

Department of Agricultural and Resource Economics

COMPACT

with the

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

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Approved

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Date

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Date

I. Introduction

Mission: The Department of Agricultural and Resource Economics (ARE) serves consumers, producers, students, and others engaged in agricultural, natural resource, and life science related activities through teaching, research, and extension programs which address and solve economic, policy, legal, and business problems. Its programs enhance decision-making skills essential in the operation and management of businesses, households, nonprofit, government, and other public organizations.

Vision: ARE will be the department chosen by students, individuals and organizations associated with food, fiber, agriculture, and the environment, and others seeking knowledge, understanding, and insight about the economics of agricultural, environmental, policy, and resource issues.

The department consists of 29 tenured or tenure-track faculty (five with joint appointments in other departments), nine non-tenure track faculty, one post-doctoral staff, and 11 permanent SPA staff. In addition, 1.4 faculty and 3 SPA vacancies exist currently in the department. Numerous other part-time faculty and full time staff are employed on temporary teaching, research or extension funds or grants generated by faculty. Approximately 220 undergraduates currently major in one of the department's programs. Approximately 75 students major in the department's two-year Associate degree program associated with the Agricultural Institute, and approximately 150 students are enrolled in the jointly sponsored (with Economics) graduate degree program with the majority of these students seeking the Ph.D. Both the undergraduate and graduate programs have experienced significant growth in recent years.

Central to our mission as an educational institution are the students, both traditional and, more frequently, non-traditional, who enroll in our classes, declare majors in our curricula, and receive advice from our faculty. We look beyond serving the immediate needs of students (to obtain employment) to providing an environment for life-long learning. In some cases, these students will return to NCSU for further education, others will seek additional education elsewhere. Still others may return at a later time, perhaps seeking a career change. Parents of students and employers of students have their own set of expectations regarding college education and the skills acquired. Alumni have a vested interest in the reputation of the department, college, and university.

Our research and extension programs serve a large and diverse set of clientele. Being a social science department whose partial mission is to improve the economic literacy of those it serves, we have responsibility in CALS for conducting research and educational programs that encompass the 70+ agricultural commodities produced in the state. Farmers, commodity and trade associations, lender institutions, and agribusiness firms including input suppliers and food and fiber processors receive important economic information that can lead to improved decision-making. In addition, our faculty provide economic information to policy-makers and decision-makers at the community, county, state, and federal levels covering not only agricultural commodities but also issues dealing with the environment and natural resource allocation and use, public policy, economic development, and other policy items. These demands for our programs are growing. Our research and extension programs are integrated with those of other departments in CALS as well as other departments in the university and at universities across the country. Consumers expect information about economic issues and receive education from a variety of programs and through multiple media avenues. By virtue of their contributions to support the university, taxpayers of the state must be included as stakeholders in the activities of the department, and we must be prudent and efficient in our use of funds to support our programs.

This Compact describes the plans and expectations of the Department of Agricultural and Resource Economics (ARE) over the next several years. It affirms ARE's commitment to prepare for future opportunities and implement programs that efficiently utilize current and new resources. ARE is

committed to enhancing the decision- and policy-making skills of society, from producers of agricultural commodities and managers (private and public) of natural and environmental resources to consumers of food and fiber products as well as environmental amenities, in the operation and management of businesses, households, government and public organizations.

One of ARE's goals is to enhance its standing in the top tier of disciplinary departments in the world. Professional rankings of departments rely on faculty research productivity and the placement of graduate students (and their subsequent productivity), along with other measures. As a land grant institution, ARE faculty add to this disciplinary objective a mandate to select research and extension activities that are responsive to state and national needs and to actively pursue efforts to communicate their findings. These goals reinforce efforts to link research with educational programs and to provide a public service.

In agricultural economics, our programs are the strongest in the southeast, and highly ranked nationally. A fall 1999 ranking of agricultural economics graduate programs by Gregory Perry, Oregon state, ranks our Ph.D. program 5th out of 22 ranked (with about 40 land grants offering the Ph.D. in agricultural economics), and our MS in agricultural economics 8th. These rankings were based on a survey of 212 referees (listed for three consecutive years) for the American Journal of Agricultural Economics. In addition to the overall ranking, programs were also ranked by specialty areas within agricultural economics. These areas are international development, markets and price analysis, production, resource and environmental economics, international trade, community and rural development, and agribusiness and finance. Only two programs had 4 of these fields ranked in the top 6-7: N.C. State University and UC-Davis. All others had fewer than 4 in the top 6-7.

An important component of our joint graduate degree program draws from the reputations of faculty who specialize in econometric theory and applications. A worldwide ranking of econometrics programs by B. H. Baltagi in 1998 (publications over the period 1989-1995), published in the journal, *Econometric Theory* (Vol. 14, pp.1-43), has N. C. State at 18th. Only a dozen U. S. universities were ranked higher than N. C. State University. In contrast, our neighbors Duke and UNC-CH were ranked 59th and 64th respectively. As noted elsewhere, a strong Statistics Department, especially in time series, contributes to our ranking (taking nothing away from our in-house econometricians!).

Relative to the university's enrollment plan, the department seeks to continue enrollment growth in both undergraduate and graduate degree programs. One initiative described below calls for a new undergraduate degree program – Biological Sciences Business Management or BBM. Sustaining growth, however, will require new resources given that current teaching resources are stretched beyond reason.

ARE's compact uses the lessons acquired from successful programs to design new efforts responsive to the opportunities that face the department in the future. Strategic planning is essential to assure that ARE's programs have the greatest impact. The department's proposed initiatives are important to its future direction. Success requires additional resources, renewed effort, and continued support from the college and university.

