	(2)	(3)	2.5
5. Accountability	(2)	(2)	(2)	(2)	2
Overall score	**81**	**95**	**82**	**96**	**93**

II. CSREES RESPONSE TO PREP RECOMMENDATIONS THAT CROSS ALL PORTFOLIOS

In response to directives from the Office of Management and Budget (OMB) of the President, CSREES implemented the Portfolio Review Expert Panel (PREP) process to systematically review its progress in achieving its mission. Since this process began in 2003, fourteen expert review panels have been convened and each has published a report offering recommendations and guidance. These external reviews occur on a rolling five-year basis. In the four off years an internal panel is assembled to examine how well CSREES is addressing the external panel's recommendations. These internal reports are crafted to specifically address the issues raised for a particular portfolio; however, despite the fact that the external reports were all written independent of one another on portfolios comprised of very different subject matter, several themes common to the set of review reports have emerged. This set of issues has repeatedly been identified by Portfolio Review Panels and requires an agency-wide response. The agency has taken a series of steps to effectively respond to those overarching issues.

Issue 1: Getting Credit When Credit is Due

For the most part panelists were complimentary when examples showing partnerships and leveraging of funds were used. However, panelists saw a strong need for CSREES to better assert itself and its name into the reporting process. Panelists believed that principal investigators who conduct the research, education and extension activities funded by CSREES do not highlight the contributions made by CSREES. Multiple panel reports suggested CSREES better monitor reports of its funding and ensure that the agency is properly credited. Many panelists were unaware of the breadth of CSREES activities and believe their lack of knowledge is partly a result of CSREES not receiving credit in publications and other material made possible by CSREES funding.

Issue 1: Agency Response:

To address the issue of lack of credit being given to CSREES for funded projects, the Agency implemented several efforts likely to improve this situation in 2005.

First it developed a standard paragraph about CSREES's work and funding that project managers can easily insert into documents, papers and other material funded in part or entirely by CSREES.

Second, the Agency is in the process of implementing the "One Solution" concept. The One Solution will allow for the better integration, reporting and publication of CSREES material on the web. In addition, the new Plan of Work (POW), centered on the Logic Model framework, became operational in June 2006. The logic model framework is discussed in more detail below. Because of the new POW requirements and the POW training conducted by the Office of Planning and Accountability (also described in more detail below), it will be simpler for state and local partners to line up the work they are doing with agency expenditures. This in turn will make it easier for project managers to cite CSREES contributions when appropriate.

Issue 2: Partnership with Universities

Panelists felt that the concept of partnership was not being adequately presented. Panelists saw a need for more detail to be made available. Questions revolving around long-term planning between the entities were common as were ones that asked how the CSREES mission and goals were being supported through its partnership with University partners and vice versa.

Issue 2: Agency Response:

CSREES has taken several steps to strengthen its relationship with University partners. First, to the extent possible, implementing partners will be attending the CSREES strategic development exercise which is intended to help partners and CSREES fully align what is done at the local level. Second, CSREES has realigned the state assignments for its NPLs. Each state is now assigned to one specific NPL. By reducing the number of states on which any individual NPL is asked to concentrate and assigning and training NPLs for this duty, better communication between state and NPL leaders should occur. Finally, several trainings that focused on the POW were conducted by CSREES in geographic regions throughout the country. A major goal of this training was to better communicate CSREES goals to state leaders which will facilitate better planning between the universities and CSREES.

Issue 3: NPLs

Without exception the portfolio review panels were complimentary of the work being done by NPLs. They believe NPLs have significant responsibility, are experts in the field and do a difficult job admirably. Understanding the specific job functions of NPLs was something that helped panelists in the review process. Panelists did however mention that often times there are gaps in the assignments given to NPLs. Those gaps leave holes in programmatic coverage.

Issue 3: Agency Response:

CSREES values the substantive expertise NPLs bring to the Agency and therefore requires all NPLs to be experts in their respective fields. Given the budget constraints often faced by the agency, the agency has not always been able to fund needed positions and had to prioritize its hiring for open positions. In addition, because of the level of expertise CSREES requires of its NPLs, quick hires are not always possible. Often CSREES is unable to meet the salary demands of those it wishes to hire. It is essential that vacant positions not only be filled but with the most qualified candidate.

Operating under these constraints and given inevitable staff turnover, gaps will always remain. However, the establishment and drawing together of multidisciplinary teams required to complete the Portfolios has allowed the Agency to identify gaps in program knowledge and ensure that these needs are addressed in a timely fashion. To the extent that specific gaps are mentioned by outside panel experts heightens the urgency to fill them.

Issue 4: Integration

Lack of integration has been highlighted throughout the panel reviews. While review panelists certainly noted in their reports where they observed instances of integration, panel reports almost without fail sought more documentation in this regard.

Issue 4: Agency Response:

Complex problems require creative and integrated approaches that cut across disciplines and knowledge areas. CSREES has recognized that need and has undertaken steps to remedy this situation. CSREES has recently mandated that up to twenty-two percent of all NRI funds be put aside specifically for integrated projects. These projects cut across functions as well as disciplines and ensure that future Agency work will be better integrated. Finally, integration is advanced through the Portfolio process which requires cooperation across units and programmatic areas.

Issue 5: Extension

While most panels seemed satisfied at the level of discussion that focused on research, the same does not hold true for extension. There was a call for more detail and more outcome examples based upon extension activities. There was a consistent request for more detail regarding not just the activities undertaken by extension but documentation of specific results these activities achieved.

Issue 5: Agency Response:

Outcomes that come about as a result of extension are, by the very nature of the work, more difficult to document than the outcomes of a research project. CSREES has recently shuffled its strategy of assigning NPLs to serve as liaisons for states. In the past one NPL might serve as a liaison to several states or a region comprised of states. Now, each state will be assigned two NPLs and no NPL will serve as the liaison to more than two states. Those same liaisons will review states POWs for formula-based support, and work with those states to ensure that meaningful outcomes are reported. This will ensure more attention is paid to extension activities.

In addition CSREES has also been in discussion with partners and they have pledged to do their best to address this issue. The new POW will make extension-based results and reporting a priority. Placing heavy emphasis on logic models by CSREES will have the effect of necessitating the inclusion of extension activities into the state's POWs. This in turn will

require more reporting on extension activities and allow for the improved documentation of extension impact.

Issue 6: Program Evaluation

Panelists were complimentary in that they saw the creation of the Office of Planning and Accountability and portfolio reviews as being the first steps towards more encompassing program evaluation work. However, they emphasized the need to see outcomes and often times stated that the scores they gave were partially the result of their own personal experiences rather than specific program outcomes documented in the portfolios. In other words, they know first hand CSREES is having an impact but would like to see more systematic and comprehensive documentation of this impact in the reports.

Issue 6: Agency Response:

The effective management of programs is at the heart of the work conducted at CSREES and program evaluation is an essential component of effective management. In 2003 the PREP and subsequent internal reviews were implemented. Over the past three years fourteen portfolios have been reviewed by external panel members and each year this process improves. NPLs are now familiar with the process and the staff of the Planning and Accountability unit has implemented a systematic process for pulling together the material required for these reports.

Simply managing the process more effectively is not sufficient for raising the level of program evaluations being done on CSREES-funded projects to the highest standard. Good program evaluation is a process that requires constant attention by all stakeholders and the agency has focused on building the skill sets of stakeholders in the area of program evaluation. The Office of Planning and Accountability has conducted trainings in the area of evaluation for both NPLs and for staff working at Land-Grant universities. This training is available electronically and the Office of Planning and Accountability will be working with NPLs to deliver training to those in the field.

The Office of Planning and Accountability is working more closely with individual programs to ensure successful evaluations are developed, implemented and the data analyzed. Senior leadership at CSREES has begun to embrace program evaluation and over the coming years CSREES expects to see state leaders and project directors more effectively report on the outcomes of their programs as they begin to implement more rigorous program evaluation. The new POW system ensures data needed for good program evaluation will be available in the future.

Issue 7: Logic Models

Panelists were consistently impressed with the logic models and the range of their potential applications. They expressed the desire to see the logic model process used by all projects funded by CSREES and hoped not only would NPL's continue to use them in their work but, also, that those conducting the research and implementing extension activities would begin to incorporate them into their work plans.

Issue 7: Agency Response:

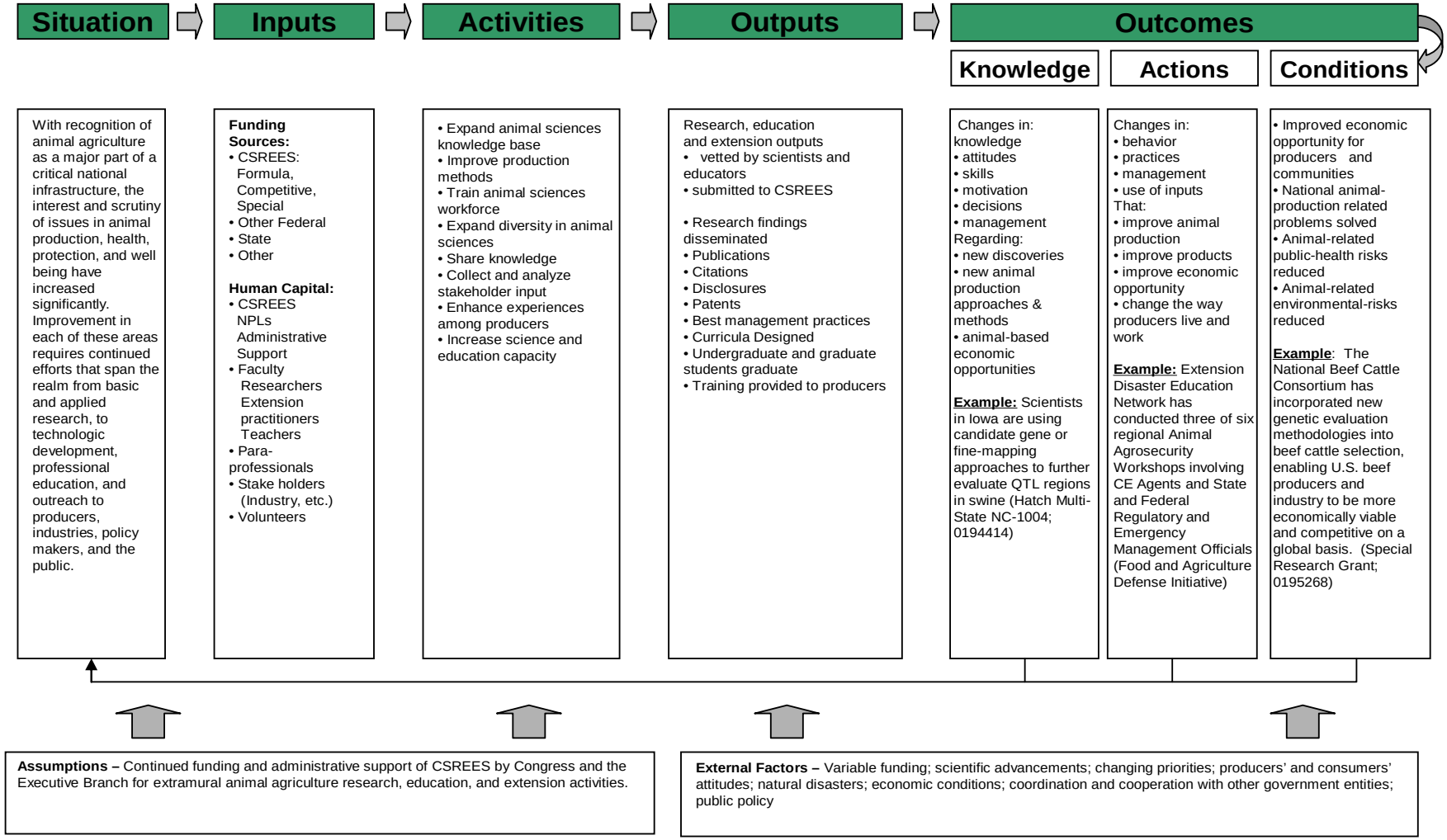
Logic models have become a staple of the work being done at CSREES and the Agency has been proactive in promoting the use of logic models to its state partners. Two recent initiatives highlight this. First, in 2005, the POW reporting system into which states submit descriptions of their accomplishments was completely revamped. The new reporting system now closely matches the logic models being used in portfolio reports. Beginning in Fiscal year 2007 states will be required to enter all of the following components of a standard logic model. These components include describing the following:

- Program Situation
- Program Assumption
- Program Long-Term Goals
- Program Inputs, which include both monetary and staffing
- Program Output, which include such things as patents
- Short-Term Outcome Goals
- Medium-Term Outcome Goals
- Long-Term Outcome Goals
- External Factors
- Target Audience

The system is now operational and states are started using it June, 2006. By requiring the inclusion of the data components listed above, states are in essence, creating a logic model which CSREES believes will help better improve both program management and outcome reporting.

The second recent initiative by CSREES regarding logic models concerns a set of training sessions conducted by Planning and Accountability staff. In October and November of 2005 four separate training sessions were held in Monterrey, California, Lincoln, Nebraska, Washington D.C. and Charleston, South Carolina. More than 200 people representing land-grant universities attended these sessions where they were given training in logic model creation, program planning and evaluation. In addition, two training sessions were provided to NPLs in December 2005 and January 2006 to further familiarize them with the logic model process. Ultimately it is hoped these representatives will pass on to others in the Land-Grant system what they learned about logic models thus creating a network of individuals utilizing the same general approach to strategic planning. These materials also have been made available to the public on the CSREES website.

CSREES Animal Systems Logic Model



Assumptions – Continued funding and administrative support of CSREES by Congress and the Executive Branch for extramural animal agriculture research, education, and extension activities.

External Factors – Variable funding; scientific advancements; changing priorities; producers' and consumers' attitudes; natural disasters; economic conditions; coordination and cooperation with other government entities; public policy

III. NATIONAL PROGRAM LEADER RESPONSES

A Brief Summary of the PREP Report with the Panel's Specific Portfolio Recommendations:

The Animal Production and Animal Protection portfolios were previously reviewed as separate portfolios of work by separate review panels and processes. In 2004 and 2005 panels comprised of independent experts from the field were convened to assess and score the current state of the Animal Production and Animal Protection Portfolios, respectively. The external reviews conducted in 2004 found that the Animal Production portfolio was outstanding with regard to its work and accomplishments. The panel noted that the Animal Production portfolio has dedicated NPLs who are involved with stakeholders and who collaborate with other agencies. The two major deficiencies found in the Animal Production portfolio were (1) a lack of integration among mission areas and (2) a lack of measurable outcomes and impacts, especially with regard to extension and technology transfer. In the 2005 PREP review, the Animal Protection portfolio was found to be an extremely important part of the U.S. agriculture system with creative and well-respected NPLs leading the programs. The Coordinated Agriculture Programs were identified as a strength in that the programs bring together states, agencies and industry in coordinated, integrated, and focused research, education, and extension efforts. The quality of outputs of relevant portfolio projects was found to be excellent. The panel found significant productivity in the Animal Protection portfolio despite relatively limited funding. A discussion of specific panel comments and recommendations related to each of the dimensions of the three Office of Management and Budget (OMB) research and development criteria used (relevance, quality, and performance) is provided below. Responses are provided sequentially by year for overall panel comments and recommendations.

RELEVANCE

Overall Comment: A lack of integration across mission areas of the agency and within animal production program areas was identified by PREPs as a major deficiency that reduces the strength of our work. The review teams for both the animal production and animal protection portfolio reviews recommended that a strategic plan with performance indicators be developed for the combined portfolios and that plan be linked to performance tracking and evaluation of these portfolios.

2007 Response

To address this deficiency and the readily apparent lack of integration across animal protection and animal production activities, the two portfolios were united under the umbrella of a comprehensive new single Animal Systems portfolio. As one of the first endeavors of the fully integrated Animal Systems team, an initial draft strategic plan for Animal Systems was developed. The restructuring and the development of a draft strategic plan are responsive to panel comments related to across-agency issues and to those specific to animal programs regarding integration, balance, and accountability.

2006 Response

The portfolio review process reinforced the need and value for strategic alignment of programs with broader goals and objectives of the department and the agency to address critical national needs. The Animal Systems team agreed that strategic planning is a key element of effective operations and

management. The program leadership of the Animal Systems team took formal responsibility for strategic planning, which was identified as a priority activity, and initiated steps to develop an Animal Systems Roadmap that would serve as both a strategic plan as well as a performance plan. The agency's strategic plan, as well as portfolio reviews, served as overarching guidance for the Animal Systems strategic plan. During 2006, the Animal Systems team contributed to the revision of the agency's strategic plan, preparing for development of the Animal Systems plan.

Scope

The scopes of both animal production and protection portfolios were judged to be very good and generally good in 2004 and 2005, respectively. The panel suggested enumeration of the value of the industry, the potential value of working on a problem and the value of a successful implementation of the knowledge generated by a CSREES-funded effort. They recommended that CSREES make investments that provide an insurance policy for American agriculture and the American public.

2007 Response
The Animal Systems team and our land-grant partners are now utilizing logic-model concepts to a greater degree to better plan and align investments with desired outcomes and impacts. In addition, the Animal Systems team is proactively working across the REE mission area to address and coordinate mission-area activities in the rapidly emerging areas of animal-related agriculture (e.g., bioenergy, genomics) by taking on lead roles in interagency and departmental working groups and task forces. The Animal Systems team retained the previous score for Scope at 3.

2006 Response
The portfolio's coverage of work with the available funds remained exceptional. The scope and relevance were maintained at the highest level during 2005.

Focus

The focus of the animal production and protection portfolios was evaluated by the PREPs to be in line with their scope, relevant, and timely.

2007 Response
While the need to focus on priority issues in the National Research Initiative is recognized, the portfolios continue to work to maintain scientific knowledge across a number of areas to maintain capacity. The Animal Systems team retained the previous score for Focus at 3.

2006 Response
The Animal Systems team worked to focus National Research Initiative priorities to maintain appropriate scope. The portfolio demonstrated a continued focus on issues, topics and critical needs of the nation.

Contemporary and/or Emerging Issues

The PREPs stated that the Animal Production and Animal Protection teams demonstrated good ability to address emerging issues, notably with genetics and genomics. They cited Animal ID and animal welfare issues as areas that deserve attention in the future.

2007 Response
The Animal Systems team continues to address emerging issues by working with and involving other agencies. An example of a major multi-agency effort is the publication of the USDA's Blueprint for Animal Genomics, which lays the foundation for the Department's research, education, and extension work in this area and provides plans to address issues likely to emerge over the next decade. Similarly, the Animal Systems team has led CSREES work in partnership with APHIS to develop a new web-based resource for the National Animal Identification System. Finally, the Animal Systems team has been a leader during the past year to address the emerging field of bioenergy production and its impacts on animal agriculture by coordinating closely with ARS counterparts and other agencies in reviewing the state of science, conveying our work to industry leaders, and participating in the development of future plans. The Animal Systems team retained the previous score for Emerging Issues at 3.

2006 Response
The portfolio continued to identify contemporary and/or emerging issues that are consistent and relevant to the portfolio and its mission.

Integration

Integration is solid in overall coverage, but it is apparent that researchers and extension personnel are not communicating as well as they should be. The panel reviewing Animal Protection felt that integration is an area that required significant attention. Integration among the three parts of USDA is weak and completed efforts lack proper documentation. The panel recommended serious efforts to bring the appropriate parties together to develop a new working paradigm that structures how CSREES operates internally. This new paradigm would then be rolled out to Land-Grant partners.

2007 Response
In addition to the agency-wide responses to integration issues, the Animal Production and Animal Protection teams followed up with the agency's Office of Planning and Accountability on the notion that the portfolios, as defined, created an inherent lack of integration, especially as regards performance reporting. A mutual decision was made to combine the portfolios (as described above under "Overall Comment"), which has resulted in improved integration of knowledge-area planning and performance as well as integration of education, extension, and research activities. In addition, this move is anticipated to improve transparency of integration across program and mission areas during the review and reporting process.

Progress has been made in 2007 integrating research, education, and extension efforts in several distinct areas led by the Animal Systems team: (1) the National Animal Identification System, (2) the National Animal Health Laboratory Network, (3) the Extension Disaster Education Network, and (4) eXtension's dairy and beef modules. The Animal Systems team led CSREES work with the joint CSREES/APHIS development of a new web-based resource for extension educators (Extension-NAIS Resource Center), which was rolled out in 2007 to provide access to latest tools to help inform local

livestock and poultry producers about the National Animal Identification System. The National Animal Health Laboratory Network provides nationwide early detection, response, and recovery activities for significant foreign and domestic animal diseases with the broad objective to develop a cohesive state and federal animal disease laboratory network that provides improved service to animal agriculture and the American public. The Extension Disaster Education Network has initiated pilot projects that bring together federal and state government, non-governmental organizations, and academe to plan and articulate the roles of various agricultural bio-security players. Similarly, CSREES NPLs contributed to the development of eXtension's focused web sites that bring together results of research, expertise of the land-grant system, and educational materials, delivering it to those in the field who need it. The DAIReXNET was launched in 2007 and the beef web site is scheduled to launch in 2008.

The Animal Systems team retained the previous score for Integration at 2.

2006 Response
The Animal Systems team moved forward in terms of program integration by aligning goals and objectives for each knowledge area within the Animal Systems portfolios with goals and objectives in the broader agency strategic plan. The team continued to move toward a systems-based approach to program planning, delivery, and performance tracking. Significant progress continued in integrating the competitive grants portfolio with other programs by building a strong team across units (Competitive Programs and Plant and Animal Systems). The team continued to focus on integration of programs in terms of biological systems as well as commodity/species based production systems.

The Animal Systems team recognized that Planning and Accountability had defined portfolios based on the aggregation of knowledge areas used for tracking projects and expenditures. Use of these knowledge areas in reporting performance across program areas does result in biases from a review and assessment perspective. Programs and projects are actually more integrated across knowledge areas.

Multidisciplinary Balance

This topic refers to disciplinary balance, not multidisciplinary balance. On the positive side, NPLs and KAs make a real effort to work with other organizations. Some areas had reports and papers documenting their leadership in communications with states, professional societies, etc., intended to effectively bring the federal programs forward. We wish to see NPLs take more risks, think outside the box, and encourage non-traditional approaches. Examples of where this is occurring include genomics, animal identification, and air quality.

2007 Response
The Animal Systems team continues to work innovatively in genomics, animal identification, and air quality, animal welfare, and bioethics. The Animal Systems team gave Multidisciplinary Balance a score of 3, which is the same as the previous Animal Protection score and an increase from the previous Animal Production score of 2. Several activities relating to animal welfare and bioethics, including major national symposia at professional society meetings, reflect significant advances in the ability of NPLs to work with other organizations to bring multi-disciplinary expertise together to address hard-hitting and contentious issues.

2006 Response
The portfolio continues to demonstrate a multidisciplinary balance in solving scientific problems. NPLs will continue to challenge the stakeholders for innovative and futuristic approaches in research, education and extension mission areas. A continued interaction with stakeholders through multi-state meetings, professional societies, and other federal partners will be maintained and improved.

QUALITY

Overall Comment: The quality of the animal production portfolio was varied and quality of the animal protection portfolio was good. In both portfolios, PREPs noted that outcome data were insufficient and there is a need to be able to measure outcomes.

Significance of Findings

Outcomes need to be measured, the results packaged in a consumable way and then they need to be promulgated so that they inform and promote CSREES efforts.

2007 Response
With regard to measurements of outcomes/impacts, the new POW reporting system is anticipated to improve our abilities in this area. With regard to packaging results in a consumable way, NPLs have been innovative in utilizing materials drafted as highlights for the agency's web pages and for the Animal Systems Annual Performance Review report, compiling and distributing these key results and impacts of funded research, education, and extension activities in brochures and other informational materials. The Animal Systems team gave Significance of Findings a score of 2.5 which reflects, on average, no change in the previous Animal Protection score of 3 and the previous Animal Production score of 2.

2006 Response
The portfolio continues to demonstrate the generation of significant findings and outputs from its stakeholders. Efforts to improve reporting, especially in extension and education-related outputs, will be enhanced.

Stakeholder/Constituent Inputs

The PREPs commended the animal production and protection teams for working with stakeholders, noting FAIR (1995 and 2002). Recommendations were made to have a clear definition of the term "stakeholder" in the self-review document and to take a more systematic approach to the methods and timing of connecting with stakeholders.

2007 Response
In April 2006, the Animal Systems team embarked on the first-ever joint ARS/SCREES National Animal Production Program Planning Stakeholder workshop for planning the direction of the USDA intramural (ARS) and extramural (CSREES) national research programs in the animal production and

well-being areas. The development and conduct of this stakeholder meeting involved close collaborations of the two agencies to plan a useful program for interaction with a diverse set of stakeholders. In addition, a new web-based stakeholder comment form was launched for animal health, removing the inherent biases, financial constraints and challenges associated with obtaining stakeholder input through large, structured, one-time meetings. The Animal Systems team gave Stakeholder/Constituent Inputs a score of 3, which is an increase from the previous Animal Protection score of 2.5 and retains the previous Animal Production score of 3.

2006 Response
The portfolio continued to demonstrate high-quality stakeholder/constituent input for all three mission areas. An example of continued stakeholder input through ARS and CSREES partnership include a USDA Domestic Animal Genomics Workshop. The Animal Systems team clearly recognized the importance of enhanced integration of the CSREES and ARS programs in Animal Production and Protection. CSREES and ARS jointly sponsored two major national stakeholder workshops for animal production and protection since the portfolio reviews were conducted. These workshops are part of the ARS 5-year performance planning and management cycle, and are now part of the CSREES performance planning cycle. These joint workshops will greatly enhance the integration of ARS and CSREES programs consistent with the needs of diverse stakeholders. These workshops help to ensure the relevancy of major research programs of both agencies. Linked to other performance planning and tracking efforts of the Animal Systems team, these efforts should enhance the quality and performance of programs within both portfolios. Stakeholders have been supportive of these workshops and the fact that CSREES and ARS are engaged in joint program planning and stakeholder interaction.

Alignment with Current State of Science

The CSREES really has direct control only over non-formula funds. The NRI has shifted its areas of emphasis over the years and is in alignment with current and emerging issues within animal agriculture. Given the time period and resources available the PREP felt there was good alignment between work in animal protection that preceded the review period and work accomplished during the review period.

2007 Response
The portfolio continues to demonstrate alignment with current state of science. With the newly integrated single Animal Systems portfolio, there will be greater opportunities to ensure alignment and to make appropriate adjustments as necessary. The Animal Systems team retained the previous score for Alignment with Current State of Science at 3.

2006 Response
The portfolio continues to demonstrate alignment with current state of science-based knowledge and previous work to the strategic plan of the agency.

Appropriate and/or Cutting Edge Methodology

The methodology shown for research in animal production and animal protection was found to be generally appropriate; however, concerns were expressed about voids in extension and education methods. In addition, the panel felt that the animal protection peer review process must be visible, transparent, and applied wherever possible. Highly advanced, cutting-edge methods may not always

be required to answer some important issues. The key to this evaluation question is appropriate methods. Overall, the current system was judged to be good, but there is a concern about the limiting nature of funds spent only on certain diseases. There is no way of knowing when the next important disease will emerge and therefore there is a need to educate a pool of experts on many diseases not just certain diseases.

2007 Response

The Animal Systems team recognized that methodologies must be appropriate for the scenario. Peer review processes that are visible and transparent have been adopted by NPLs responsible for administering formal and ad hoc competitive grants programs (e.g., critical issues, rangeland research). Awards are made on the basis of scientific merit, quality, and priority. With the competitive processes in place for these two programs, the quality of research funded has improved and the education and extension components desired in projects are better clarified. The Animal Systems programs seek not only cutting edge methodologies, but also practical application of the knowledge, which is now conveyed through RFAs. The Animal Systems team gave Appropriate and/or Cutting Edge Methodology a score of 3, which is the same as the previous Animal Protection score and an increase from the previous Animal Production score of 2.

2006 Response

The portfolio continued to provide leadership to stakeholders in utilizing and adopting cutting edge methodologies. For example, a number of food science/food safety distance education courses (including one about food science and the law) were developed at North Carolina State University. Purdue and Michigan State Universities have several distance education classes and a real time distance education class on animal welfare.

PERFORMANCE

Overall Comment: Both portfolio review reports indicated a need to improve performance tracking and accountability documentation for the two portfolios.

Portfolio Productivity

The PREP viewed performance of the animal production team as mixed, with some KAs providing better evidence than others. Productivity in terms of research measures, such as scientific papers, is strong. However, productivity in terms of technology transfer is poor and must be improved. If technology transfer and other extension activities are taking place there needs to be a system to report this productivity. The PREP was complimentary of the performance of the animal protection team and noted that there needs to be an effective and appropriate method for evaluating and reporting productivity. There is a need to determine how the tangible and intangible outcomes can be measured and recognized, with due credit given and reported. The tangible aspects of research involvement are one thing; the intangibles of education and extension involvement are another. This provides a challenge of incorporating education and extension into the logic model to get the recognition of and feedback from those aspects.

2007 Response

The Animal Systems team has acted on the panel's recommendation to incorporate education and extension into logic models, which will facilitate recognition and reporting on productivity and performance. The implementation of electronic grant submissions should improve review and award processes and performance. Recent advances in education and extension efforts, including technology transfer, have been described above and will serve as examples for documenting and reporting on performance (e.g., EDEN, eXtension). The Animal Systems team gave Portfolio Productivity a score of 2.5 which reflects, on average, no change in the previous Animal Protection score of 3 and the previous Animal Production score of 2.

2006 Response
The portfolio continued to demonstrate moderate productivity to create and provide services through funding, directing, managing, and partnering with its various stakeholders. Enhanced efforts were promised to properly document technology transfer and extension activities through the available databases and progress/termination reports under each knowledge area.

Portfolio Comprehensiveness

The PREP found the same weaknesses here as were found in "Portfolio Productivity" as regards documenting technology transfer. While there was good coverage of national and international needs, the panel expressed concern about focusing, emphasizing that it is important to maintain an infrastructure of facilities and to continue to train individuals to carry on the activities of this agency so that the very dynamic and varied needs of the future are met.

2007 Response
The Animal Systems team continues to utilize its comprehensive annual performance report as the basis for annual and 5-year reviews and performance tracking. This report indicates program shifts, resource trends, highlighted accomplishments, and impacts by each knowledge area. The process serves as a valuable tool from a program leadership perspective in enhancing the quality, relevancy and performance of the diverse portfolios managed and led by the Animal Systems team. The Animal Systems team gave Portfolio Comprehensiveness a score of 2.5 which reflects, on average, no change in the previous Animal Protection score of 3 and the previous Animal Production score of 2.

2006 Response
The portfolio continues to demonstrate moderate comprehensiveness in terms of areas of work, outputs, and outcomes. Efforts will be made to enhance documentation of extension and education activities.

Portfolio Timeliness

Timeliness was an area that was difficult for the panel to assess, given there is little to no data available on timeliness of projects. The bioethical issues in animal production were very timely.

2007 Response
The portfolio is comprised of projects that are required to have annual progress, final, and termination reports filed. The portfolio continues to improve timeliness of projects by monitoring and encouraging project directors to complete these reports and their work on time. The portfolio continues to be timely in its coverage of topics, such as bioethics and bioenergy, where workshops and sessions at

professional scientific meetings (e.g., American Society of Animal Science Bioethics of Food Animal Production) have drawn praise from stakeholders. The Animal Systems team gave Portfolio Timeliness a score of 3, which is the same as the previous Animal Protection score and an increase from the previous Animal Production score of 2.

2006 Response
The portfolio continues to monitor timely completion and closure of projects under various knowledge areas. Efforts will be enhanced to ensure timely and adequate progress/termination report monitoring, and timely feedback to bridge voids and gaps.

Agency Guidance

The review panels found evidence of good guidance in some areas, but also found some voids such as in the areas of technology transfer and other extension. Leadership was judged to be good in research and although not explicit, the review team indicated that there is a need to enhance the agency's roles in terms of leadership for the extension function within the Animal Systems portfolio. The panel recommended that NPLs be dynamic, forward looking, creative, and innovative. It was unclear what guidance is given by the agency and what information reaches individual investigators. Improved communication is needed with physical geographic contact from top to bottom, bottom to top, and laterally. For example, NPLs need to communicate available programs to investigators as well as institutional administrators. Also, administrators should communicate better with investigators/recipients and feedback (formal reports and informal comments) should be expected and incorporated into work plans. The panel felt this was an important need.

2007 Response
NPLs have increased efforts in the areas of guidance and leadership. NPL State Liaison activities have increased the interaction of NPLs with professionals at all levels. Exchanges of information (informal and formal) are occurring through the liaison and POW processes. Solicitation processes have been implemented and complete information on availability of competitive funding has been provided in an open and timely manner. NPLs are seeking new and innovative input from stakeholders to guide the portfolio. The Animal Systems team gave Agency Guidance a score of 2.5 which reflects, on average, no change in the previous Animal Protection score of 3 and the previous Animal Production score of 2.

2006 Response
The portfolio continued to provide dynamic leadership and management to foster a broad spectrum of activities to develop human resources and collaborative interaction among all three mission areas. The team addressed opportunities to strengthen leadership for the extension function. NPLs are now asked to report accomplishments and describe their leadership roles for research and extension functions. The team promised to assess opportunities to strengthen leadership relative to extension programming. NPLs within the team network extensively with extension counterparts in the states. Meetings with extension specialists and special sessions on extension programs are held in conjunction with professional meetings and national workshops. The team planned to integrate extension goals into performance planning and leadership functions; however, as mentioned above, there are still major deficiencies in terms of reporting extension accomplishments and impacts. These deficiencies must be resolved at the agency level.

Portfolio Accountability

Accountability on balance of the animal production portfolio was not good. Much progress regarding methods and relevance needs to be done to be useful, meaningful, and comprehensive. The CSREES has an evaluation system for projects up front, but there is no follow up at the end of projects to determine if something really was accomplished. There is a strong need to improve accountability showing measurable impacts, not just in CSREES, but throughout the system and down to individual investigators. Overall, the panel was pleased with the accountability evidenced by the animal protection portfolio's self-review document. Communication of research results seemed to be adequate, if not exemplary. Even though the funds contributed to a project by CSREES may be a minor percentage of the total project funding, investigators need to be reminded that demonstration of wise use of all funds, as well as research outcomes, is paramount for assuring sustained or increased federal research funding in the future.

2007 Response
The Animal Systems team concurs with the observation that accountability needs to be improved. Concurrent with agency-wide efforts to improve portfolio accountability, the Animal Systems team is increasing efforts to improve post-award management and requirements for funded projects. The team's strategic plan, with actionable goals, will also improve its ability to be accountable and to report on what has actually been accomplished. The Animal Systems team retained the previous score for Scope at 2.

2006 Response
This is a broad systemic problem across the agency. Improved reporting systems for extension and higher education integrated with the research reporting that provides measurable outcomes and impacts are needed. The agency is moving forward to address this issue regarding reporting needs and systems. The Animal Systems team recognizes that there need to be new approaches and visionary thinking regarding the tracking of outcomes and impacts. There is a need to focus on performance reports instead of activity reports. Current systems being discussed within the agency are project-based reporting systems. Most reportable impacts occur well after projects are terminated and are not based on inputs from a single project. The agency needs to consider new models for performance tracking and impact documentation.

IV. EVIDENCE OF PROGRESS

The following items are a few examples of selected highlights that demonstrate significant impacts and progress in representative areas of the Animal Systems portfolio. These examples provide evidence for the appropriately broad but balanced scope, the timeliness and responsiveness of work on emerging issues, and the quality of research, education, and extension activities conducted under the Animal Systems portfolio.