II. Initiatives

A. Initiatives Supporting University Goals

1. Building a diverse and inclusive campus community, fostering demographic and intellectual diversity.

Intellectual diversity has traditionally been a strength of ARE. The department seeks to broaden the intellectual and cultural backgrounds of its faculty, staff, and students whenever possible. Its goal is to hire (and retain) the best faculty and staff possible and increase the pool of available candidates in the profession from its diverse graduate student cohort. Strong and well-established collaborative ties across departments inside and outside the college foster variety in the ways faculty address and solve issues related to the discipline. The 37 ARE faculty represent final degrees from 22 different universities. Since 1995, four women have joined the faculty. One is currently a tenured Professor, one is a tenured Associate Professor, and one is a Lecturer (permanent position) and has resigned to accept a position at another university. During the five years prior to 1995, no women were members of the faculty. Seven of the tenured or tenure-track faculty have origins outside of the United States, representing four continents. ARE continues to search for qualified candidates from ethnic and minority pools. These candidates are relatively scarce in the discipline. The department's efforts to expand diversity, however, will not deviate from its goal of hiring and retaining the most qualified faculty members.

Actions: ARE will work to increase the percentage of well-qualified faculty, staff, and students who come from under-represented minority, ethnic, or gender backgrounds or who bring international diversity to the department. ARE will strive to improve salaries of key faculty so that they are competitive with the market and key faculty are retained.

Measures: Percentage of faculty that add to the diversity of the department. Average and spread of salaries at various ranks that foster a competitive mix of faculty from varied backgrounds and interests.

Additional resources required: Additional funds from the university may be required to recruit and hire minority faculty if qualified candidates apply for positions. Supplemental salary adjustment may be needed to retain key faculty.

2. Fostering and enhancing partnerships

ARE seeks to raise the awareness and appreciation of its programs and contributions to a wider scope of people and organizations in North Carolina and the region. With the hiring of several new faculty, ARE is positioned to develop and deliver programs in research, extension, and teaching that provide the highest quality economic decision-making information. From a previous Compact plan, ARE's initiative to establish a new Center for Environmental and Resource Economic Policy (CEnREP) has led to increased visibility for ARE, the college, and the university in the important area of environmental policy facing this state. CEnREP is establishing ties across the college, other departments at NC State, and other universities in the region via affiliate appointments and with local, state, and federal agencies. It is the goal of ARE and CEnREP to develop and make available relevant, timely, and unbiased information on matters pertaining to environmental and resource challenges facing the state and nation. The department proposes two other important initiatives (Bio-complexity (#5) and Economics of Food Safety (#6) that will increase partnerships with other departments in the college and university.

ARE endeavors to enhance the close ties it currently enjoys with other academic departments, various commodity organizations, environmental groups, local governmental agencies, and financial institutions across the state. ARE also recognizes the need to supplement public funding with funding from private sources. Recent and planned efforts to increase the visibility of ARE to its clientele groups should result in an increase of private funds to support student scholarships and other ARE programs and activities. The department also expects this activity to be an important component of the Scholars initiative (#13) designed to raise funds to support scholarly activities of students in the department.

Actions: ARE will solicit feedback from its stakeholders and increase departmental communications. ARE will foster increased giving from partners who have benefited significantly from its programs. ARE will increase collaborative efforts with members of other academic units on campus. ARE will monitor the advisory committee established for CEnREP to determine what other types of partnerships might be established that helps to achieve the mission of the department, college and university.

Measures of performance: Contacts will be made with potential donors. Gift funds will be measured against previous year's giving. Measure success of partnering with other units for research and extension activities.

Additional Resources Required: Assistance from College of Agriculture and Life Sciences Alumni Society Director and Director of College Advancement to raise funds for departmental activities.

B. Initiatives Contributing to the University's Planning for Student Learning in a Technology-Rich Environment

3. Enhancing Technology-based learning

The department seeks to expand its set of courses currently available on line to anyone who wishes to access these courses. Currently, two on-line courses are currently available in the department: ARE 201 and ARE 309. There is a need by county extension agents in the state to make progress toward a Master's degree while in the job. ARE could design and offer an on-line course at the 5xx level which would address the needs of county agents in the area of Environmental Law. Other on-line courses could be designed which meet undergraduate and graduate student needs. The department would expand its on-line course offerings if resources needed to move materials to the web were made available. These added on-line courses would give students more opportunities to register for classes and would increase the revenue stream to the university, particularly when the registrants are from off campus. Currently, the department has had good success with registration of on-line courses. However, making these courses available to students and providing evaluation and assessment of student achievement requires additional resources such as staff time to provide advice on technique, faculty release time from teaching so that these persons could invest the time needed to design the on-line courses, and resources to actually teach the class.

Actions: Design courses for on-line availability to students on and off campus. Secure resources to provide staff and faculty release time for design and teaching of courses. Measures: Number of courses designed and taught online. Number of students registering for and completing courses. Additional resources required: Support staff to assist faculty in preparation of courses and release time for faculty to design and teach courses. Operating budget of \$1,000 for needed software.

C. Initiatives Supporting Unit-Specific Goals and Aspirations

ARE will pursue seven unit-specific initiatives in extension, research, and teaching that will support and enhance the unit's ability to deliver programs to clientele if needed resources are forthcoming.

4. Center for Environmental & Resource Economic Policy (CEnREP)

Stage Two

In the first Compact, the department set a first stage goal of building on its strong core faculty and student interest by launching the Center. During the 2001/2002 academic year, this goal was accomplished. After two years of planning, the Center received formal authorization from the Board of Governors in November 2001. Two distinguished advisory boards were established -- one on policy issues and a second on the economic science used in the Center's research. The Policy Advisory Board has met twice and displayed a keen interest in the Center's activities.

External funding has been consistent with four grants from the U.S. Environmental Protection Agency, one from the National Science Foundation's Biocomplexity Program and one from the U.S. Department of Energy. Over its first year and a half since authorization, the Center has pursued collaborative research proposals with PAMS (NOAA -- Len Pietrafesa), WRI (NSF -- Ken Reckow), COM (NSF -- Robert Handfield), RTI International (EPA -- Subhrendu Pattanayak), College of Natural Resources (Sloan -- G. Brothers and L. Gustke), Resources for the Future (Glaser -- R. Kopp and S. Banzhaf), University of Missouri - Columbia (EPA -- C. Poulos), Duke (EPA -- Frank Sloan and Don Taylor) in addition to the currently funded (and recently ended) research with ARE faculty. About half of these proposals are pending and the other half declined. Large proposals require the ability to sustain activity in the face of high rejection rates.

Significant increases in funding require a sustained effort in preparing proposals for external grants while managing interactions with the Center's Advisory Committees. There is also need for a more extensive outreach program of training workshops. One such workshop was sponsored by the Center in 2001 and planning for a second should begin soon if the Center is to sustain long term momentum.

This new compact reflects the need to address phase two of the Center's development with a recognition that operating funds for the Center, originally committed by CALS, are at best uncertain and at worst no longer available in a way that sustains consistent planning. These conditions have required all Advisory Committee meetings to be postponed, appropriate software licenses to be compromised (there are no resources to pay for them, but research commitments must be fulfilled), travel to seek external funds to be cancelled, etc.

The success of the Center depends on attracting larger, longer-term support for programmatic activities. This requires the appointment of an Associate Director, with a requirement of released time to allow that individual to oversee some of the Center's proposal writing and outreach activities. This would allow the Director to devote some time to larger team efforts underlying the longer-term support.

Three initiatives will provide the basis for our activities:

- (1) Environmental Security -- the current small proposal (\$100,000 to NSF) outlines the nucleus of a research program that would be linked to Supply Chain Management Group in COM and ultimately to the Department of Statistics as well. We propose to seek long term support to supplement this effort. This process would necessarily require more exploratory activities to identify partners and sources of support. It would also position the Center to take advantage of opportunities likely to become available if the Homeland Security legislation passes.
- (2) Spatial Location and Time -- the Center's new EPA support for the project linking Land Conversion, Watersheds, and Water Quality is the second success in using spatial methods to address environmental issues. The Glasser Foundation, BLS and NSF are launching new initiatives in understanding household time allocation activities and the importance of time constraints in other activities. This issue is closely linked to sprawl and the spatial organization of economic activities. The forces driving the location of service and retail activities in rapidly growing areas, with inadequate transportation infrastructure to support that growth, are responding to households' time constraints. We propose to launch an initiative in that area seeking long term support and links to the new survey activities. (One signal suggest that the Center's work is paying off. Kerry Smith has recently been appointed to the premier center for spatial analysis, literally the place where most of the action started - - the Center for Spatially Integrated Social Science at the University of California, Santa Barbara.)
- (3) Valuing Risks to Health -- Without direct external support, the Center has been able to use internal resources to launch a modest program on the issues associated with developing monetary measures of the benefits of reducing risks to human health. Expanding this activity to seek NIH and NIA support would offer opportunities to diversify support and provide access to larger grant budgets through conventional support for social science research in pure environmental applications. The clear overlap between the environmental and health policies uses of this information is what enables this prospect. Again this will require time to capitalize on the base research completed and develop proposals.

Actions: Link with faculty in NCSU COM, Department of Statistics and Vet School; and Duke and RTI International relevant to each area. Continue to develop long range plans for Center's research and educational activities.

Measures: Submit proposals in all three areas over the next three years. Output measured by generated long term support and resulting research. Continuity and sustainability of pledged resources to the Center so that plans can be developed and carried out on a timely basis.

Additional Resources Required: Released time sufficient for one course release for Associate Director; part time support for student clerical support; additional support for graduate students.

5. **Bio-complexity**

Bio-complexity is defined as the phenomena that result from dynamic interactions among the biological, physical and social components of the Earth's diverse environmental systems. There is a clear recognition that these interactions affect people and are affected by human activity. Moreover to understand these interactions, the department must integrate social science (in large part economic) models with natural science modeling of the dynamic structures involved.

" . . . Advancing our understanding of the nature and role of Bio-complexity demands increased attention and new collaborations of researchers from a broad spectrum of fields --

biology, physics, chemistry, ecology, hydrology, mathematics, statistics, social and behavioral sciences, computer sciences and engineering" (National Science Foundation (NSF) Program Announcement, p. 1).

Led by CEnREP and other faculty with expertise in this area, the department proposes an initiative organized around three themes from the NSF announcement:

- (1) Land Cover activities – ARE faculty have expressed considerable interest in increasing research on the land use patterns that both create greater prospects for flooding and increase the damage caused. The Bio-complexity announcement highlights land use, the effects of property right systems, and the spatial transformation of the landscape.
- (2) Biological Invasions – The Bio-complexity announcement identifies complex interactions between human and biological processes on a variety of scales. An ARE faculty member's work has clearly identified the role of pesticides in this area. In addition, trade issues associated with sanitary and phyto-sanitary standards would involve other ARE faculty. The research calls for quantitative analyses to understand biological invasions including the impacts of human interests via health and economics.
- (3) Marine Environment – Several areas in the announcement identify the role of industrial and agricultural processes and environmental quality; note the interaction between atmospheric and marine and ecosystem interactions that are comparable to the issues associated with animal agriculture and waste management; and highlight factors that impact the marine community (e.g., nutrients, rates of photochemical transformation of dissolved oxygen matter).

These activities have several important characteristics—they are interdisciplinary, emphasize applied science, and have a quantitative approach that clearly links the type of statistics and applied math programs for which NC State has always been known. During the 1999-2000 academic year, the department, through CEnREP, collaborated with MEAS at NC State, as well as social and natural scientists at UNC Chapel Hill, Maryland, and Colorado to secure an "incubator" grant from NSF's Biocomplexity Program. As a result, we propose to use the resources to develop a proposal to establish a NSF Biocomplexity Center linked to CEnREP, focusing initially on themes (1) and (3). It is essential to begin planning for the required matching resources envisioned in that initiative. To meet these, we propose adding a distinguished non-tenured senior scholar and two tenure track assistant professors, one in each of the two theme areas.

The distinguished scholar would be Senior Fellow in CEnREP, currently a collaborator in the NSF proposal. This scholar would be primarily supported by external grants developed under CEnREP's initiative. Approximately 50% base support is sought from internal funds. This appointment would dramatically increase the ability of the Center to acquire funds. Because the scholar has an international reputation in the field, and is a Fellow of the AAFA, this appointment would assure credibility of our initiative.