Reproductive Performance of Animals
Large-Scale Production of Sex-Selected Embryos by In Vitro Fertilization (IVF) in Cattle: A New Opportunity for Global Business: Investigators at Evergen Biotechnologies, Inc. demonstrated a feasible system for the large-scale production, cryopreservation, and transfer of sexed IVF embryos

produced by sorted semen. Both bull effect and influence due to cell-sorting of semen were demonstrated in IVF with sexed sperm. High rates of blastocyst development from IVF with sexed sperm, high post-warming survivability of vitrified embryos, and high pregnancy rates were achieved. Thus, this technology demonstrated that sperm sexing, in vitro embryo production, vitrification, and embryo transfer are efficient methods to produce livestock of a desired gender for the purposes of herd expansion and rapid genetic replacement. (*SBIR Phase I Grant; CRIS Accession Number 0202992*)

Nutrient Utilization in Animals

At present, the focus on production of biofuels is dramatically changing the way animals are being fed, especially swine. As a consequence of ethanol plants, the dietary availability of spent co-products from ethanol plants, namely distiller's dried grains (DDGS) as well as the use of spent restaurant grease is starting to make its way into swine rations. Conjugated linoleic acids (CLA) are a group of polyunsaturated fatty acids that are positional and geometric isomers of linoleic acid (C18:2) and known to positively (make firmer) carcass fat. Work at Purdue University suggests that DDGS can be fed at 20% with no deleterious effects on carcass quality as long as 1% CLA is included in the diet; that is, a 20% DDGS diet alone (compared to a traditional corn/soybean diet) will significantly increase the amount of unsaturated fatty acids and cause the carcass to be come soft, but CLA reverses that effect in bacon of swine. Further, our work suggest that market pigs given restaurant grease supplemented with CLA will also exhibit remarkable carcass firmness with is highly desired in the swine industry for bacon slicing. Conjugated linoleic acid may be an excellent supplement to swine diets that are considering using either DDGS or used vegetable oils in order to improve swine carcass firmness. (*Hatch; CRIS Accession Number 0174359*)

Genetic Improvement of Animals

Tuskegee University research scientists are studying the relationship of diet and genetic predisposition as possible cause for cardiovascular disease in poultry. The project will examine if there is any relationship between the genes associated with predisposition of cardiovascular disease in poultry and in humans. Apolipoprotein genes relative to dilated cardiomyopathy had not been investigated using the turkey model. Also, the identification and analysis of apolipoprotein genes may be useful as biomarkers in identifying healthy individuals at risk for cardiomyopathy. Atherosclerosis is the leading cause of morbidity and mortality in western societies and is rapidly increasing in minority populations. *(Evans-Allen; CRIS Accession Number 0193879)*

Animal Physiological Processes

Improving Reproductive Performance in Broiler and Turkey Breeders Using Sperm Penetration Values: Scientists at the University of Arkansas developed a sperm penetration assay to evaluate breeder flock performance in the U.S. broiler breeder poultry industry. Flock criteria identified as causative to poor fertility from this project are: insufficient male/female ratio; poor physical conditioning as the male or female birds age; and poor physiological development of males. Poor hen conditioning was also shown to cause many of the fertility and hatchability problems in the industry. The investigators also developed new methods for storing eggs during hatching which requires little to no capital expense and results in a 1-4% increase in hatch. These methods are being implemented by the two largest poultry integrators in the U.S. and nearly half of all broilers produced in the U.S. have been produced utilizing this egg storage program. A 1-2% increase in hatch in all broiler breeder flocks in the U.S. results in an increase of 2.5-5 million more chicks hatched per week. With the cost of

chicks at nearly $0.25 per chick, this results in a potential net increase of $1.25 million additional revenue. (*Animal Health; CRIS Accession Number 0189950*)

Environmental Stress in Animals

Stress Factors of farm animals and their effects on performance (from W1173):
An Arizona State researcher focused on accurately identifying heat-stressed cows and the biological mechanism of thermal stress on reduced milk synthesis and reproductive indices to develop novel approaches to ameliorate these impacts. Core body temperature was monitored using intra-vaginal recording thermistors to evaluate the relationship of the surrounding environment (e.g., solar radiation, temperature, humidity) and the cow's body temperature. Genes associated with the stress response in cattle were identified. Sweating rate was determined to be a new physiological parameter which might be associated with thermal resistance in dairy cattle. The GH/IGF axis appeared to act differently during negative energy balance during heat stress and may be an important indicator of potential nutritional strategies to be utilized during heat stress. New genes were identified which appear to be involved in the heat-shock response in bovine cells. (*Hatch, CRIS Accession number 0158027*)

Animal Production Management Systems

Scientist at Texas A&M University have successfully deployed and tested a wireless, handheld platform with the first generation of Integrated Corral Management (ICM). During the last quarter of 2006, they were approached by two commercial firms having a keen commercial interest in licensing the software and hardware modules they have prototyped, including features that may potentially be interfaced with existing feedyard-management databases. The researchers are migrating to a more-rugged PDA form factor with advanced Bluetooth capabilities and Windows Mobile 5.0 OS. They have also identified a commercial feedyard cooperator where they will develop and test a sprinkler-system audit protocol during 2007. Project deliverables are now potentially licensable to commercial feedyard-management database/software companies whose products are in use by feedyards totaling over 1,000,000 head of one-time capacity (*NRI Competitive grant Accession number 0202121*).

Improved Animal Products Before Harvest

Effects of pre-slaughter management on safety and quality of muscle foods derived from poultry and rainbow trout (Oncorhynchus mykiss): Lactic acid accumulation in poultry meat at slaughter is a primary determinant of muscle-food properties. Researchers reported work to address the observation that without proper and timely temperature control, poor breast meat quality can occur in turkeys, most notable as a pale, soft, and exudative condition. Researchers at West Virginia University found that stunning method minimally affected processing and fillet attributes of trout but feed withdrawal did affect fillet attributes and is a significant component of animal conditioning prior to harvest. Trout fillet color and composition were not affected by one-week feed withdrawal. These findings will increase consumer acceptance and demand for trout products. (*Hatch; CRIS Accession number 0203762*).

Animal Diseases

Channel catfish aquaculture is the largest aquaculture industry in the U.S. in terms of acreage (177,800 acres), production (680 million pounds), and dollar value ($1.4 billion dollars). Enteric septicemia of catfish, caused by *Edwardsiella ictaluri*, is the most economically important disease of farm-raised catfish. The mechanisms used by *E. ictaluri* to establish infection in catfish and avoid the catfish's

early defense systems are not well understood. Scientists at Mississippi State University, with collaborators at USDA-ARS-Stoneville, studied the mechanism used by *E. ictaluri* to avoid killing by catfish neutrophils. To accomplish this, they screened random *E. ictaluri* transposon mutants to identify those with increased susceptibility to channel catfish neutrophils; determined the affected genes in neutrophil susceptible mutants; and, determined the virulence of selected mutants in channel catfish. Plasmids were developed for constitutive and inducible expression of gfp and bacterial luciferase in gram-negative bacteria. A system was developed for real-time monitoring and quantification of *E. ictaluri* infection in living catfish ("Development of bioluminescence *Edwarsiella ictaluri* for noninvasive disease monitoring"; FEMS Microbiol. Lett. 260 (2006) 216-223). This construction of luciferase and gfp-labeled *E. ictaluri* enabled studying pathogenesis of *E. ictaluri* infection in living catfish using an IVIS Imaging System (Xenogen). These methods should be applicable to noninvasively investigate pathogenesis of disease caused by other bacterial pathogens. A high-throughput system was also developed for screening *E. ictaluri* mutants for susceptibility to catfish neutrophils and serum. Fourteen attenuated serum-and neutrophil-susceptible mutants were isolated, and their genetic mutations were identified. Five mutants caused no mortalities in an immersion challenge; of these, three gave better protection than the commercial vaccine, and one gave 100% protection demonstrating encouraging promise as a candidate vaccine. For the *E. ictalur*i mutants that are susceptible to catfish neutrophils, the corresponding genes required to prevent killing by catfish neutrophils will now be identified. (*NRI Competitive Grant; CRIS Accession 0199034).* The Mississippi State University researchers were awarded a 3-year follow-on grant in FY2007 to continue to identify *E. ictaluri* virulence factors by expression profiling and biophotonics (*NRI Competitive Grant; CRIS Accession 0211851).*

External Parasites and Pests of Animals

Insects, ticks and mites cost US livestock producers in excess of $3 billion annually. Traditional methods of pest control have involved the use of topically applied pesticides (pyrethroids and organophosphorus chemicals). Because of the potential impact of these chemicals on the environment and human health, and the costs of maintaining the EPA registration, the number of agents for pest control has declined. Reliance on only a few active ingredients has created additional problems with pesticide resistance. Stratacor Inc. (Richmond, CA) initially received an SBIR phase 1 award to show proof of concept for a natural insect repellent. Results were promising and the business received an SBIR phase-2 award to optimize formulations of low-cost, naturally occurring, environmentally benign actives having high intrinsic repellent activity against flies. Formulations were developed for cattle and horses to provide relief from stable flies (*Stomoxys calcitrans*), horn flies (*Haematobia irritans irritans*), and cattle lice (*Bovicola bovis, Solenopotes capillatus*, and *Linoganthus vituli*). The repellent also had activity against face flies (*Musca autumnalis*), house flies (*Musca domestica*), sand flies (*Lutzomyia longipalpis*), mosquitoes (*Aedes aegypti* and *Culex quinquefasciatus*), ticks (California black-eyed tick (*Ixodes pacificus*) and lone star tick (*Amblyomma americanum*)). Solid formulations were developed for use in dust bags or cattle rubs. Liquid formulations were developed for spray or wipe-on application.). Laboratory tests with horn flies showed statistically significant repellent activity at doses as low as 9-18 ug actives/square cm in dust form, with some activity possible at 4.5 ug/square cm. Horn fly repellency was demonstrated under actual use conditions in three trials using dust bags, and when tested in comparison to pesticide treatments, gave similar reductions in horn fly numbers (approximately 90%) on pastured cattle. The liquid formulation provided reduction in stable fly counts when applied to the legs of pastured horses and dairy cattle. A pre-registration meeting has taken place with the US EPA for the two formulations, which will be registered as biopesticides,

meaning shortened regulatory approval. Negotiations are under way to license issued US and international patents for commercialization. In summary, the Stratacor repellent represents the first effective non-toxic alternative to pesticides for fly control in livestock. It is based on chemicals which occur naturally in a variety of plants and on human skin. These compounds are commercially available and are competitive in cost with traditional pest control agents. All of the actives have Generally Recognized as Safe (GRAS) status with the U.S. FDA and are used as food additives. Formulations can provide high repellent activity against the major livestock pests and fly reduction competitive with traditional pesticides. Because these formulations are vapor phase repellents, they reduce the nuisance of fly landing on treated surfaces, as opposed to pesticides where physical contact is required. This results in a higher level of comfort for companion animals. Since the mechanism is repellency rather than toxicity, the potential for development of resistance is greatly reduced. *(SBIR Competitive; CRIS Accession Number 0200581)*

Internal Parasites of Animals

Equine protozoal myeloencephalitis (EPM) is a common cause of neurologic disease in horses. Horses typically become infected by *Sarcocystis neurona* (*S. neurona*) consuming infectious parasite stages found in opossum feces. Once a horse has been infected, *S. neurona* can travel to the brain and spinal cord, where merozoite stages of this parasite replicate and cause pathology. Horses with EPM typically present with lameness, but may alternatively or additionally present with symptoms characteristic of primary brain disease. Because the parasite can inhabit any area of the central nervous system (CNS) of the horse, symptoms associated with EPM can vary widely. The degree of infection can range from subtle to severe and can involve the brain and/or the spinal cord. EPM is usually progressive. Presently, a definitive diagnosis of EPM is made by post-mortem examination, where *S. neurona* organisms are identified in histological lesions. The organ may also be cultured from the lesion. The presence of the organism in the histologic section, or when cultured from the lesion establishes the diagnosis. Heretofore, pre-mortem methods for diagnosing EPM were based on assays using whole merozoites, and not a purified protein, to probe for the presence of anti-*S. neurona* antibodies (as an indication of infection) in the horses. The use of such whole merozoites results in significant cross-reaction with non-*S. neurona* specific antibodies (e.g., those against other Sarcocystis species). This cross-reactivity obscures interpretation of results using whole merozoite-based assays. The University of Florida-Gainesville has received a patent (# 6,808,714) for detection of *S. neurona*. The invention relates to the discovery and characterization of a 29 kilodalton (kDa) protein found on the surface of merozoite stage *S. neurona*. This antigen, termed SnSAG-1 or SnSMA1, is an immunodominant antigen recognized on protein blots. Using purified or recombinant SnSAG-1 (i.e., rSnSAG-1) antigen, accurate assays for diagnosing EPM in horse pre-mortem have been developed. These assays involve identifying a marker indicative of the presence of the 29 kDa antigen or an antibody to this antigen in a sample to be tested. Thus, because a single purified antigen or marker is utilized in such assays, the cross-reactivity problems associated with whole-merozoite based assays are obviated or much reduced. (*NRI Competitive Grant; 1998-35204-6487)*

Toxic Chemicals, Poisionous Plants, and Naturally Occurring Toxins and Other Hazards Affecting Animals

A research project at the University of Missouri has clearly shown that large domestic mammals and even possibly humans might be more susceptible to the adverse reproductive effects of some common agricultural and industrial chemicals than rodents. This project has demonstrated the advantages of the porcine model, as compared to other research animal models, with respect to the antemortem

evaluation of the toxic effects of xenobiotics (exogenous chemicals) on semen quality and serum concentrations of reproductive hormones. The dramatic scrotal enlargement and fluid retention observed in post-pubertal boars treated with vinclozolin in this study are worthy of further investigation to ascertain their importance in relation to normal testicular function and the pathophysiology of testicular injury in the boar and, possibly, other male domestic animals of agricultural significance. (*Animal Health; CRIS Accession Number 0201809*)

Animal Welfare, Well-being, and Protection

University of California (*NRI Competitive Grant; CRIS Accession Number 0190556*) studies showed that relatively simple and inexpensive structural changes such as the addition perches to broiler pens could help to improve walking ability. Lameness in broilers has been an increasing problem due to the rapid growth of these birds. These researchers also found (*Animal Health; CRIS Accession 0192687*) that bill-trimming of Muscovy ducks caused acute but not chronic pain. Bill-trimming is currently necessary to prevent feather pecking and cannibalism and short-term pain can potentially be controlled by management practices such as feed depth in the feeder trough and giving an analgesic.

Insects and Other Pests and Zoonotic Diseases and Parasites Affecting Humans

Results from a study by scientists at Auburn University have provided a better understanding of the ecology and transmission dynamics of two important mosquito-associated diseases (West Nile encephalitis, eastern equine encephalitis). This may in turn lead to a more-effective control strategy for each disease in the Southeastern USA. Also in this study, *Culex erraticus* was identified as a likely vector of both WN and EEE viruses. This is the first time this mosquito has been incriminated as a species of public health importance. (*Hatch; 0198773*)

V. SUMMARY OF UPDATES TO THE 2004 PORTFOLIO REVIEW REPORT

In preparation for the Animal Systems self-assessment, the Animal Systems team compiled a 2007 Animal Systems Annual Performance Review Report, reporting on 2006 work (Animal Systems Annual Performance Report, 100 pp). The report is based on the 2004 Portfolio Expert Review Panel report, the internal 2006 self-assessment of work completed in 2005, and work conducted in 2006. It presents the Animal Systems draft strategic plan and presents updated information on the following sections: KA Situation, KA Investments, KA Program Shifts, KA Research-Extension Highlights, KA Impact Highlights, and KA Logic Models. General information was also updated such as: Responses to External Panel Recommendations, list of Peer-Panels, list of Congressionally Directed Line Items within Animal Systems, list of Multi-State Committees within Animal Protection, and information regarding Principal Investigator and Stakeholder Workshops with CSREES animal production involvement. Listed below are selected funding tables and logic models from that report. Data are presented separately for Animal Production and Animal Protection because they were tracked as separate portfolios during 2006.

Budget

Relatively little change has occurred in total CSREES budget for Animal Systems (Animal Production and Animal Protection) budget over the period of 2000-2006 (Tables V. A-F). The budget has increased in nominal dollars by approximately $20 million (from $101 million in 2000 to $120 million

in 2006) over that period, but in real dollars (constant 2000 dollars) this represents an increase of approximately only $2 million. In terms of overall funding for animal systems, which includes CSREES and other sources both federal, non-federal, state, and private sources, funding has increased in nominal dollars by approximately $143 million (from $478 million in 2000 to $621 million in 2006); however, in real dollars (constant 2000 dollars), this represents an increase of approximately $61 million.

Overall funding for animal production from all sources has increased by only $4 million real dollars (constant 2000 dollars) as reported in the Current Research Information System over the period 2000-2006. The CSREES portion of overall funding for animal production has increased by approximately $2 million real dollars. Overall funding for animal protection from all sources has increased by $57 million real dollars. The CSREES portion of funding for the animal protection portion of Animal Systems has experienced no increase in funding (in real dollars) since the year 2000.

Animal Systems Funding Tables

Table V.A. Animal Systems CSREES Funding
(as reported in the Current Research Information System
$ in the thousands

Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	3,542	$40,668	$170	$7,197	$4,474	$6,151	$20,629	$1,803	$20,368	$101,460
2001	3,802	$40,439	$187	$7,930	$4,486	$9,091	$21,899	$3,751	$28,185	$115,968
2002	3,948	$38,615	$271	$9,135	$4,393	$10,308	$34,838	$2,282	$11,612	$111,454
2003	4,024	$36,554	$331	$8,312	$4,371	$14,672	$23,572	$3,530	$10,050	$101,392
2004	4,088	$37,979	$201	$8,911	$3,949	$14,117	$43,666	$2,824	$12,321	$123,968
2005	4,194	$37,578	$203	$9,204	$4,251	$14,787	$37,326	$3,829	$14,265	$121,440
2006	4,079	$37,667	$223	$6,881	$4,475	$17,725	$37,597	$2,615	$13,573	$120,756
Total	27,677	$269,500	$1,586	$57,570	$30,399	$86,851	$219,527	$20,634	$110,374	$796,438

Table V.B. Animal Systems Overall Funding
(as reported in the Current Research Information System
$ in the thousands

Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	3,542	$101,456	$8,325	$53,973	$227,314	$41,883	$27,342	$15,686	$478,273
2001	3,802	$115,972	$10,856	$60,746	$234,619	$44,360	$29,176	$18,999	$517,184
2002	3,948	$111,453	$14,502	$82,416	$227,086	$44,428	$34,749	$20,073	$537,265
2003	4,024	$101,394	$14,603	$100,766	$225,455	$48,534	$37,447	$25,076	$555,886
2004	4,088	$123,969	$15,510	$108,994	$217,281	$50,629	$43,706	$30,942	$593,666
2005	5,116	$121,440	$26,322	$248,249	$312,853	$78,796	$54,378	$60,808	$905,946
2006	4,079	$120,756	$15,381	$127,115	$234,851	$51,738	$40,424	$31,527	$621,791
Total	28,599	$796,440	$105,499	$782,259	$1,679,459	$360,368	$267,222	$203,111	$4,210,011

Animal Systems (Animal Production and Animal Protection) Funding Tables

Table V.C. Animal Production Overall Funding									
(as reported in the Current Research Information System									
$ in the thousands									
Year	**NO. Proj**	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	2,296	$69,278	$2,848	$23,138	$149,442	$32,810	$18,110	$9,210	$307,132
2001	2,457	$78,498	$5,093	$25,521	$156,419	$34,547	$20,285	$10,569	$333,389
2002	2,557	$69,396	$7,311	$33,758	$153,840	$34,700	$22,971	$10,084	$334,617
2003	2,606	$70,663	$5,538	$39,185	$148,744	$37,718	$22,314	$12,499	$339,267
2004	2,635	$78,862	$6,536	$43,254	$144,104	$40,897	$27,714	$14,320	$358,322
2005	3,096	$81,787	$11,771	$92,121	$175,172	$53,643	$28,353	$22,833	$468,776
2006	2,627	$83,142	$6,306	$43,181	$152,287	$43,255	$22,199	$13,898	$364,267
Total	15,647	$448,484	$39,097	$256,977	$927,721	$234,315	$139,747	$79,515	$2,141,503