By exploiting a creative appointment strategy (i.e., a fixed term contract with defined salary commitment), the plan does not require a senior tenure track appointment and directs all resources where they are of greatest need -- in grantsmanship and research oversight.

Actions: Use NSF grant to develop a major Center proposal in collaboration with natural scientists from NC State, UNC and Duke that responds to the NSF RFP in this area. Provide partial support for a senior scholar, as Senior Fellow in CEnREP, and full support for two tenure

track assistant professors in environmental economics with a focus on land cover activities and the marine environment. Each would be expected to have a strong background in quantitative methods, and would contribute to transforming the biomathematics program into one in Bio-complexity.

Measures: In addition to the NSF Biocomplexity proposal that will be funded, CEnREP has participated in the initiation of an NSF Science Center proposal led by Professor K. Reckhow, and has a proposal to EPA's Environmental Statistics program on theme area (1). Proposals funded, materials published, presentations/seminars presented.

Additional resources required: Partial funding for a fixed term senior scholar as a Senior Fellow in CEnREP; new assistant professor (tenure track) and replacement of retiring faculty member (T. Johnson, .3T/.3R) in expanded form (.4R) to work in the Bio-complexity area. Additional space and operating support resources for senior and junior faculty (including startup funds).

6. Economics of Food Safety

Consumer surveys and an increasing number of public health and regulatory agencies support the belief that food safety is the most important food-related issue in the United States. Media attention to food safety issues has increased consumer awareness about potential health risks and has encouraged individuals to update their perceptions about the overall risks in eating fresh meat, poultry, and produce. Agricultural economists have much to add to the information discovery process related to the issues of food safety. One part of ARE's effort will be to develop and implement a methodology that examines information effects associated with food borne pathogens on consumer subjective risk perceptions, mitigation activities, and impacts on meat and poultry demand for U. S. households. The Food Safety Research Group within USDA [1997] identified ten important research questions as part of the Food Safety and Inspection Service's (FSIS) new food safety initiatives. The objective of the research group's activities is to identify and outline the research needed to reduce the incidence of food borne illness associated with the consumption of meat, poultry, and eggs. ARE's initiative seeks to provide answers for the two social science questions cited in the FSIS report: (1) Are there effective models of risk communication in relation to food borne illness? (2) What are the costs and benefits for risk reduction and what will consumers pay for food safety?

ARE proposes to broaden the research to consider non-meat food safety and focus its attention initially on the retail - consumer interactions. Delivering these results relies on the effectiveness of the HACCP activities that connect this work to the production side of agriculture. This dimension of the research links several faculty in the department with small but important research and extension programs in food safety with the department's expanding teaching, research, and extension expertise in agribusiness. A new faculty position, which devotes a major portion of time and effort to this critical area, is needed. The person filling this position will collaborate with faculty in other College of Agriculture and Life Sciences departments (e.g., Food Science and Microbiology) and the university who are actively involved in food safety issues.

Actions: Develop major proposals to begin Economics of Food Safety research efforts in the department. Hire a new faculty member to establish a critical mass of expertise within the department who can work effectively with food safety faculty in related departments.

Measures: Number of proposals submitted and grants awarded in Food Safety. Number of projects initiated and manuscripts published in this area. Number of faculty hired to work in this area.

Additional resources required: A tenure track research/teaching (Assistant Professor) position (plus startup investment) which focuses on the economics of food safety. Operating budget of \$5,000 annually for this position.

7. Agricultural Business Management

Advancing technology and globalization of the production, processing, and distribution industries have profoundly and rapidly changed the course of the American food and fiber sector. Major agribusiness firms are responding to this change with mergers and partnerships. E-commerce is making rapid inroads to traditional marketing channels from farm inputs to food product outputs. Globalization is bringing to an end the dominance of the traditional American farmer in commodity agriculture. Many farmers are considering alternatives to traditional commodity agriculture, whether contract production for a specific buyer or identity-preserved crops and livestock. Farming, agribusiness, the rural infrastructure is at point of needing to reinvent itself.

ARE receives scores of requests for information regarding these rapidly occurring changes. Research and educational opportunities are numerous. ARE will be a focal point for economic and business decision-making information and education for farmers, agribusiness persons, and rural decision-makers as they cope with change. The pace and intensity of changes in technology, governmental policy, global competition, and structural organization in agriculture increase the importance of and need for sound business management practices in farm and agribusiness operations. These changes create opportunities where ARE will respond—particularly in the areas of marketing, cost analysis, risk, finance, legal and tax issues and strategic, tactical, and operational planning.

Due to financial cuts in the college, ARE has apparently lost its vacancy in teaching and extension position associated with Agribusiness. The undergraduate Agricultural Business Management degree program continues to grow in spite of fewer teaching resources allocated by the college to the department in tenure track faculty positions.

A tenure-track faculty position (teaching and research) to focus on the changing structure of agriculture and agribusiness is needed. The teaching of the agribusiness management undergraduate course, which anchors ARE's agricultural business management B.S. curricula (220 majors) and is a key service course for undergraduates in other College of Agriculture and Life Sciences majors, will be of prime responsibility of this faculty member.

Actions: Hire a tenure-track faculty member (formerly Ward) by June 30, 2004 to develop a teaching and research program in agricultural business management to meet increasing and changing demands. Increase publications and presentations by faculty and students, and strengthen grantsmanship efforts to provide external support for these programs.

Measures: One faculty member hired to conduct teaching and research in the agribusiness management program of the department. Number of publications and grant funds generated by faculty. In agribusiness management courses, number of undergraduate students and credit hours taught.

Additional resources required: Position vacated by Ward (with associated start-up funds) must be returned to ARE. Additional research assistantships to leverage the expertise of faculty would increase the overall productivity of the department.

8. Center for Economics of Agricultural Contracts (CEAC)

Agricultural contracts are an integral part of the production and marketing of a growing number of agricultural commodities, ranging from livestock (broilers, turkeys, hogs), to fruits and vegetables (grapes, sugar beets, tomatoes, sweet potatoes) to tobacco. Over one-third of the total value of production on U.S. farms is produced under contractual agreements. Agricultural and

food supply chain contracts are extremely important for farmers and businesses in North Carolina. Virtually all of the North Carolina broilers, turkeys and hogs are produced under production contracts between integrators and independent farmers. North Carolina also has a substantial vegetable production, which increasingly relies on contracting as a means of industry organization and supply chain management. The examples are cucumbers for pickling and sweet potatoes, among others. Most recently, virtually the entire state flue-cured tobacco production switched over from an antiquated auctioning system to direct contracting with cigarette manufacturers.

An important goal of the Department has been to build upon its research and extension faculty capabilities in agricultural production and supply economics. With complementary human capital in microeconomic theory, industrial organization and labor economics at its sister Economics Department and a large contingent of graduate students from the joint graduate program in economics, ARE is already superbly positioned to become a national focal point for the research in economics of contracts. It is important to mention that some of the path-breaking research in this area has been conducted at NCSU. The series of articles by Knoeber and Thurman have been widely cited in first-tier economics journals. The work by Tsoulouhas and Vukina has won national acclaim by winning a prestigious best publication award from the *American Journal of Agricultural Economics*. Given the structure and trends in the North Carolina agriculture and the food sector, the need for concentration and coordination of the research, extension, and teaching activities in the area of contracts and incentives is large and growing.

The main objective of CEAC will be to provide impartial economic analysis of the structure, conduct, and performance of contracts as means of industry organization in agriculture and food supply chain. The global mission of CEAC will be to bring together scholars from around the world who share an interest in the analysis of contractual choice and incentives mechanisms in agriculture and the food supply industries and their implications for competition and welfare. Its local mission will be to conduct and disseminate timely economic analysis of production and marketing contracts in agriculture and food industries of critical importance to farmers and businesses in North Carolina, train students and other professionals in the area of economics of contracts and incentives, and serve as a point of contact between teaching, research and extension faculty and the public at large.

Actions: Efforts are underway to secure funding of research efforts in this area. Some success has been achieved. Additional resources are needed in order to leverage existing faculty efforts with technicians who have appropriate training and background in the economics of contracting and to provide operating support

Measures: If funding becomes available, request permission to plan for Center. Number of grants proposed and funded, number of publications generated, number of clientele educated through extension and teaching activities.

Additional Resources Required: In order to get the Center established, start-up funding from CALS and the University will be needed to supplement existing efforts in the department. In the short run, resources will be needed for technical support of faculty and for operating budget to build upon expertise in the department and to increase the opportunity for additional extramural funding.

9. Southeast Regional Center for Agricultural Innovation

Rapid changes in agricultural and environmental policies affecting farms and communities in the Southeastern United States have increased the importance of research and educational efforts in development and evaluation of new technologies and enterprises to enhance farm profitability,

rural incomes, enterprise diversity, and environmental quality of rural communities. The structure of the agricultural community, particularly small and minority farms, is especially affected by these changes. In particular, changes in the tobacco program and demand for tobacco, changes in the peanut program, and changes in environmental policies concerning swine and poultry production indicate a need to focus research and educational resources on development and evaluation of new technologies and enterprises.

The Southeast Regional Center for Agricultural Innovation will be a part of the College of Agriculture and Life Sciences at North Carolina State University. Its mission will be to foster and facilitate development, evaluation, and implementation of economically viable new agricultural technologies and enterprises for rural communities in the southeastern United States. The Center will accomplish its mission by acting as a catalyst for research in new agricultural technologies and enterprises pertinent to the southeastern United States. The center will seek to partner with agribusiness, farmers, and rural communities to provide a comprehensive package that includes agronomic and husbandry research, economic evaluation at the farm and economy levels, environmental impact assessment, management strategies, and educational implementation strategies for successful adoption of promising new technologies and enterprises. The center will work with farmers, agribusiness and rural communities to identify potential research areas, promising technologies, and enterprises. The center will capitalize on the vast array of resources currently available at 1890 and land grant universities across the southeast to provide research and disseminate research findings on identified projects. A major focus of the center will be economic evaluation and managerial implications of new technologies and enterprises.

The objectives of the center will be to:

1. work closely with advisory boards made up of leadership in agribusiness, farm organizations, and rural communities to identify opportunities and problems and potential solutions as they relate to researchable topics on potential technologies and enterprises,
2. identify and procure resources (faculty, facilities, etc.) at 1890 and land grant universities in the southeast to provide research and development of the identified projects,
3. provide seed moneys and seek funds in partnership with industry, commodity groups and others to fund research and development of the identified projects,
4. provide analysis of the potential economic impact of new technologies and enterprises on the farmer, the rural community, the agricultural sector, and the southeastern economy,
5. develop management strategies to facilitate successful adoption of technologies and enterprises showing sufficient merit to be introduced to the farm community,
6. disseminate research findings with economic impact and managerial information to target audiences through appropriate channels,
7. coordinate region wide research and educational strategies.

The center will impact the lives of residents of the southeast, especially those in agricultural areas, through development of new sources of incomes, increasing income from existing enterprises, and easing the negative income impacts of transitions with existing enterprises.

Actions: Efforts are underway to secure funding for this Center. Senator Helms has included wording about a Center in a Senate tobacco buyout bill that will include funding (up to \$10 million per year) for a land-grant university in a major tobacco producing state. We hope this to be NC State University.

Measures: Request permission to plan for Center if funding becomes available.

Additional Resources Required: In order to get the Center established, space from CALS and the University will be needed to house new personnel hired to establish and implement the activities of the Center.

10. Center for Economic Education

The Department of Agricultural and Resource Economics will work with the North Carolina Council on Economic Education to establish a Center for Economic Education (CEE) at North Carolina State University. The mission of the CEE will be the improvement of economic literacy among K-12 teachers in school systems geographically close to the main campus of NCSU. The mission will be accomplished by (a) holding annual continuing-credit workshops for K-12 teachers, and (b) serving as a resource center of information and materials for K-12 teachers. The activities of the CEE will be coordinated with similar centers at other public university campuses in North Carolina.

Actions: Permission to establish Center will be undertaken in the year ahead. Seek funding to support this Center and faculty activities related to it.