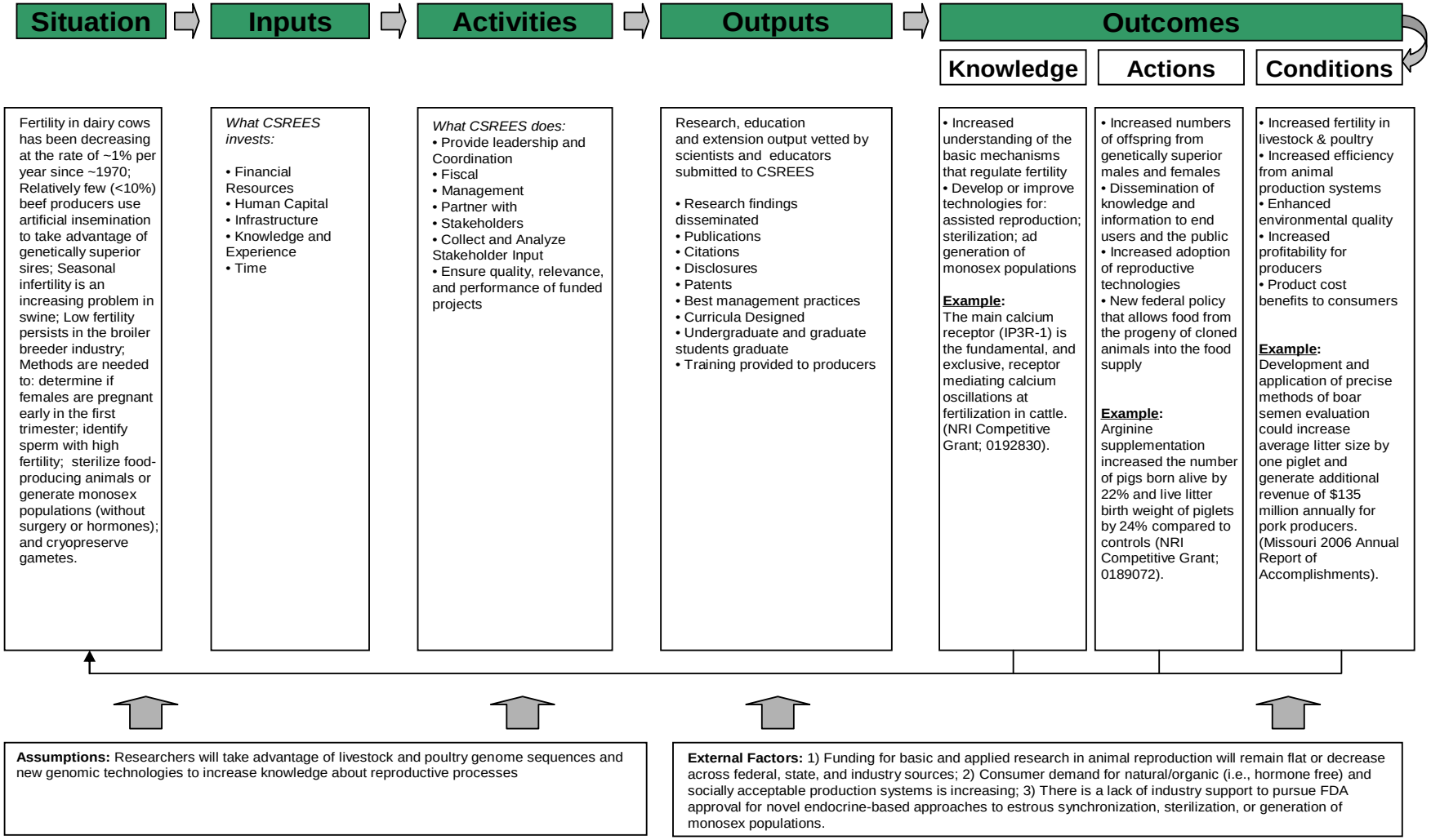
Table V.D. Animal Protection Overall Funding									
(as reported in the Current Research Information System)									
$ in the thousands									
Year	**NO. Proj**	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	1,246	$32,178	$5,477	$30,835	$77,872	$9,073	$9,232	$6,476	$171,141
2001	1,345	$37,474	$5,763	$35,225	$78,200	$9,813	$8,891	$8,430	$183,795
2002	1,391	$42,057	$7,191	$48,658	$73,246	$9,728	$11,778	$9,989	$202,648
2003	1,418	$30,731	$9,065	$61,581	$76,711	$10,816	$15,133	$12,577	$216,619
2004	1,453	$45,107	$8,974	$65,740	$73,177	$9,732	$15,992	$16,622	$235,344
2005	2,020	$39,653	$14,551	$156,128	$137,681	$25,153	$26,025	$37,975	$437,170
2006	1,452	$37,614	$9,075	$83,934	$82,564	$8,483	$18,225	$17,629	$257,524
Total	10,325	$264,814	$60,096	$482,101	$599,451	$82,798	$105,276	$109,698	$1,704,241

Animal Systems (Animal Production and Animal Protection) Funding Tables (continued)

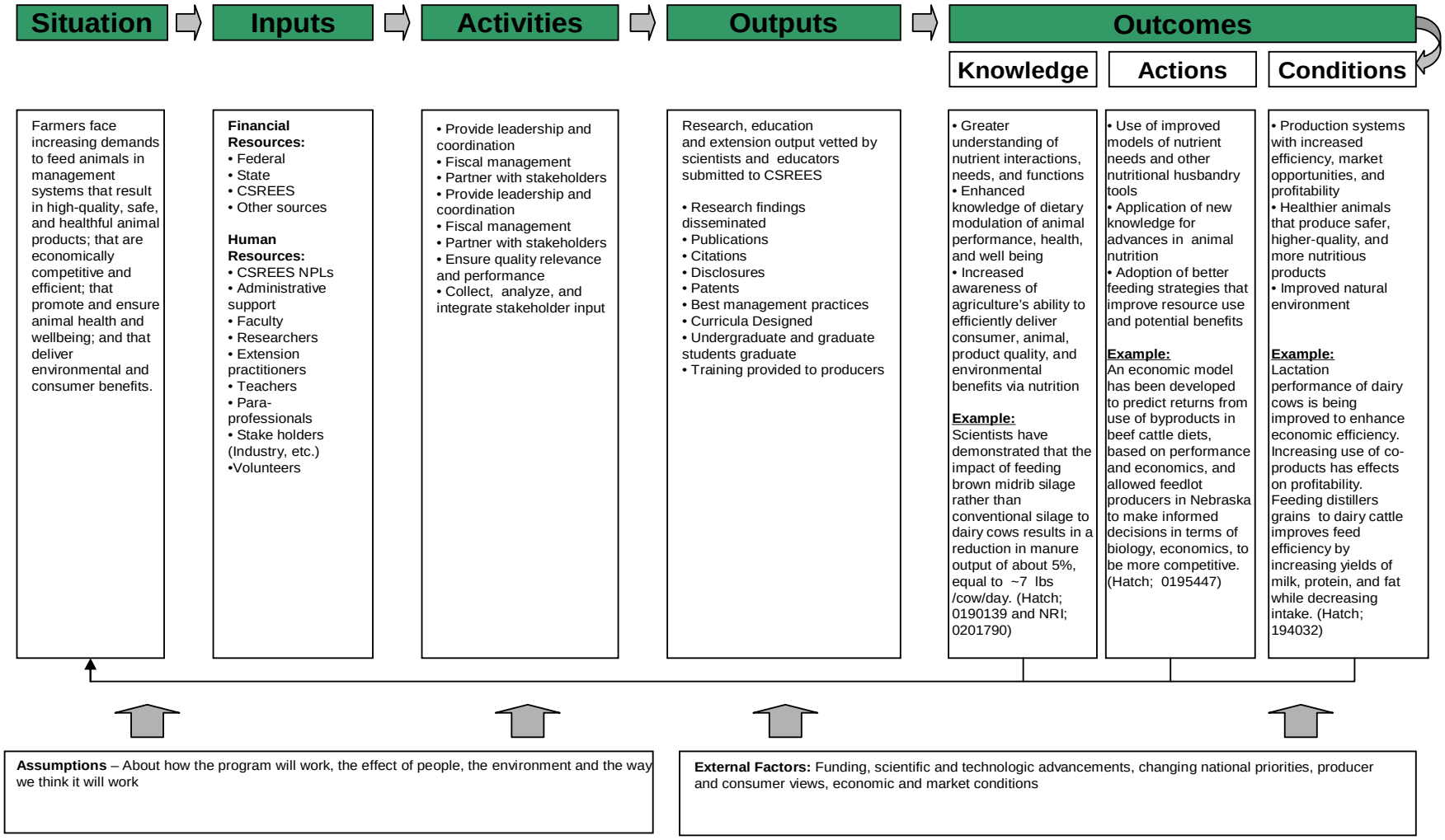
Table V.E.: Animal Production CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	**No. Proj.**	**HATCH**	**MC-STN**	**Evans Allen**	**Animal Health**	**Special Grants**	**NRI Grants**	**SBIR Grants**	**Other CSREES**	**Total CSREES**
2000	2,296	$30,579	$93	$5,795	$455	$3,889	$12,387	$1,303	$14,779	$69,280
2001	2,457	$31,161	$100	$6,607	$614	$6,765	$10,537	$2,861	$19,850	$78,495
2002	2,557	$29,605	$165	$8,140	$696	$7,262	$16,324	$1,554	$5,649	$69,395
2003	2,606	$27,973	$202	$7,685	$693	$10,869	$14,903	$2,308	$6,028	$70,661
2004	2,635	$29,208	$102	$8,405	$425	$11,082	$21,899	$741	$7,003	$78,865
2005	2,693	$28,952	$67	$8,513	$571	$10,535	$22,026	$1,612	$9,510	$81,787
2006	2,627	$28,586	$125	$6,250	$755	$12,417	$24,978	$1,168	$8,864	$83,142
Total	15,244	$177,478	$729	$45,145	$3,454	$50,402	$98,076	$10,379	$62,819	$448,483

Table V.F.: Animal Protection CSREES Funding										
(as reported in the Current Research Information System										
$ in the thousands										
Year	**No. Proj.**	**HATCH**	**MC-STN**	**Evans Allen**	**Animal Health**	**Special Grants**	**NRI Grants**	**SBIR Grants**	**Other CSREES**	**Total CSREES**
2000	1,246	10,089	77	1,402	4,019	2,262	8,242	500	5,589	32,180
2001	1,345	$9,278	$87	$1,323	$3,872	$2,326	$11,362	$890	$8,335	$37,473
2002	1,391	$9,010	$106	$995	$3,697	$3,046	$18,514	$728	$5,963	$42,059
2003	1,418	$8,581	$129	$627	$3,678	$3,803	$8,669	$1,222	$4,022	$30,731
2004	1,453	$8,771	$99	$506	$3,524	$3,035	$21,767	$2,083	$5,318	$45,103
2005	1,501	$8,626	$136	$691	$3,680	$4,252	$15,300	$2,217	$4,755	$39,653
2006	1,452	$9,081	$98	$631	$3,720	$5,308	$12,619	$1,447	$4,709	$37,614
Total	9,806	$63,436	$732	$6,175	$26,190	$24,032	$96,473	$9,087	$38,691	$264,813

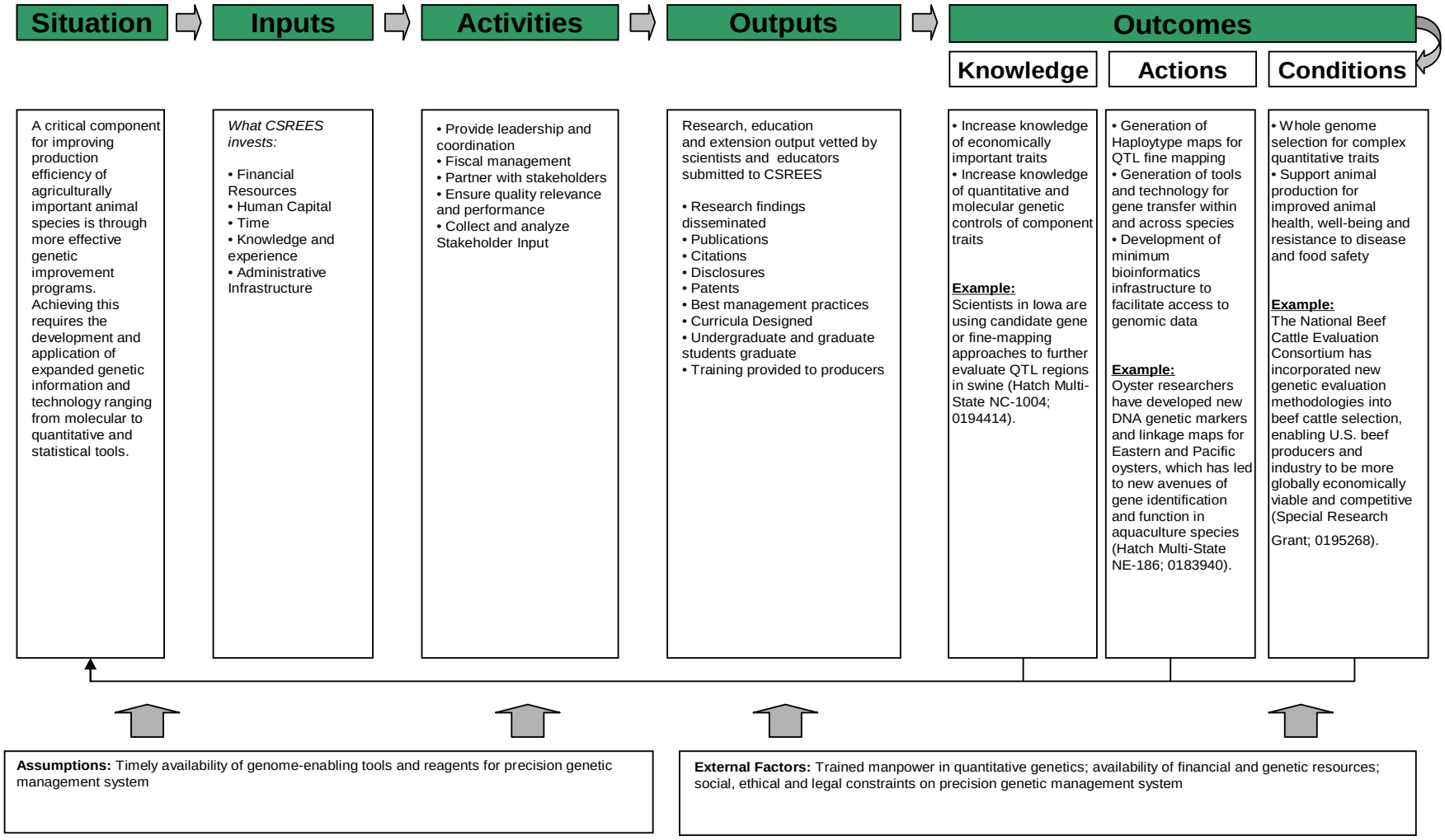
KA 301: Reproductive Performance of Animals