Measures: Submit request to plan for Center proposal by June 30, 2004.

Additional resources required: Funding for materials, venue rents, meals, etc. associated with accomplishing the two delivery methods will be from the North Carolina Council on Economic Education. Partial compensation of the time involved in workshops by ARE faculty will also be sought from the North Carolina Council on Economic Education. Other activities of the CEE will be blended with on-going extension activities of select ARE faculty.

D. Initiatives Supporting Improved Performance

11. Enhancing Historical Strengths and Core Programs

The reputation of ARE's research, extension, and teaching programs has placed it in the top tier of agricultural and resource economics departments in the country. A recent report placed ARE in the top five graduate programs in the country. As another example, NC State was ranked among the top twenty research and graduate programs in econometrics and quantitative methods internationally in an article in the prestigious journal, *Econometric Theory*. ARE proposes an initiative to build on the quality of its research and graduate programs by linking new initiatives with the existing base of programs and faculty in residence. Food safety issues (#6) link closely with international trade opportunities for North Carolina and U.S. agriculture. Bio-complexity research (#5) will draw heavily from theoretical and empirical quantitative economics. Resource and environmental issues to be pursued by CEnREP faculty (#4) will interface directly with production agriculture. Trade, quantitative, production, resource and environmental economics have been traditional strengths in the department. Current and pending vacancies in the department's core strengths threaten both existing programs and ARE's ability to act comprehensively on the new initiatives. ARE's graduate student research skills have been defined by strong training in applied microeconomic theory and econometrics. Loss of support in core areas will affect ARE's ability to contribute to this key area of graduate teaching. Recently, the department has lost one faculty to another university, another faculty member expects to retire in the current academic year, and two other faculty may retire in another year. All are actively involved in one or more core programs in the department. ARE's initiatives to increase the quality and quantity of its students will be heavily dependent on strengthening its core programs. The age distribution of the department suggests three to five additional faculty could retire within the next three years. In addition, the department has not been able to fill two research technicians vacancies due to budget uncertainty.

Another goal is to expand collaboration among faculty with strong quantitative skills and in applied research on problems confronting the state of North Carolina today. The new Bio-

complexity initiative (#5) with its quantitative research base complements this historical strength of the department.

Agricultural markets are rapidly changing. The advent of the World Trade Organization, globalization of agricultural markets, and changes in tobacco and other commodity policies will have significant implications for the viability of rural communities in North Carolina. ARE is uniquely positioned for leadership in this rapidly changing policy arena. Recent hires in the policy and international trade areas complement an already outstanding faculty but one weakened with the departure of an exceedingly productive faculty member in mid career (Goodwin). ARE will address such social and policy concerns as waste management, elimination of the tobacco program, effects of the full-scale adoption of biotransgenic crops, and effects of globalization on agricultural markets.

Recent changes in the production and marketing practices for agricultural highlight the importance of the study of industrial organization. These developments include: the introduction and refinement of contracting and vertical integration in the swine and poultry industries, the increased value of intellectual property in agricultural production, and the industrialization of agriculture due to new types of biotechnology. Research and extension efforts are needed to investigate and explain this changing structure of agriculture in order for producers, processors, and handlers of agricultural products to compete effectively.

Actions: Hire a new tenure-track faculty to conduct research and teaching in agricultural economics with emphasis on quantitative methods by June 30, 2004. Increase publications and presentations by faculty and students, and strengthen grantsmanship efforts to provide external support for these programs. Hire a tenure- or non-tenure-track faculty (formerly Ward) by June 30, 2004 to develop a teaching and research programs in Agribusiness Management to meet increased teaching demands and research opportunities. Fill two research technician vacancies. Measures: Number of faculty and staff hired to conduct research, teaching, and extension in the core programs of the department. Number of publications and grant funds generated by faculty. Additional resources required: Vacated positions (with associated start-up funds) must be returned to ARE to hire persons that enhance core programs and address high priority areas in teaching, research, and extension. An additional position is needed to enhance the department's reputation and output and add depth to faculty core areas. Additional research assistantships to leverage the expertise of faculty would increase the overall productivity of the department.

12. Increasing Extra-mural funding

ARE recognizes the need to leverage the time and intellectual expertise of its faculty. Increasing the numbers of funded graduate and undergraduate students, post-doctoral staff, and other support staff (EPA and SPA) can add to the capacity of the department to conduct research, disseminate information through extension activities, and teach others. Funds will be required to employ these persons and to support the operational needs of the expanded programs and new initiatives of the department. New funds allocated from the legislative change-budget process will be helpful to the department in meeting the permanent staffing needs associated with the new initiatives. Similarly, ARE recognizes that a significant responsibility for these efforts lie with the faculty. As such, the department proposes to increase the number of grant proposals submitted over the next five years relative to the past five years. It proposes to increase the resources requested for student and staff support in these grants and contracts.

Actions: ARE faculty will be proactive in seeking extramural funding to enhance and expand research and extension programs by supporting salaries, assistantships, and operating budgets.

Measures: Comparison of the number of proposals submitted and awarded and of the amount of extramural funding awarded and expended year by year.

Additional resources required: Ensure staffing of trained personnel in college and university grants and contract offices who can assist with and expedite the flow of proposals and the subsequent expending of funds from grants and contract. Improve system for getting staff appointed and paid and grants monitored (i.e., improve PeopleSoft).

13. Developing and Funding Society-ready Graduates

ARE's record in preparing graduates from the two-year associate, the four-year undergraduate, and the graduate degree programs has been excellent. Placement of students at all levels has been first-rate. In recent years, agricultural business management graduates have led the college in starting job salaries. ARE undergraduate programs are currently challenged by unprecedented growth. The number of majors has risen over 150 percent since 1992. No new faculty teaching FTEs accompanied this growth. In fact, as a result of budget cuts, one tenure track faculty position (vacated by Ward) with significant teaching FTE has been taken by the college. A second tenure-track faculty vacancy exists due to a resignation (Goodwin) more than a year ago. The department has not been permitted to refill this position.