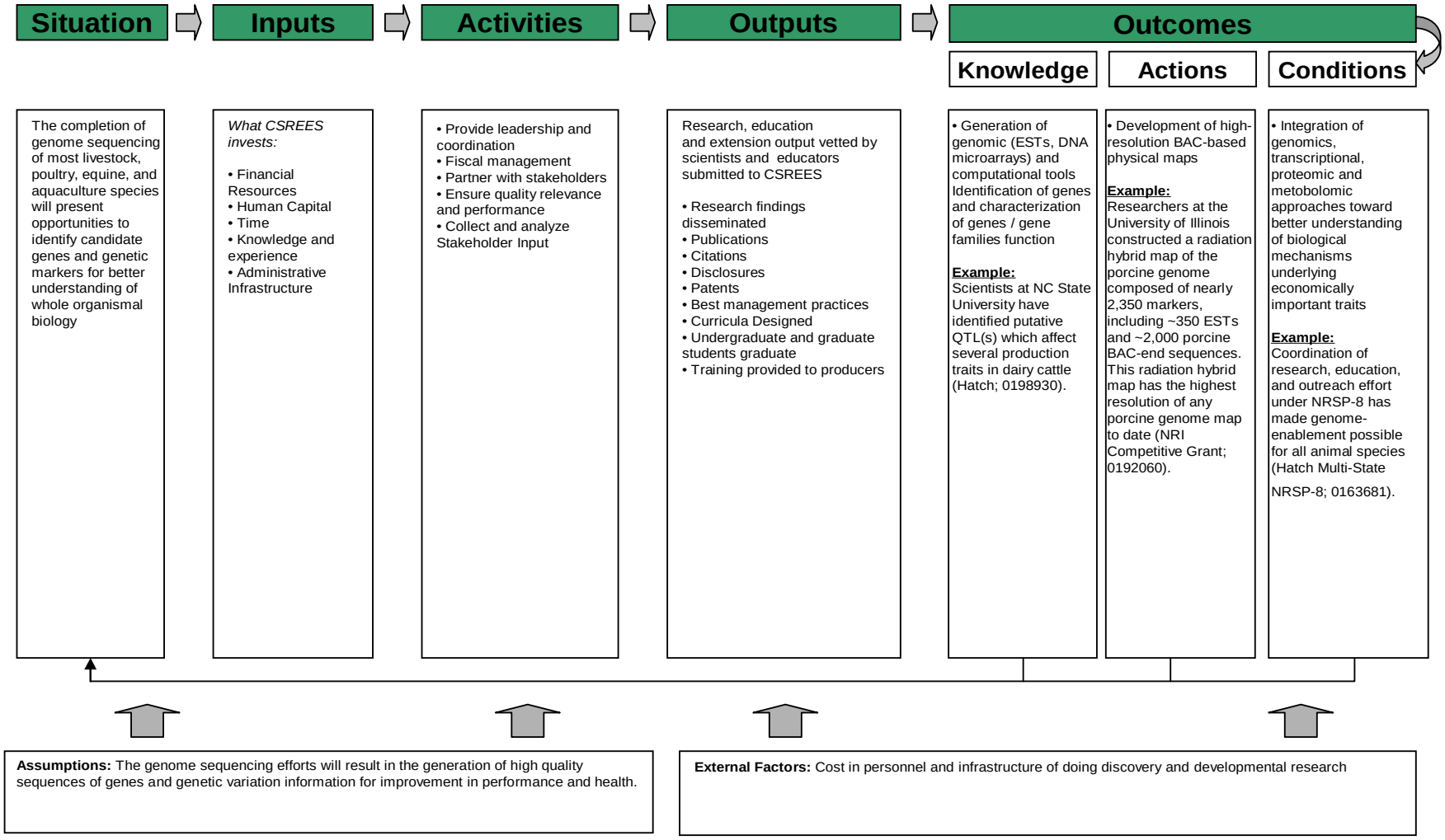
KA 302: Nutrient Utilization in Animals



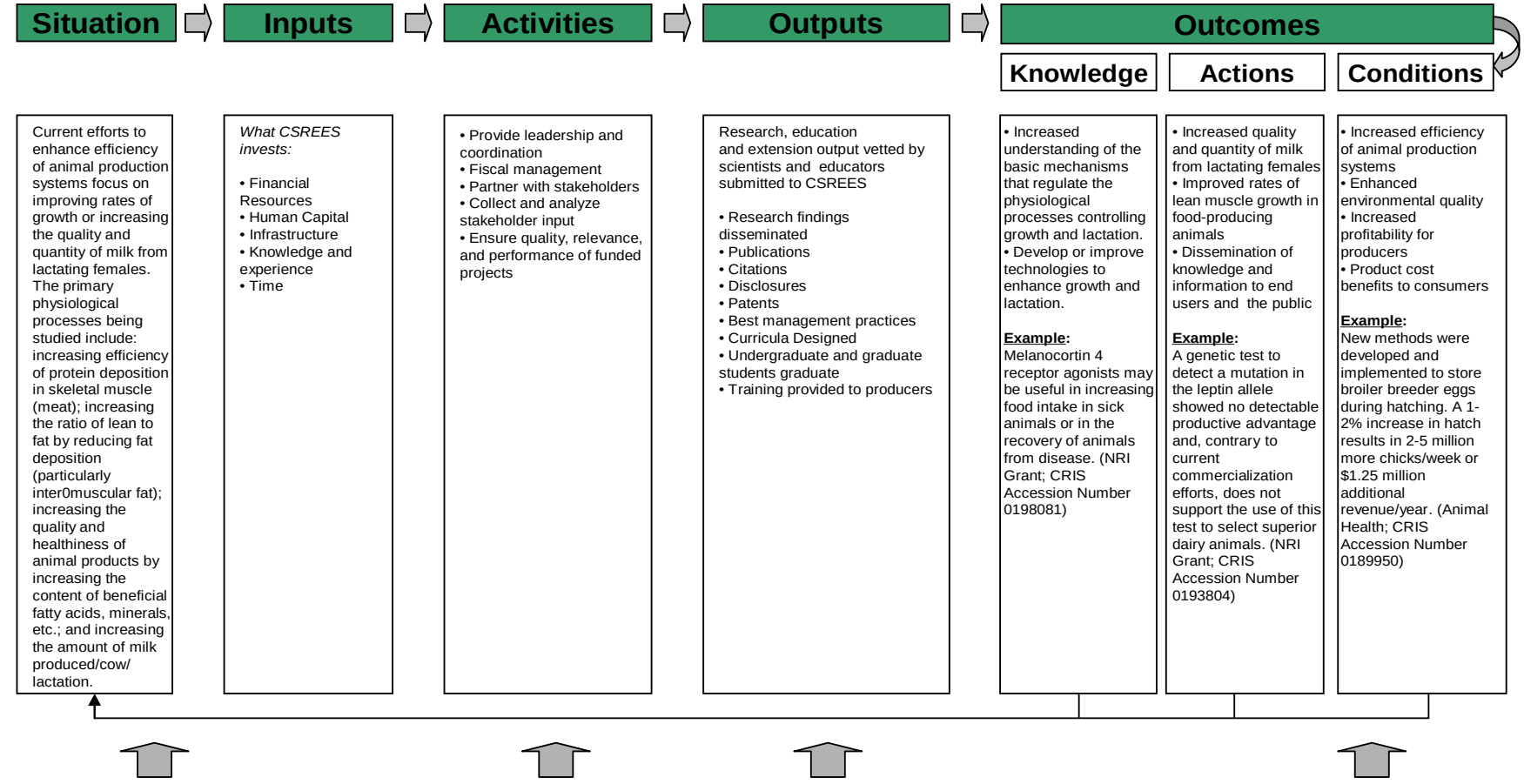
KA 303: Genetic Improvement of Animals



KA 304: Animal Genome



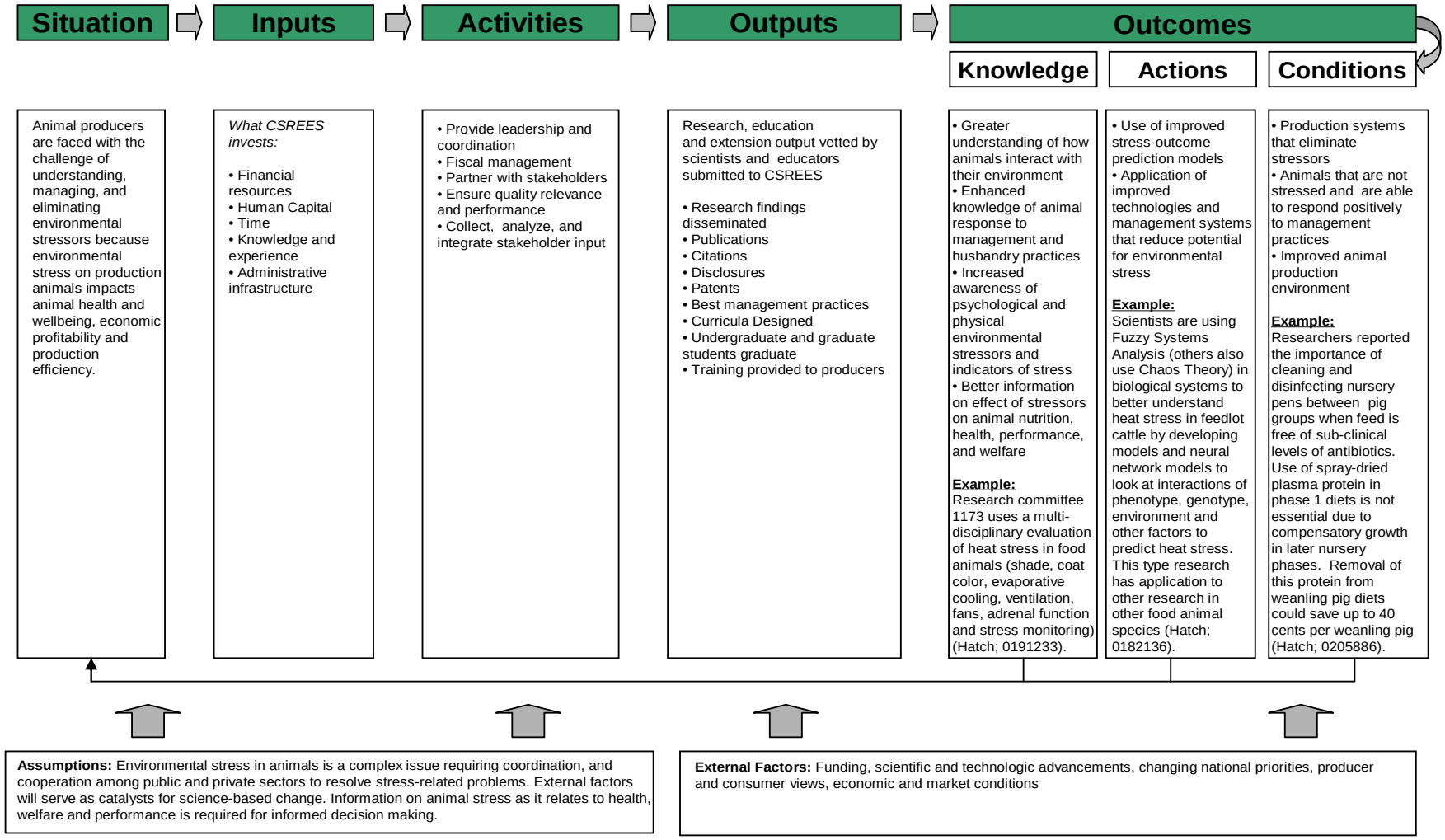
KA 305: Animal Physiological Processes



Assumptions: Researchers will take advantage of livestock and poultry genome sequences and new genomic technologies to increase knowledge about the physiological processes that control growth and lactation.

External Factors: 1) Funding for basic and applied research in animal physiological processes will remain flat or decrease across federal, state, and industry sources; 2) Consumer demand for natural/organic (i.e., hormone free) and socially acceptable production systems is increasing; 3) There is a lack of industry support to pursue FDA approval for novel endocrine-based approaches to enhance growth rates or lactation rates.

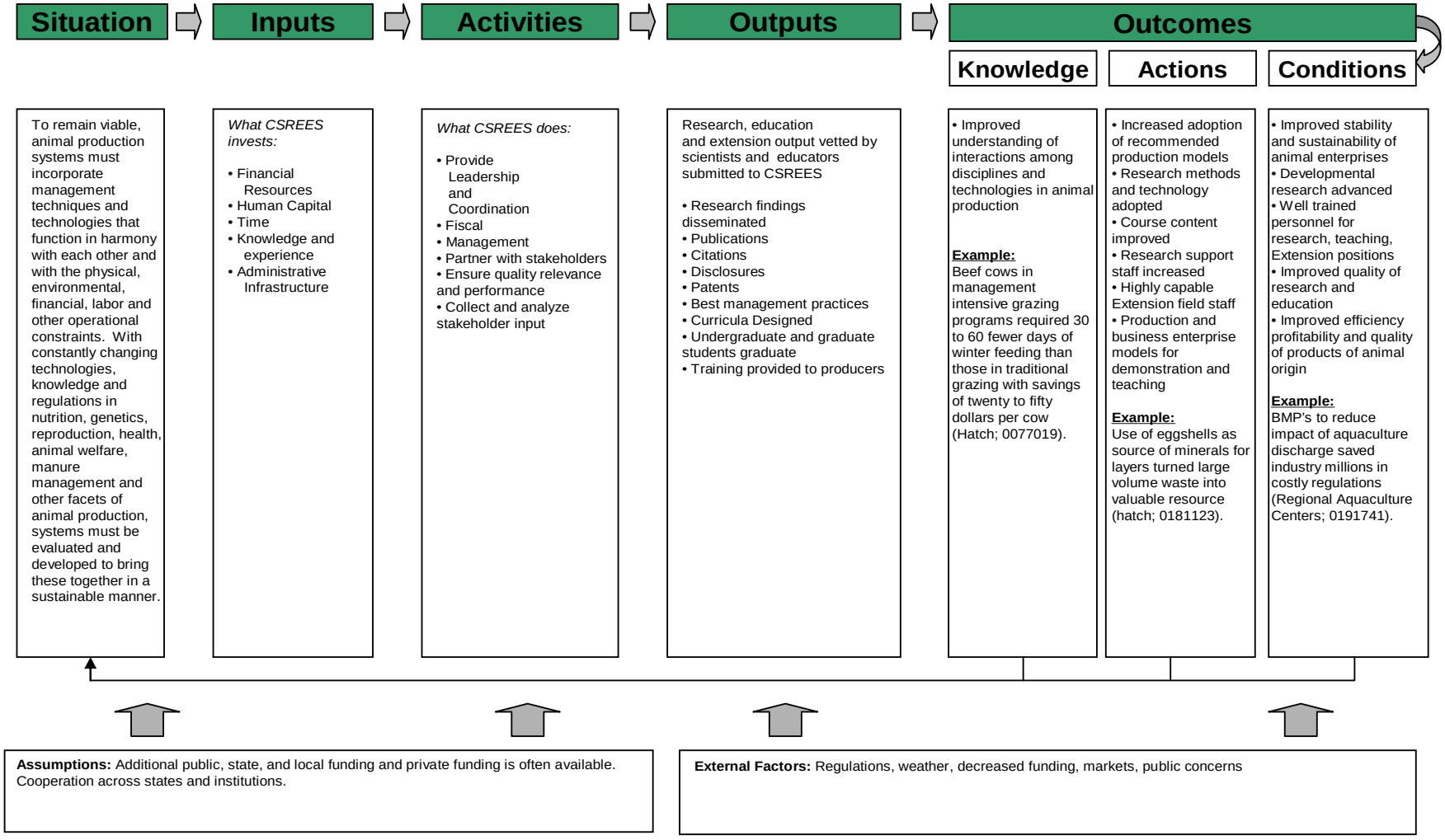
KA 306: Environmental Stress in Animals



Assumptions: Environmental stress in animals is a complex issue requiring coordination, and cooperation among public and private sectors to resolve stress-related problems. External factors will serve as catalysts for science-based change. Information on animal stress as it relates to health, welfare and performance is required for informed decision making.

External Factors: Funding, scientific and technologic advancements, changing national priorities, producer and consumer views, economic and market conditions

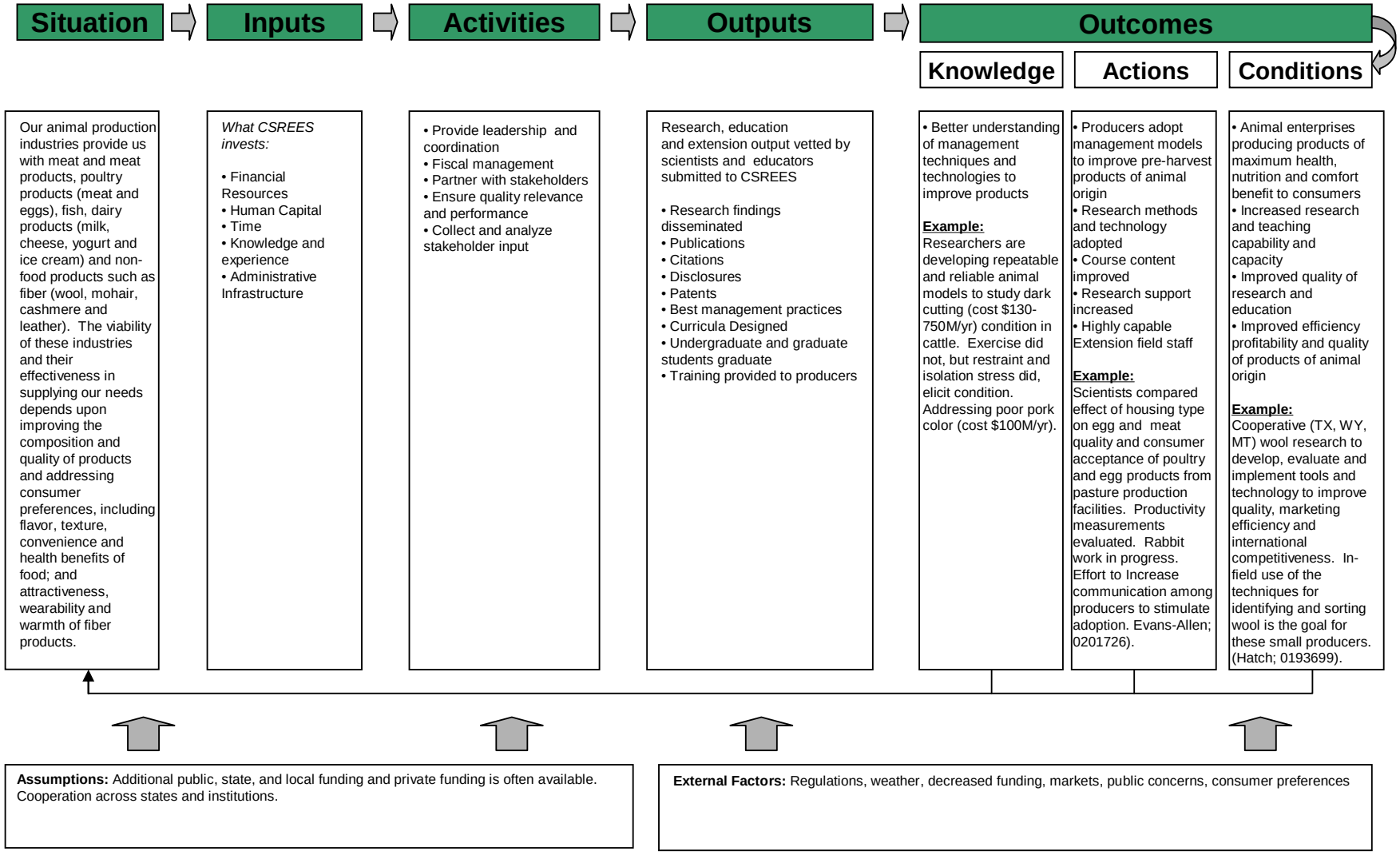
KA 307: Animal Production Management Systems



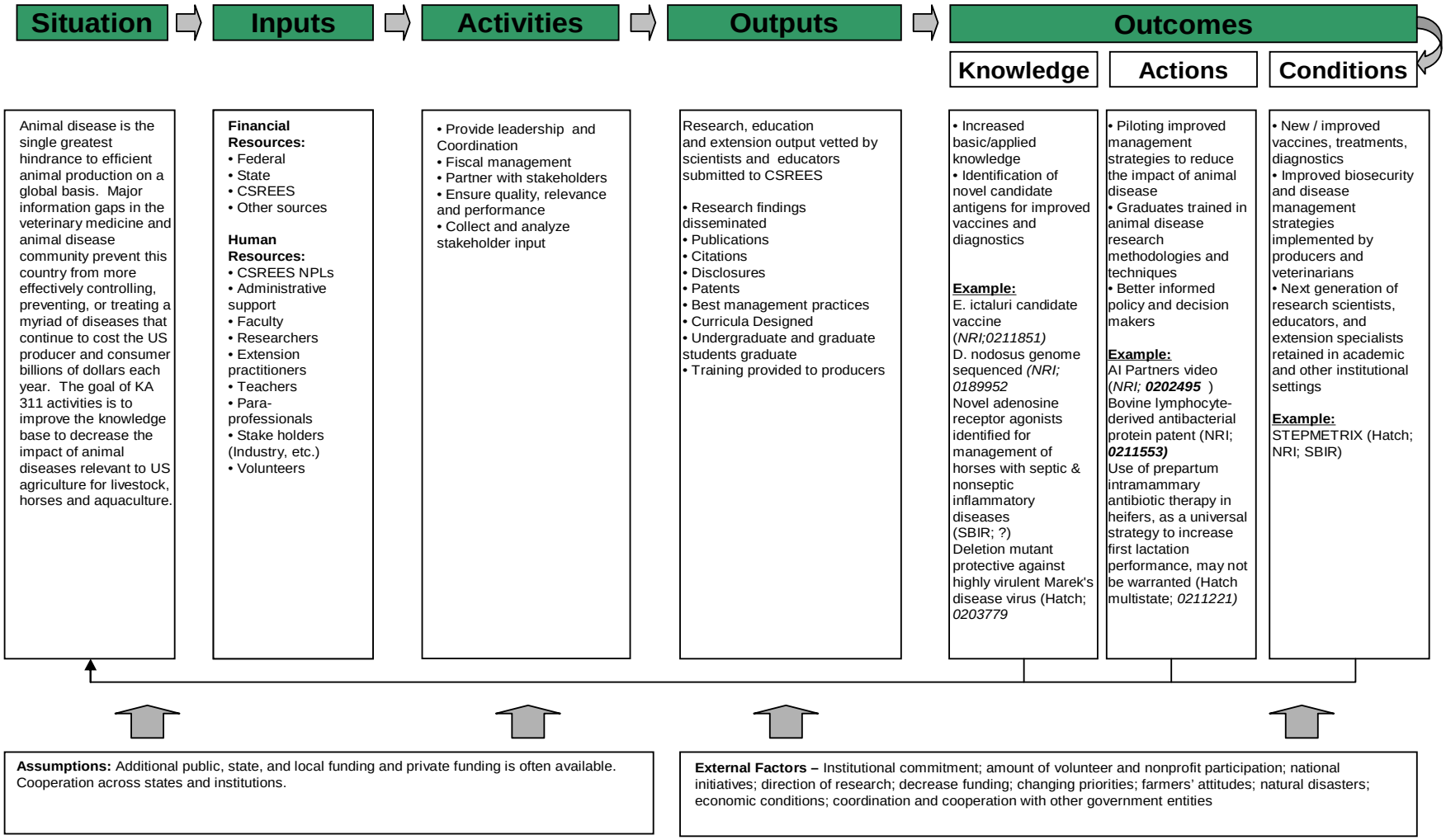
Assumptions: Additional public, state, and local funding and private funding is often available. Cooperation across states and institutions.