ARE is enhancing productivity through the use of multimedia techniques and by offering instruction at a distance through the Web and other means. However, large classes and insufficient teaching resources preclude opportunities for realizing additional productivity in this area. Future increases in classroom enrollments and student majors will require additional resources.

A new initiative to enhance the undergraduate experience is proposed. The ARE Research and Extension Scholars (ARES) initiative fosters high quality partnerships between undergraduate ARE majors and research and extension faculty. The initiative stimulates and challenges ARE's best undergraduates; identifies qualified students for agricultural and resource economics grad programs; meets the College's initiative to involve more undergraduates in research/extension experiences; and builds a stronger College of Agriculture and Life Sciences and University Honors Programs presence in ARE. ARE will identify resources to support five Scholars initially. Partnering with off-campus companies and associations will provide resources for funding the ARES initiative. Undergraduate researchers will be encouraged to participate in research fairs at NC State and in poster sessions at the annual professional meeting of the department.

Actions: Replace all faculty vacancies that have a teaching component (Ward and Goodwin). Add new positions in food safety and in agricultural economics with teaching components. Increase the presence of ARE course materials on the Web to improve teaching efficiency and student access to course materials. Use this activity as a precursor to developing future ARE distance education activities. Generate funds from gifts to establish the ARE Research and Extension Scholars (ARES) program to involve selected ARE undergraduates in 12-month research/extension experiences. In order to better advise students in ARE's Biological Science Business Management (BBM) major and to offer the BBM major as a viable choice for more students in the life sciences curricula of the College, identify employment and internship opportunities for these students.

Measures: Number of faculty hired by June 30, 2004. Number of students and course sections taught. Have 100% of ARE course syllabi on the ARE Web by June, 2004. Level of funding for Research and Extension Scholars program received. By July 2004, complete a list of current and

potential employers who are active or interested in hiring BBM graduates and interns. Number of students participating in professional activities.

Additional resources required: Replacement of existing and pending vacancies that support the scholarly efforts of ARE students (including the Ward and Goodwin positions and new positions for teaching and research in agricultural economics and in food safety).

E. Initiatives Supporting Enrollment Targets

The undergraduate teaching program plays a vital role in supplying the increased number of entry-level and mid-management skilled workers needed by the agribusiness/farm industry, as reflected in a 54% increase in undergraduate majors from 1997 to 1999. A perceived demand for a master's level courses is also evident from middle level managers in several agribusiness firms in the state. The number of undergraduate majors in ARE has increased by 165 percent since 1992 (83 in 1992 to 220 in 2001). Fall semester enrollment in undergraduate courses has increased by 25 percent in just the past two years according to data from University Planning and Analysis. Enrollment in courses and the number of majors are higher in ARE's Agricultural Institute program in recent years as well. Graduate student figures remain steady but the program can expect an increase in student majors due to the redesign of a Master's degree program, the hiring of new faculty, and maturing of faculty in residence who are enhancing the reputation of the graduate program significantly.

14. Growth in Teaching and Learning

Undergraduate Program -- Currently ARE teaches approximately 55 courses/sections per year and advises students in the Agricultural Institute, baccalaureate, and graduate programs. This is accomplished on 9 teaching FTEs. In order for ARE to participate in undergraduate enrollment expansion and more majors over time, particularly in ABM and BBM, additional resources for teaching must be forthcoming. A business-based degree is a viable alternative for many students in the life sciences; this demand exists if ARE wants to pursue it. ARE does not anticipate large growth in the NRM (Natural Resources – Management) and ESE (Environmental Sciences – Economics) majors as these programs are currently structured. Students completing a minor in ABM will increase in numbers as they seek to add business knowledge and skills to their major degrees. This will increase student credit hours at a slightly faster rate than the increase in ARE undergraduate headcount. Growth will be limited from new freshmen since the university as a whole projects no net growth in total undergraduate enrollment. There will be pressure to accept more external transfers rather than new freshmen to accommodate the role of NC State as a “partner” with other institutions in higher education. To accommodate these changes, ARE will require additional faculty and additional graduate level Teaching Assistants as well as funds to support undergraduate graders. A most critical issue facing ARE is adequate classroom space in Nelson Hall where its faculty reside, as well as in classrooms close to Nelson Hall. (ARE currently has no classrooms assigned as priority space in Nelson.) There is a shortage of classrooms and specifically a lack of larger multimedia classrooms that can accommodate the numbers of students that ARE is now teaching. Without resources in this area, growth cannot be sustained.

Agricultural Institute Program -- Increased recruitment efforts by the College of Agriculture and Life Sciences Academic Programs in high schools and in community college transfers would likely net new students to the Agricultural Institute program. ARE would expect to share in that gain. As agribusiness management majors rise, faculty must increase their efforts in developing employment opportunities for graduates. Agribusiness management majors will experience

expanded employment opportunities by partnering with other Agricultural Institute majors. Currently, ARE is exploring the opportunity with the Department of Food Science to offer a concentration in food science to agribusiness management majors. The projected (aspirational) increase of 50 percent in the area of agribusiness management will require additional teaching resources both at the faculty rank and at the graduate student teaching assistant level.

Economics Graduate Program -- The economics graduate program seeks a modest increase in Ph.D. enrollment and a larger percentage increase in Master's enrollment. Curricular areas that would receive emphasis at the doctoral level are economic development, environmental and resource economics, and industrial organization. The increase in student numbers at the Master's level would be in the Applied Economics and Policy Analysis track of the Master of Economics degree. The increased commitment required for both classroom teaching and advising and for working with students during the thesis and dissertation writing stages would require additional faculty resources. Finally, research assistantship and teaching assistantship funding will be needed to accommodate the growth in the graduate program.