External Factors: Regulations, weather, decreased funding, markets, public concerns

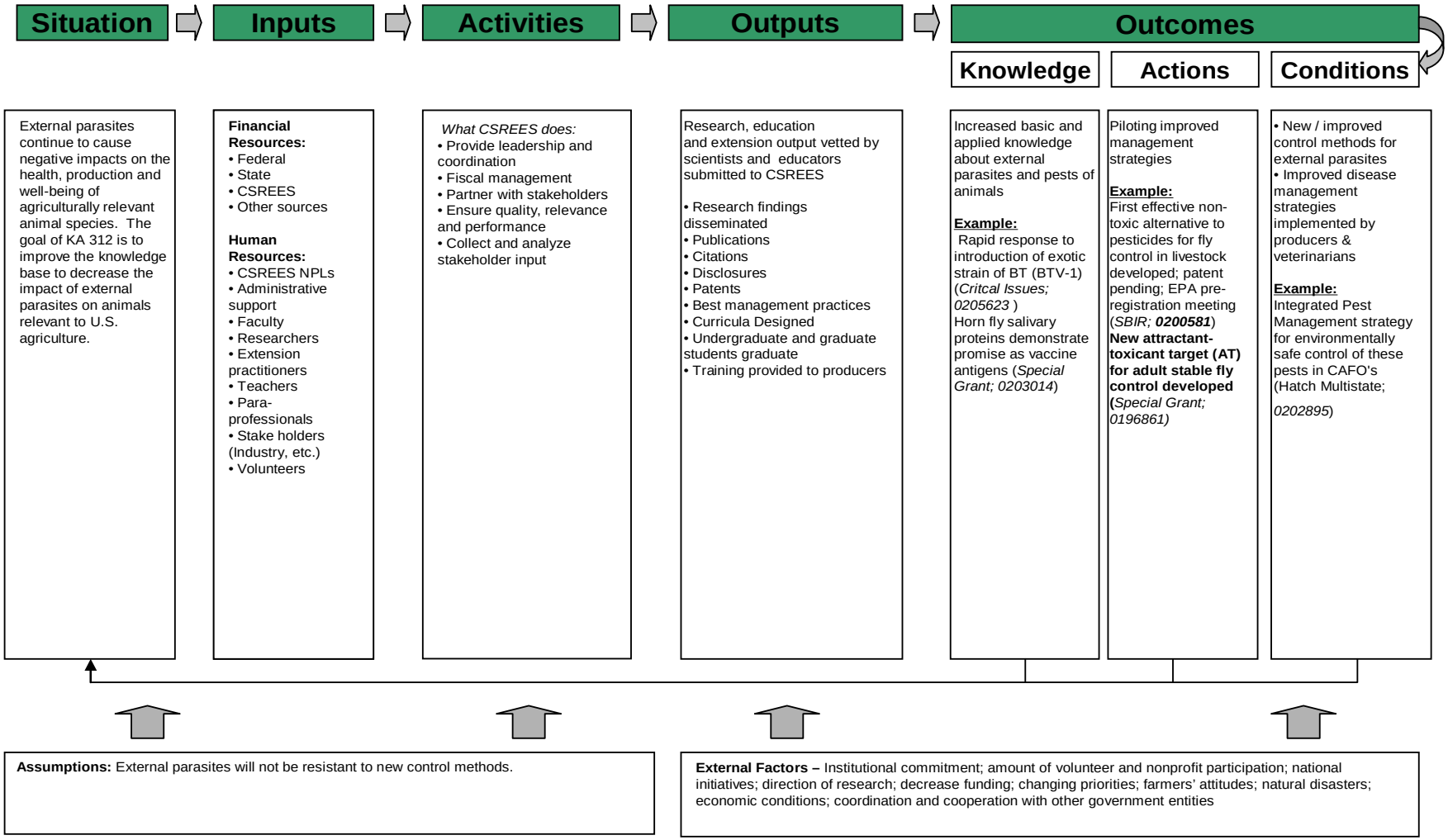
KA 308: Improved Animal Products (Before Harvest)



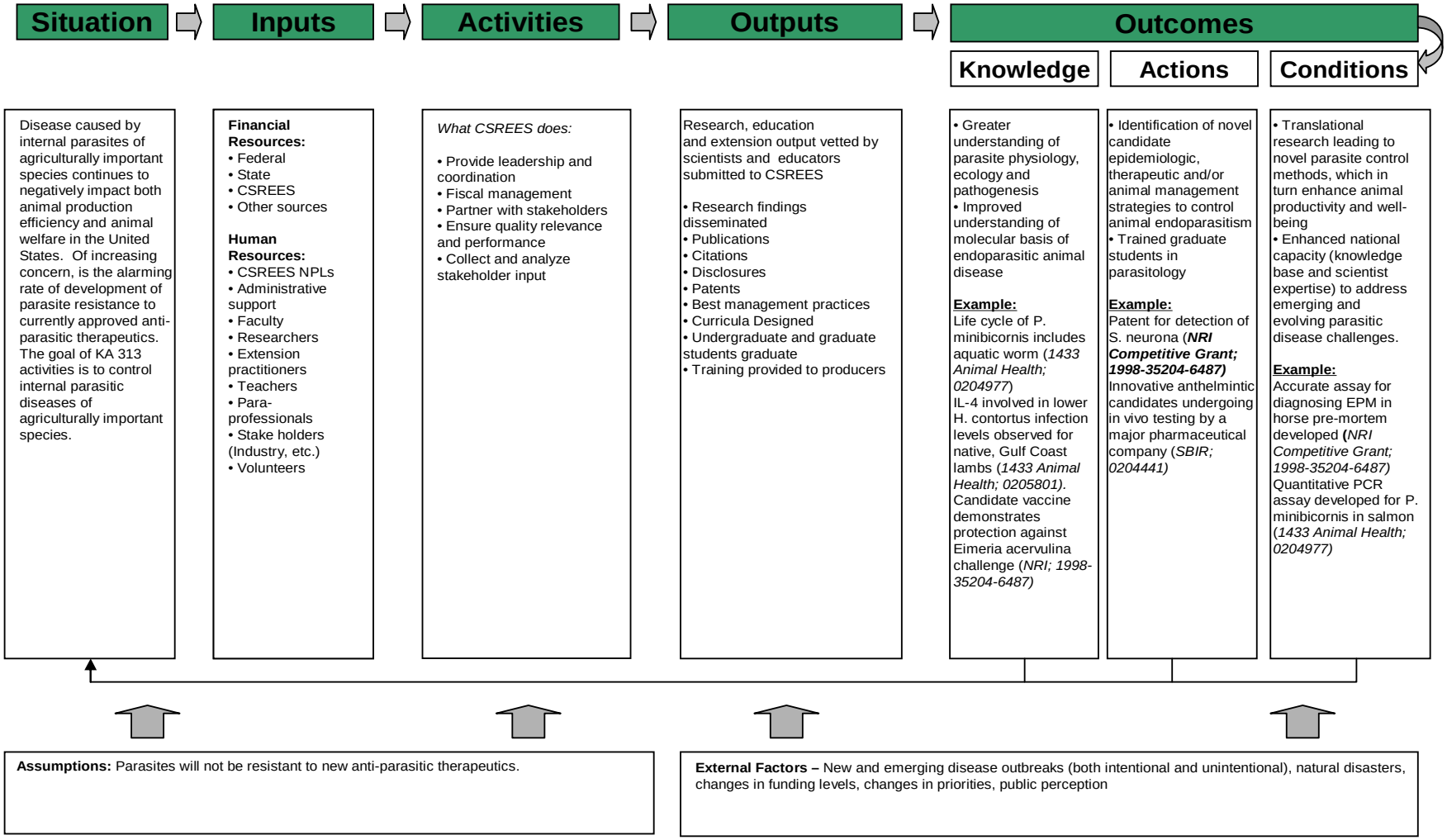
KA 311: Animal Diseases Logic Model



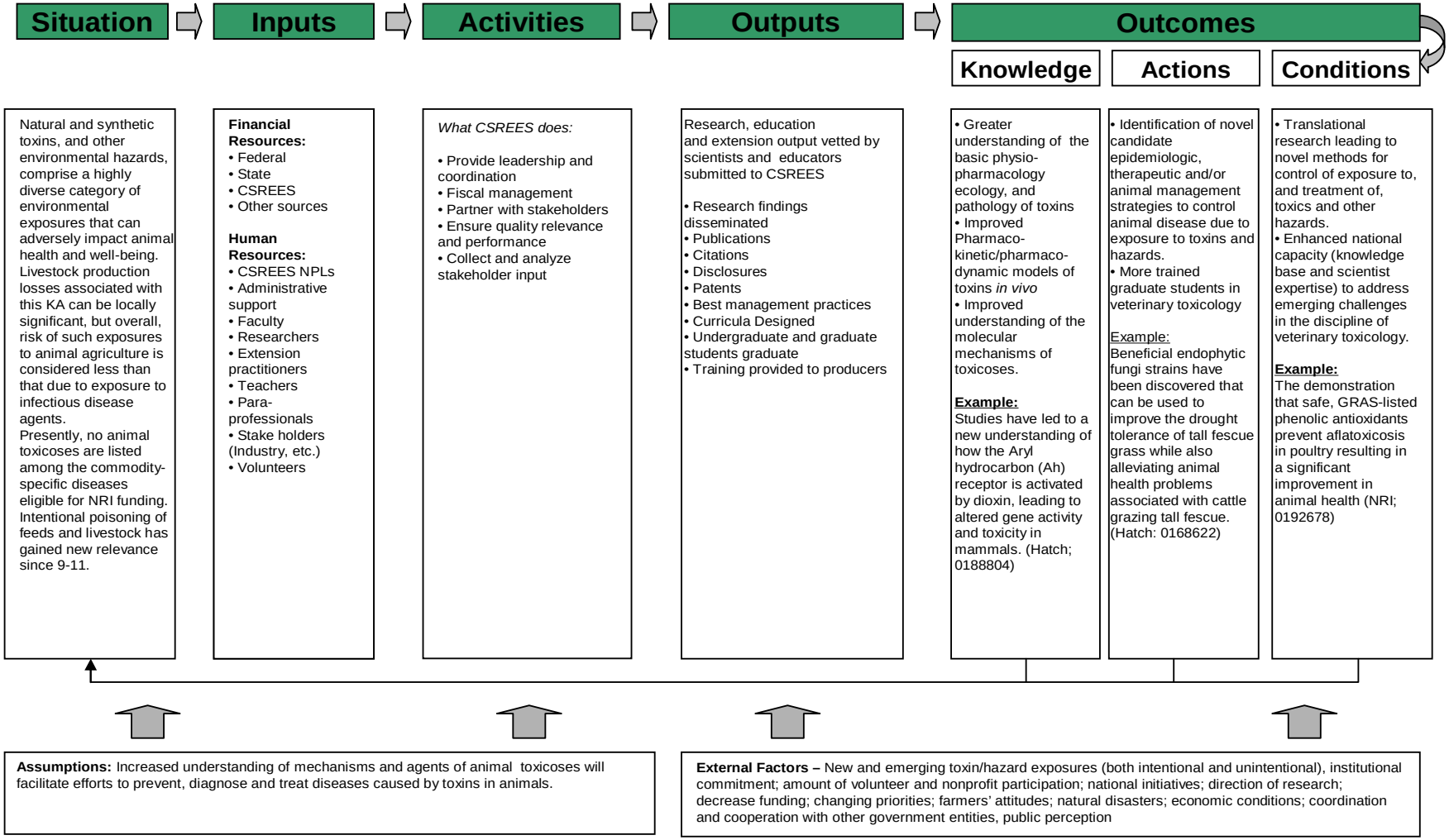
KA 312: External Parasites and Pests of Animals Model



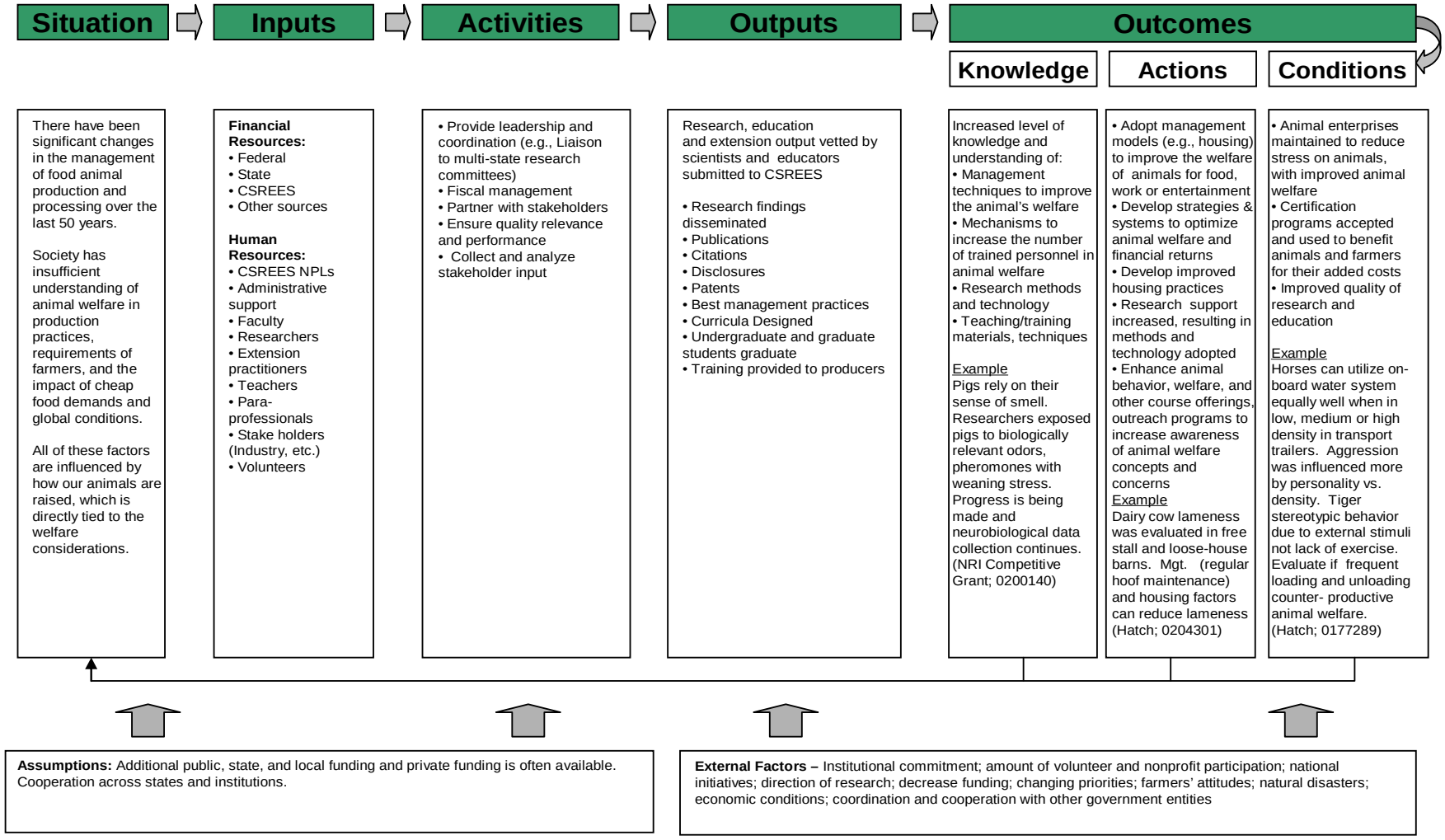
KA 313: Internal Parasites in Animals Logic Model



KA 314: Toxic Chemicals, Poisonous Plants and Naturally Occurring Toxins, and Other Hazards Affecting Animals Logic Model



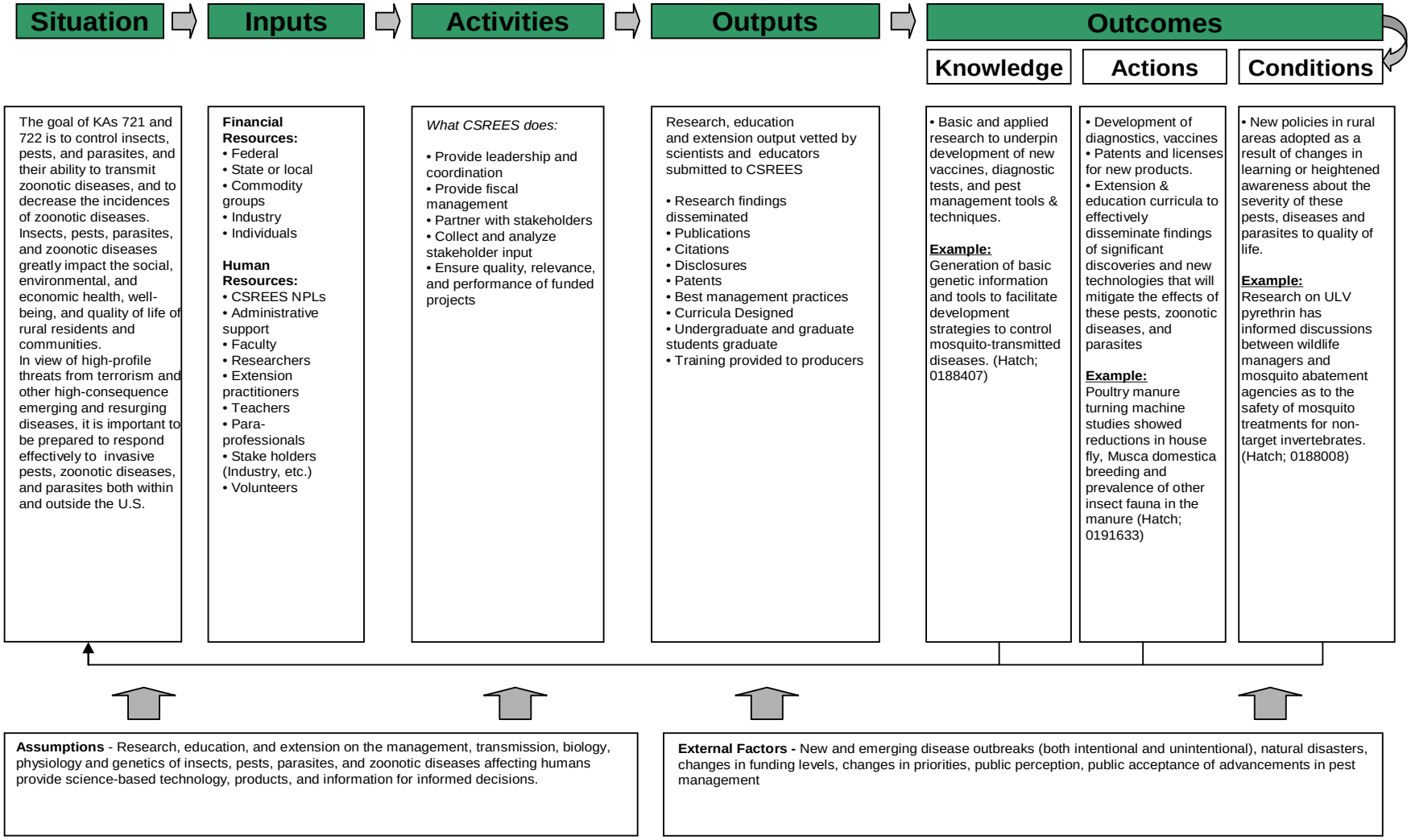
KA 315: Animal Welfare



Assumptions: Additional public, state, and local funding and private funding is often available. Cooperation across states and institutions.

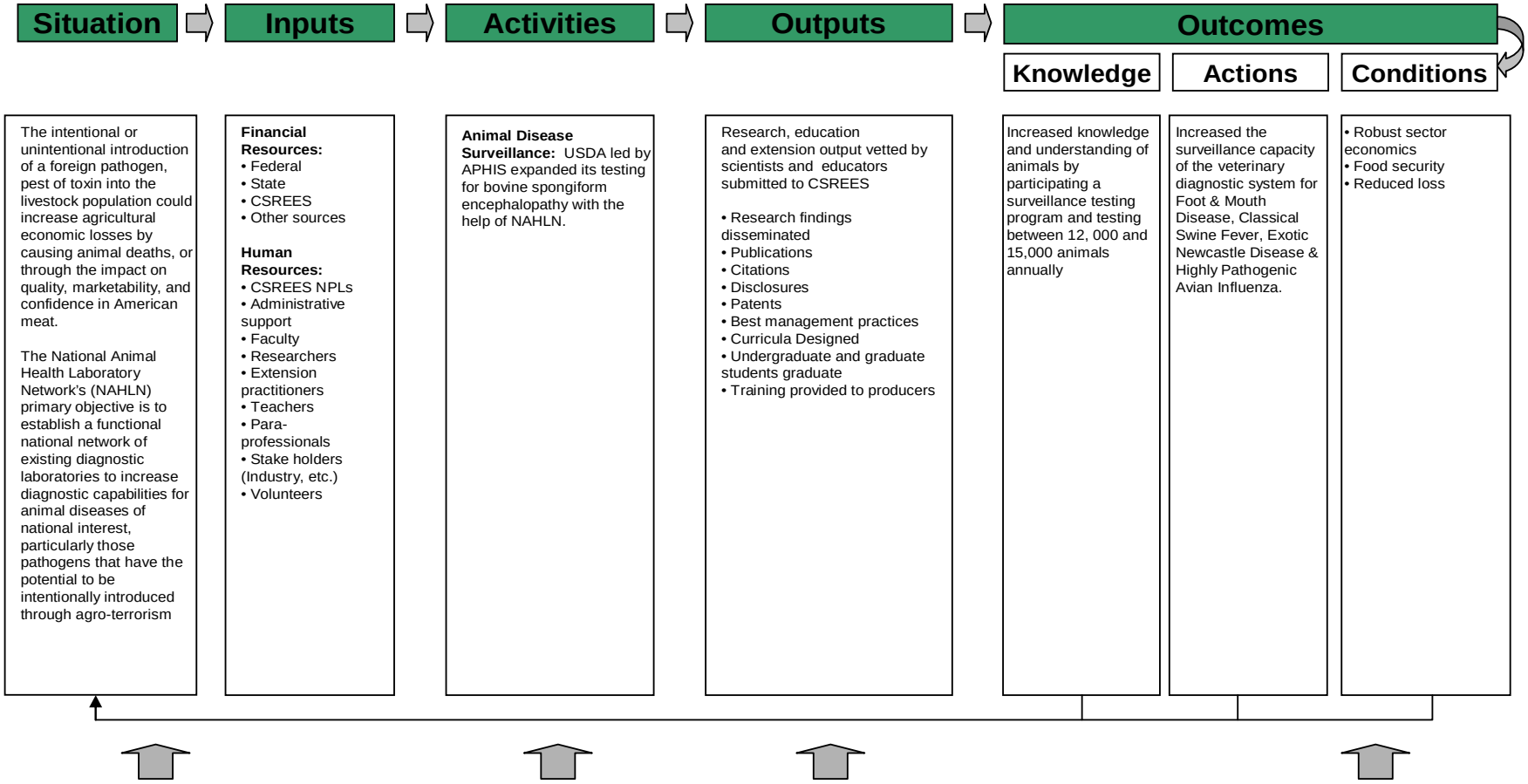
External Factors – Institutional commitment; amount of volunteer and nonprofit participation; national initiatives; direction of research; decrease funding; changing priorities; farmers' attitudes; natural disasters; economic conditions; coordination and cooperation with other government entities

KAs 721 & 722 Pests, Zoonotic Diseases and Parasites Affecting Humans Logic Model

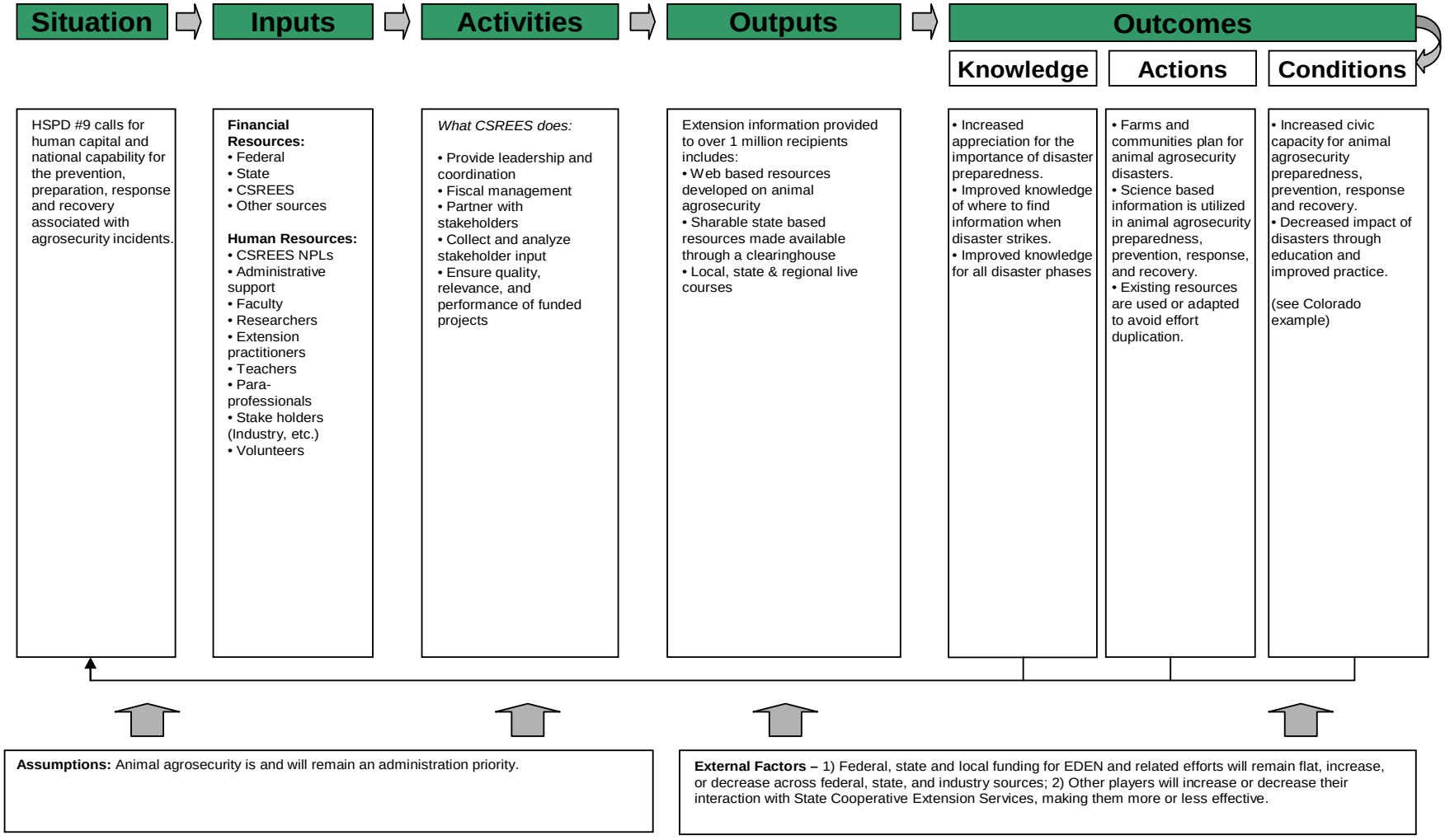


National Animal Health Laboratory Network (NAHLN)

Note: The following activities and outcomes are examples of accomplishments made in KAs 311-314



Extension Disaster Education Network Logic Model



Appendix B: Individual Knowledge Area Data Tables

KNOWLEDGE AREA 301: REPRODUCTIVE PERFORMANCE OF ANIMALS

KA 301: Reproductive Performance of Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	446	$7,404	$0	$1,360	$150	$514	$6,036	$471	$249	$16,184
2001	469	$7,208	$0	$1,534	$117	$493	$2,470	$1,305	$2,172	$15,299
2002	480	$6,484	$0	$2,068	$116	$1,043	$4,894	$376	$702	$15,683
2003	471	$6,503	$68	$1,737	$144	$752	$4,688	$524	$501	$14,917
2004	456	$6,566	$65	$1,551	$137	$1,330	$3,937	$220	$556	$14,362
2005	454	$6,175	$60	$2,054	$186	$1,398	$4,819	$545	$575	$15,811
2006	433	$6,504	$76	$816	$255	$1,986	$3,833	$345	$368	$14,184
Total	3,209	$46,844	$269	$11,120	$1,105	$7,516	$30,677	$3,786	$5,123	$106,440

KA 301: Reproductive Performance of Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	446	$16,184	$555	$3,561	$30,200	$5,410	$4,370	$1,506	$61,786
2001	469	$15,299	$1,269	$4,242	$31,876	$5,135	$4,679	$2,335	$64,835
2002	480	$15,684	$1,257	$6,094	$29,766	$4,606	$5,553	$1,711	$64,670
2003	471	$14,916	$702	$8,387	$33,933	$6,599	$4,048	$2,369	$70,956
2004	456	$14,362	$880	$7,035	$28,059	$6,428	$3,158	$2,502	$62,423
2005	517	$15,811	$2,739	$14,730	$34,119	$13,338	$4,105	$4,211	$89,054
2006	433	$14,184	$1,377	$5,019	$28,818	$7,135	$2,690	$2,703	$61,924
Total:	3,272	$106,440	$8,779	$49,068	$216,771	$48,651	$28,603	$17,337	$475,648

KNOWLEDGE AREA 302: NUTRIENT UTILIZATION IN ANIMALS

KA 302: Nutrient Utilization in Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	419	$7,029	$0	$1,601	$22	$561	$1,138	$0	$3,688	$14,039
2001	448	$7,277	$0	$1,227	$97	$1,061	$585	$410	$5,212	$15,869
2002	460	$7,023	$0	$1,705	$147	$652	$1,282	$136	$710	$11,655
2003	484	$6,905	$0	$1,659	$86	$1,693	$1,583	$413	$980	$13,319
2004	476	$6,865	$7	$1,903	$83	$2,074	$2,231	$145	$860	$14,168
2005	494	$7,199	$5	$1,909	$58	$1,931	$1,695	$335	$1,426	$14,558
2006	478	$7,594	$8	$1,136	$69	$2,309	$2,735	$231	$880	$14,961
Total	3,259	$49,892	$20	$11,140	$562	$10,281	$11,249	$1,670	$13,756	$98,569

KA 302: Nutrient Utilization in Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	419	$14,037	$461	$638	$35,020	$9,302	$4,783	$2,242	$66,482
2001	448	$15,870	$879	$1,192	$39,089	$10,684	$5,962	$2,139	$75,815
2002	460	$11,655	$2,388	$3,952	$37,547	$10,341	$6,324	$2,612	$74,819
2003	484	$13,320	$1,188	$2,486	$35,322	$11,119	$6,671	$2,543	$72,647
2004	476	$14,167	$1,312	$2,713	$35,443	$10,124	$11,394	$2,308	$77,462
2005	552	$14,558	$1,532	$3,704	$39,847	$13,074	$7,659	$3,388	$83,762
2006	478	$14,961	$1,052	$2,883	$35,805	$14,601	$6,861	$3,053	$79,217
Total	3,317	$98,568	$8,812	$17,568	$258,073	$79,245	$49,654	$18,285	$530,204

KNOWLEDGE AREA 303: GENETIC IMPROVEMENT OF ANIMALS

KA 303: Genetic Improvement of Animals CSREES Funding (as reported by the Current Research Information System) $ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	269	$3,679	$0	$327	$20	$544	$579	$308	$1,067	$6,524
2001	268	$3,649	$0	$137	$24	$1,297	$1,341	$492	$1,050	$7,990
2002	284	$3,138	$0	$649	$78	$1,252	$1,418	$490	$1,749	$8,774
2003	288	$2,862	$0	$559	$59	$1,854	$1,349	$436	$1,702	$8,821
2004	292	$3,245	$0	$419	$24	$1,350	$1,239	$40	$2,094	$8,411
2005	292	$3,135	$0	$447	$36	$1,528	$2,224	$168	$2,697	$10,235
2006	293	$3,150	$12	$326	$54	$2,231	$1,372	$219	$2,566	$9,931
Total	1,986	$22,858	$12	$2,864	$295	$10,056	$9,522	$2,153	$12,925	$60,686

KA 303: Genetic Improvement of Animals Overall Funding (as reported by the Current Research Information System) $ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	269	$6,525	$243	$2,849	$20,017	$5,671	$2,245	$1,301	$38,851
2001	268	$7,990	$453	$3,562	$19,829	$5,504	$2,020	$1,498	$40,856
2002	284	$8,774	$764	$3,601	$17,352	$5,572	$2,373	$1,290	$39,726
2003	288	$8,821	$646	$3,959	$16,354	$6,925	$2,390	$1,985	$41,079
2004	292	$8,411	$836	$3,959	$14,682	$5,499	$2,600	$1,919	$37,907
2005	330	$10,235	$981	$8,693	$18,029	$7,435	$3,249	$2,006	$50,628
2006	293	$9,931	$751	$6,117	$18,015	$7,035	$2,460	$1,638	$45,946
Total	2,024	$60,687	$4,674	$32,740	$124,278	$43,641	$17,337	$11,637	$294,993

KNOWLEDGE AREA 304: ANIMAL GENOME

KA 304: Animal Genome CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	PROJ No.	HATCH	MC-STN	EVANS ALLEN	ANIMAL HEALTH	SPECIAL GRANTS	NRI GRANTS	SBIR GRANTS	OTHER CSREES	TOTAL CSREES
2000	130	$1,866	$0	$71	$27	$146	$2,476	$0	$1,938	$6,524
2001	169	$1,903	$0	$20	$201	$240	$2,630	$0	$4,003	$8,997
2002	197	$2,011	$0	$52	$180	$545	$3,409	$0	$0	$6,197
2003	216	$2,300	$0	$56	$190	$563	$2,631	$0	$84	$5,824
2004	248	$2,934	$0	$175	$41	$797	$11,331	$0	$7	$15,285
2005	261	$2,991	$0	$309	$96	$906	$7,908	$0	$400	$12,609
2006	265	$2,353	$0	$312	$78	$1,261	$9,902	$80	$155	$14,141
Total	1,486	$16,358	$0	$995	$813	$4,458	$40,287	$80	$6,587	$69,577

KA 304: Animal Genome Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	130	$6,524	$184	$2,555	$6,228	$1,147	$1,006	$344	$17,988
2001	169	$8,998	$684	$2,325	$6,914	$1,101	$1,021	$569	$21,611
2002	197	$6,196	$776	$3,286	$8,689	$1,357	$1,453	$638	$22,395
2003	216	$5,825	$985	$4,182	$9,779	$1,494	$1,357	$719	$24,339
2004	248	$15,285	$970	$4,376	$12,027	$3,719	$2,668	$1,590	$40,636
2005	289	$12,609	$1,040	$9,182	$13,599	$4,592	$4,026	$4,852	$49,901
2006	265	$14,141	$1,096	$7,675	$15,263	$4,403	$2,807	$1,298	$46,683
Total	1,514	$69,578	$5,735	$33,581	$72,499	$17,813	$14,338	$10,010	$223,553

KNOWLEDGE AREA 305: ANIMAL PHYSIOLOGICAL PROCESSES

KA 305: Animal Physiological Processes CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	482	$4,971	$93	$342	$160	$147	$1,784	$240	$683	$8,420
2001	484	$4,910	$100	$983	$107	$217	$1,978	$0	$136	$8,431
2002	479	$4,809	$165	$1,411	$89	$377	$3,881	$80	$26	$10,838
2003	448	$4,220	$134	$1,542	$130	$597	$4,382	$371	$26	$11,402
2004	434	$3,953	$30	$1,859	$83	$673	$1,928	$16	$90	$8,632
2005	430	$3,410	$0	$1,265	$99	$398	$4,163	$0	$260	$9,595
2006	423	$3,586	$1	$739	$173	$309	$3,403	$0	$170	$8,381
Total	3,180	$29,859	$523	$8,141	$841	$2,718	$21,519	$707	$1,391	$65,699