Financial Mathematics and Engineering Program -- The recent explosive growth in financial markets, as well as the rapid development of knowledge in the quantitative approaches to finance, has led to the demand for technically trained professionals. Job opportunities exist for individuals with an understanding of how to value financial derivatives and complex investments, and assess the associated risks. Employers hiring individuals with training in financial mathematics and engineering include banks, investment firms, financial trading companies and financial exchanges, insurance companies, power companies, natural resource based and agribusiness firms, and government regulatory institutions. Such individuals must have a rigorous training in mathematics, especially in the area of stochastic processes and probability, in statistics and in computation, together with a foundation in the institutional operation of financial markets. ARE, in cooperation with the departments of Mathematics, Industrial Engineering, Statistics and Economics, would participate in the development and implementation of a two-year MS degree program in Financial Mathematics and Engineering. The program would capitalize on NC State's historic strengths in agriculture, technology, and engineering, bringing together the various threads needed to train students in the new discipline of quantitative finance and risk analysis.

Actions: In order to guarantee that ARE is more than meeting the needs of its student majors and the employers of its graduates, the department will conduct a review of its undergraduate and graduate curriculums in academic year 2002-2003 as part of a departmental CSREES review. Net increases in faculty teaching FTEs, teaching assistants, and research assistants needed to attain the aspirational level of student majors (in the 2000 Compact) are: 3.0, 6.0, and 12, respectively. In order to remain competitive nationally, the funding level for individual assistantships will have to rise significantly. An increase in the teaching operating budget needed for these enrollments is \$25,000 annually. Classroom space will be needed to accommodate extra sections particularly larger classes. Likewise, space to hold student seminars, review sessions, and extracurricular activities is needed. Such classroom space should be equipped for multi-media to enable instructors and students to use Web-based materials. In order to meet the curriculum objectives of a more diverse set of ABM and BBM majors, ARE will design and offer an additional 400-level course. Any increases from current enrollment levels will require additional resources (faculty, graduate students, operating budget, and classroom space). Create multidisciplinary MS degree program in Financial Mathematics and Engineering. Develop one new course for program's core curriculum in ARE/Economics graduate program.

Measures: Number of hired faculty to meet demand of increasing student majors and higher classroom enrollment by June 30, 2004, 2005, and 2006. Number of majors and credit hours taught and the number of degrees awarded in 2-year, 4-year, and graduate programs and length of

time to complete programs. Number of classrooms in Nelson dedicated to ARE priority use and in a building reasonably close to Nelson Hall dedicated to separate or joint control in scheduling for courses, seminars, meeting space and other academic uses. Number of new Teaching Assistantship (TA) and Research Assistantship (RA) positions allocated to department. Change in teaching operating budget from previous year. Related to the Financial Mathematics program, number of students applying to and accepted in the program, and number of graduates employed in jobs related to training.

Additional resources required: New positions for faculty to cover increased demands for teaching. See previously described positions associated with Economics of Food Safety (new), Agricultural Business Management (Ward), Agricultural Economics (new), Trade (Goodwin), and Bio-complexity (Johnson). Six new TA positions to cover complementary responsibilities in teaching and twelve new RA positions for research programs are needed. A higher operating budget to cover increased costs is essential. Retaining First priority classrooms in Nelson Hall and expanding First priority classrooms in other College of Agriculture and Life Sciences buildings are also extremely important. With respect to the Financial Mathematics program, administrative budget to support a half-time program director, secretary and operating expenses (\$150,000 annually, administered through the Graduate School). Recruitment efforts by the College to increase Agricultural Institute enrollment are needed.

15. **New B.S. Degree in Biological Sciences/Business Management**

Continuing advances in science, especially in biotechnology and health care, are creating new career opportunities for college students who combine business with life science knowledge and skills. Since 1991 ARE has offered the Biological Sciences/Business Management option (BBM) as part of its B.S. in Agricultural Business Management degree. The number of majors choosing the BBM option held fairly steady (around 10 students annually) through the 90s. Recent growth has resulted in 14 BBM option graduates in 2000 and 18 in 2001, out of the total undergraduate enrollment in ARE of 220-plus majors. The BBM option has produced graduates with a unique combination of knowledge and skills in both the life sciences and business disciplines (economics, management, marketing and finance). This combination has enabled BBM grads to find excellent jobs in the pharmaceutical, medical and other life science industries. Focus groups of ARE graduates and employers report that the "analytical and economic way of thinking", which is the foundation of ARE curricula, serves them well and provides them with a comparative advantage in the marketplace. Based on these successes, ARE seeks to establish a B.S. degree in Biological Science/Business Management.

The increase in students choosing the current BBM option has occurred without any marketing or promotion. Most of the students who "find" the BBM option express that it is a relatively obscure program of which most life science students are unaware. Our observation is that BBM would be an attractive and meaningful program of study for a much larger number of students if: 1) it was a separate degree program oriented to students with interests and backgrounds in the life sciences, rather than as an option within an agriculturally oriented program, as it is currently structured. 2) resources were available to handle increased student enrollment in ARE courses devoted to the BBM major. 3) information about the BBM major was widely disseminated to students already enrolled at NCSU in the life science majors, FYC, etc. as well as to prospective students. 4) additional courses, especially one in intellectual property law, were added. In addition, a minor in BBM could be offered to reach the needs of a large group of students seeking and/or needing to add business discipline to their scientific/technological training of their major. The opportunity also exists for ARE to establish a codicil with other departments in CALS that would provide business education related to their disciplines.

Actions: The ARE faculty has endorsed in principle this transition of BBM from an option to a separate degree program. If resources become available, the department will seek curricula approval from the college and university curriculum committees in early 2003, which would lead to the hiring of a tenure track faculty member by June 30, 2004. This faculty member would develop a teaching and research program that would focus on unique BBM linkages between the life science and business disciplines. If resources become available, the department will seek to develop a course at the 400 level that addresses intellectual property law and economic policy for the biological sciences.

Measures: Approval of the BBM degree by the curriculum committees and awarding of the first BBM degrees in 2004. Faculty member hired to lead and support the degree and program growth. Number of BBM graduates. Number of undergraduate students earning a BBM minor. Increase in the number of ARE courses offered and students enrolled.

Additional resources needed: New position (with associated start-up funds) to hire a person to enhance business course offerings uniquely linked to the life sciences.

III. Summary

Virtually all initiatives require some infusion of resources (funds, faculty/staff positions, and/or space). Contingent upon securing those resources, some progress is expected on all initiatives each year of the Compact.