KA 305: Animal Physiological Processes Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	482	$8,419	$513	$11,902	$29,895	$3,292	$3,024	$1,696	$58,741
2001	484	$8,430	$671	$12,216	$29,811	$3,264	$3,866	$2,264	$60,521
2002	479	$10,838	$938	$13,901	$29,189	$3,181	$3,808	$1,864	$63,718
2003	448	$11,402	$554	$16,760	$22,972	$3,307	$4,012	$2,005	$61,012
2004	434	$8,632	$945	$20,717	$21,327	$2,410	$4,054	$1,924	$60,009
2005	550	$9,595	$776	$46,504	$31,273	$4,727	$5,692	$3,571	$102,138
2006	423	$8,381	$499	$18,072	$25,080	$2,764	$3,189	$1,341	$59,326
Total	3,300	$65,697	$4,896	$140,072	$189,547	$22,945	$27,645	$14,665	$465,465

KNOWLEDGE AREA 306: ENVIRONMENTAL STRESS IN ANIMALS

KA 306: Environmental Stress in Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	113	$1,143	$0	$393	$21	$0	$204	$0	$233	$1,994
2001	126	$1,129	$0	$549	$46	$66	$201	$0	$1,877	$3,868
2002	136	$1,059	$0	$0	$31	$355	$1,025	$80	$0	$2,550
2003	149	$1,014	$0	$0	$15	$190	$141	$0	$0	$1,360
2004	159	$1,086	$0	$0	$24	$1,030	$0	$24	$0	$2,164
2005	150	$1,351	$0	$0	$13	$315	$341	$187	$41	$2,248
2006	141	$968	$26	$27	$39	$210	$183	$0	$483	$1,935
Total	974	$7,750	$26	$969	$189	$2,166	$2,095	$291	$2,634	$16,119

KA 306: Environmental Stress in Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	113	$1,995	$272	$672	$6,815	$1,251	$880	$566	$12,451
2001	126	$3,869	$268	$714	$5,918	$1,251	$1,014	$381	$13,416
2002	136	$2,550	$380	$955	$7,426	$1,490	$1,359	$416	$14,575
2003	149	$1,359	$630	$1,475	$8,016	$1,302	$1,576	$750	$15,108
2004	159	$2,163	$850	$2,338	$7,758	$1,611	$1,455	$1,287	$17,461
2005	171	$2,248	$881	$2,954	$7,213	$2,035	$1,049	$1,198	$17,578
2006	141	$1,935	$922	$1,475	$7,358	$2,180	$1,489	$1,231	$16,590
Total	995	$16,119	$4,203	$10,583	$50,504	$11,120	$8,822	$5,829	$107,179

KNOWLEDGE AREA 307: ANIMAL PRODUCTION MANAGEMENT SYSTEMS

KA 307: Animal Production Management System CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	319	$3,564	$0	$1,423	$51	$1,935	$0	$284	$3,873	$11,130
2001	360	$3,909	$0	$1,656	$14	$3,334	$436	$654	$4,929	$14,932
2002	384	$4,006	$0	$2,157	$44	$2,841	$390	$376	$2,331	$12,145
2003	404	$3,221	$0	$2,014	$49	$4,810	$100	$414	$2,529	$13,137
2004	425	$3,488	$0	$2,354	$11	$2,639	$1,228	$296	$3,202	$13,218
2005	465	$3,565	$2	$2,389	$41	$2,887	$621	$317	$3,902	$13,726
2006	438	$3,473	$2	$2,716	$27	$3,367	$1,050	$261	$3,552	$14,447
Total	2,795	$25,226	$4	$14,709	$237	$21,813	$3,825	$2,602	$24,318	$92,735

KA 307: Animal Production Management System Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	319	$11,129	$555	$649	$16,505	$5,891	$1,066	$1,370	$37,165
2001	360	$14,933	$708	$1,111	$17,156	$6,765	$1,198	$1,053	$42,925
2002	384	$12,146	$598	$1,604	$18,932	$7,101	$1,327	$1,195	$42,903
2003	404	$13,138	$553	$1,239	$17,338	$5,679	$1,347	$1,613	$40,907
2004	425	$13,218	$433	$1,282	$19,422	$9,519	$1,432	$2,211	$47,518
2005	527	$13,726	$3,414	$5,382	$25,471	$7,226	$1,821	$2,887	$59,927
2006	438	$14,447	$506	$1,251	$17,961	$4,006	$1,876	$1,653	$41,701
Total	2,857	$92,737	$6,767	$12,518	$132,785	$46,187	$10,067	$11,982	$313,046

KNOWLEDGE AREA 308: IMPROVED ANIMAL PRODUCTS (BEFORE HARVEST)

KA 308: Improved Animal Products (Before Harvest) CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	118	$923	$0	$278	$4	$42	$170	$0	$3,048	$4,465
2001	133	$1,176	$0	$501	$8	$57	$896	$0	$471	$3,109
2002	137	$1,075	$0	$98	$11	$197	$25	$16	$131	$1,553
2003	146	$948	$0	$118	$20	$410	$29	$150	$206	$1,881
2004	145	$1,071	$0	$144	$22	$1,189	$5	$0	$194	$2,625
2005	147	$1,126	$0	$140	$42	$1,172	$255	$60	$209	$3,005
2006	156	$958	$0	$178	$60	$744	$2,500	$32	$690	$5,162
Total	982	$7,277	$0	$1,457	$167	$3,811	$3,880	$258	$4,949	$21,800

KA 308: Improved Animal Products (Before Harvest) Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	118	$4,465	$65	$312	$4,762	$846	$736	$185	$11,371
2001	133	$3,109	$161	$159	$5,826	$843	$525	$330	$10,952
2002	137	$1,553	$210	$365	$4,939	$1,052	$774	$358	$9,252
2003	146	$1,882	$280	$697	$5,030	$1,293	$913	$515	$10,609
2004	145	$2,624	$310	$834	$5,386	$1,587	$953	$579	$12,272
2005	160	$3,005	$408	$972	$5,621	$1,216	$752	$720	$12,693
2007	156	$5,162	$103	$689	$3,987	$1,131	$827	$981	$12,880
Total	995	$21,800	$1,537	$4,028	$35,551	$7,968	$5,480	$3,668	$80,029

KNOWLEDGE AREA 311: ANIMAL DISEASES

KA 311: Animal Diseases CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	795	$5,788	$0	$1,104	$3,250	$1,390	$6,840	$0	$5,305	$23,677
2001	840	$5,725	$0	$1,125	$3,230	$1,923	$6,260	$536	$5,222	$24,021
2002	840	$5,768	$0	$778	$3,066	$2,318	$14,571	$434	$5,219	$32,154
2003	816	$5,045	$0	$557	$2,850	$2,874	$6,548	$746	$3,043	$21,663
2004	823	$5,082	$0	$197	$2,736	$1,808	$19,819	$1,031	$3,954	$34,627
2005	810	$4,974	$0	$132	$2,867	$3,048	$11,152	$874	$3,250	$26,296
2006	776	$5,100	$0	$134	$2,891	$3,838	$8,936	$775	$4,031	$25,707
Total	5,700	$37,482	$0	$4,027	$20,890	$17,199	$74,126	$4,396	$30,024	$188,145

KA 311: Animal Diseases Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	795	$23,677	$4,202	$23,463	$50,798	$7,084	$5,355	$4,703	$119,281
2001	840	$24,022	$4,445	$26,080	$53,925	$7,900	$5,402	$6,600	$128,374
2002	840	$32,154	$5,013	$35,021	$48,640	$7,741	$8,080	$8,553	$145,203
2003	816	$21,662	$6,510	$46,292	$46,945	$8,449	$10,548	$10,335	$150,741
2004	823	$34,627	$6,470	$48,348	$45,610	$7,799	$9,179	$13,590	$165,623
2005	1,119	$26,296	$11,329	$113,649	$97,391	$21,750	$19,895	$28,701	$319,011
2006	776	$25,707	$6,764	$60,470	$47,863	$5,737	$11,233	$14,985	$172,760
Total	6,009	$188,145	$44,733	$353,323	$391,172	$66,460	$69,692	$87,467	$1,200,993

KNOWLEDGE AREA 312: EXTERNAL PARASITES IN ANIMALS

KA 312: External Parasites and Pests of Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	90	$1,121	$0	$0	$157	$165	$405	$260	$17	$2,125
2001	83	$798	$0	$0	$181	$63	$491	$272	$450	$2,255
2002	83	$678	$0	$0	$128	$350	$0	$112	$190	$1,458
2003	99	$790	$0	$0	$185	$280	$567	$371	$456	$2,649
2004	109	$1,071	$0	$0	$200	$497	$3	$661	$292	$2,724
2005	118	$971	$0	$0	$314	$432	$678	$160	$0	$2,555
2006	108	$1,045	$0	$0	$221	$443	$364	$376	$187	$2,636
Total	690	$6,474	$0	$0	$1,386	$2,230	$2,508	$2,212	$1,592	$16,402

KA 312: External Parasites and Pests of Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	90	$2,124	$66	$785	$3,904	$350	$479	$637	$8,346
2001	83	$2,254	$65	$652	$3,344	$443	$394	$434	$7,585
2002	83	$1,459	$338	$1,289	$3,528	$508	$344	$184	$7,649
2003	99	$2,649	$274	$981	$3,489	$302	$415	$231	$8,342
2004	109	$2,724	$298	$1,101	$3,644	$292	$479	$241	$8,779
2005	135	$2,555	$264	$2,751	$4,208	$535	$491	$682	$11,487
2006	108	$2,636	$388	$1,068	$4,086	$620	$422	$430	$9,650
Total	707	$16,401	$1,693	$8,627	$26,203	$3,050	$3,024	$2,839	$61,838

KNOWLEDGE AREA 313: INTERNAL PARASITES IN ANIMALS

KA 313: Internal Parasites in Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	75	$425	$0	$120	$240	$8	$373	$0	$17	$1,183
2001	80	$341	$0	$0	$191	$160	$1,686	$0	$180	$2,558
2002	88	$420	$0	$0	$154	$133	$306	$0	$248	$1,261
2003	86	$415	$0	$0	$269	$171	$774	$0	$0	$1,629
2004	96	$359	$0	$295	$264	$112	$699	$80	$102	$1,911
2005	105	$225	$0	$559	$191	$97	$202	$296	$574	$2,144
2006	95	$156	$0	$497	$208	$125	$893	$0	$0	$1,879
Total	625	$2,341	$0	$1,471	$1,517	$806	$4,933	$376	$1,121	$12,565

KA 313: Internal Parasites in Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	75	$1,183	$50	$663	$4,200	$185	$1,086	$148	$7,513
2001	80	$2,558	$124	$988	$3,495	$106	$486	$284	$8,040
2002	88	$1,261	$183	$1,341	$3,670	$152	$702	$207	$7,515
2003	86	$1,630	$290	$738	$4,105	$114	$676	$199	$7,752
2004	96	$1,912	$220	$1,356	$4,187	$146	$801	$169	$8,791
2005	129	$2,144	$389	$3,556	$5,534	$386	$1,056	$457	$13,522
2006	95	$1,879	$239	$1,692	$3,909	$125	$709	$139	$8,693
Total	649	$12,567	$1,495	$10,334	$29,100	$1,214	$5,516	$1,603	$61,826

KNOWLEDGE AREA 314: TOXIC CHEMICALS, POISONOUS PLANTS AND NATURALLY OCCURRING TOXINS AND OTHER HAZARDS AFFECTING ANIMALS

KA 314: Toxic Chemicals, Poisonous Plants and Naturally Occurring Toxins and Other Hazards Affecting Animals CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	94	$1,263	$69	$147	$235	$108	$108	$240	$75	$2,245
2001	116	$939	$76	$198	$143	$11	$384	$47	$1,088	$2,886
2002	115	$758	$103	$217	$149	$0	$380	$182	$0	$1,789
2003	122	$807	$94	$70	$125	$102	$30	$0	$221	$1,449
2004	111	$689	$59	$14	$72	$0	$4	$71	$0	$909
2005	113	$606	$85	$0	$96	$15	$0	$0	$58	$860
2006	106	$587	$65	$0	$74	$0	$0	$0	$228	$954
Total	777	$5,649	$551	$646	$894	$236	$906	$540	$1,670	$11,092

KA 314: Toxic Chemicals, Poisonous Plants and Naturally Occurring Toxins and Other Hazards Affecting Animals Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	94	$2,244	$103	$3,597	$9,147	$671	$778	$229	$16,770
2001	116	$2,887	$380	$4,131	$7,380	$533	$1,177	$516	$17,004
2002	115	$1,788	$922	$5,975	$6,403	$313	$1,064	$384	$16,851
2003	122	$1,449	$905	$7,234	$8,779	$863	$1,547	$437	$21,215
2004	111	$911	$936	$6,530	$7,338	$536	$2,999	$597	$19,847
2005	145	$860	$1,221	$12,603	$11,258	$1,087	$1,860	$1,266	$30,156
2006	106	$954	$572	$8,020	$7,375	$601	$2,482	$596	$20,600
Total	809	$11,093	$5,039	$48,090	$57,680	$4,604	$11,907	$4,025	$142,443

KNOWLEDGE AREA 315: ANIMAL WELFARE, WELL-BEING, AND PROTECTION

KA 315: Animal Welfare, Well Being, and Protection CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	98	$678	$0	$31	$108	$567	$215	$0	$0	$1,599
2001	114	$692	$0	$0	$102	$28	$1,428	$0	$1,395	$3,645
2002	139	$577	$3	$0	$167	$55	$2,654	$0	$306	$3,762
2003	148	$623	$18	$0	$210	$0	$592	$0	$109	$1,552
2004	160	$633	$24	$0	$190	$317	$830	$160	$419	$2,573
2005	173	$722	$32	$0	$147	$258	$1,867	$744	$2	$3,771
2006	168	$736	$33	$0	$124	$79	$1,528	$296	$53	$2,848
Total	1,000	$4,661	$110	$31	$1,048	$1,304	$9,114	$1,200	$2,284	$19,750

KA 315: Animal Welfare, Well Being, and Protection Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	98	$1,599	$243	$715	$4,760	$727	$734	$132	$8,910
2001	114	$3,645	$161	$473	$4,426	$770	$637	$114	$10,226
2002	139	$3,760	$268	$1,722	$4,237	$473	$463	$182	$11,106
2003	148	$1,553	$713	$1,049	$5,704	$447	$533	$529	$10,529
2004	160	$2,573	$500	$1,597	$5,107	$441	$667	$565	$11,450
2005	218	$3,771	$510	$4,629	$6,716	$592	$1,054	$4,374	$21,648
2006	168	$2,848	$278	$3,221	$7,332	$631	$1,445	$454	$16,208
Total	1,045	$19,749	$2,673	$13,406	$38,282	$4,081	$5,533	$6,350	$90,077

KNOWLEDGE AREA 721: INSECTS AND OTHER PESTS

KA 721: Insects and Other Pests Affecting Humans CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	61	$627	$8	$0	$4	$0	$290	$0	$0	$929
2001	76	$591	$11	$0	$3	$141	$405	$35	$0	$1,186
2002	75	$512	$0	$0	$0	$61	$217	$0	$0	$790
2003	89	$627	$17	$0	$3	$357	$156	$75	$160	$1,395
2004	94	$686	$16	$0	$4	$205	$412	$80	$260	$1,663
2005	105	$743	$19	$0	$3	$216	$1	$96	$813	$1,889
2006	108	$790	$0	$0	$2	$163	$377	$0	$147	$1,479
Total	608	$4,576	$71	$0	$19	$1,143	$1,858	$286	$1,380	$9,331

KA 721: Insects and Other Pests Affecting Humans Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	61	$929	$753	$975	$3,534	$36	$699	$491	$7,416
2001	76	$1,186	$457	$1,633	$3,879	$42	$690	$435	$8,323
2002	75	$790	$322	$1,798	$4,859	$425	$896	$353	$9,442
2003	89	$1,395	$223	$2,909	$5,390	$505	$1,122	$636	$12,180
2004	94	$1,663	$246	$4,318	$4,454	$347	$1,528	$1,008	$13,564
2005	130	$1,889	$354	$6,227	$7,050	$391	$1,084	$1,341	$18,336
2006	108	$1,479	$383	$4,101	$6,856	$535	$1,381	$827	$15,562
Total	633	$9,331	$2,738	$21,961	$36,022	$2,281	$7,400	$5,091	$84,823

KNOWLEDGE AREA 722: ZOONOTIC DISEASES AND PARASITES AFFECTING HUMANS

KA 722: Zoonotic Diseases and Parasites Affecting Humans CSREES Funding										
(as reported by the Current Research Information System)										
$ in the thousands										
Year	No. Proj.	HATCH	MC-STN	Evans Allen	Animal Health	Special Grants	NRI Grants	SBIR Grants	Other CSREES	Total CSREES
2000	33	$187	$0	$0	$25	$24	$11	$0	$175	$422
2001	36	$192	$0	$0	$22	$0	$708	$0	$0	$922
2002	51	$297	$0	$0	$33	$129	$386	$0	$0	$845
2003	58	$274	$0	$0	$36	$19	$2	$30	$33	$394
2004	60	$251	$0	$0	$58	$96	$0	$0	$291	$696
2005	77	$385	$0	$0	$62	$186	$1,400	$47	$58	$2,138
2006	91	$667	$0	$0	$200	$660	$521	$0	$63	$2,111
Total	406	$2,253	$0	$0	$436	$1,114	$3,028	$77	$620	$7,528

KA 722: Zoonotic Diseases and Parasites Affecting Humans Overall Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	NO. Proj	CSREES Admin	Other USDA	Other Federal	State Appr.	Self-Gen	Ind/Gr Agrmt	Other Non-Fed	Total
2000	33	$422	$60	$637	$1,529	$20	$101	$136	$2,905
2001	36	$922	$131	$1,268	$1,751	$19	$105	$47	$4,243
2002	51	$845	$145	$1,512	$1,909	$116	$229	$126	$4,882
2003	58	$393	$150	$2,378	$2,299	$136	$292	$210	$5,860
2004	60	$697	$304	$2,490	$2,837	$171	$339	$452	$7,290
2005	144	$2,138	$484	$12,713	$5,524	$412	$585	$1,154	$23,010
2006	91	$2,111	$451	$5,362	$5,143	$234	$553	$198	$14,051
Total	473	$7,528	$1,725	$26,360	$20,992	$1,108	$2,204	$2,323	$62,241