

# A VISION OF THE COLLEGE OF AGRICULTURE AND LIFE SCIENCES IN ARIZONA'S AGRICULTURAL FUTURE 2003-2013

AHWATUKEE, ARIZONA

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Summary Report and Proceedings

## Introduction

In 1985 the University of Arizona College of Agriculture undertook a comprehensive two-year assessment of Arizona agriculture, culminating in a 1986 report that 1) characterized the role of agriculture in Arizona and in the marketplace, 2) forecasted the challenges and needs facing Arizonans as a result of changes in agriculture, 3) identified scientific, technological, and institutional developments to meet our future needs, and 4) provided recommendations for action by the state, agribusiness, and Arizona's universities.

On May 20, 2003, the College of Agriculture and Life Sciences (CALs) hosted a one-day round-table forum 17 years after the original report to develop the following document, "A Vision of the College of Agriculture and Life Sciences in Arizona's Agricultural Future 2003-1013." Invitees to the round-table, representing a broad spectrum of Arizona agribusiness, provided input toward a blueprint for action in cooperation with our stakeholders and agribusiness-related public agencies. This blueprint is the first of a series of stakeholder inputs on issues related to CALs.

Prior to the meeting participants completed questionnaires asking them to identify major factors that will significantly affect Arizona agriculture over the next decade or two. At the beginning of the forum, invited leaders from various segments of Arizona agriculture gave their perspective of the future. In response to this, panels representing various agribusiness sectors were appointed to give an overview of the future from their various perspectives; a rich variety of information and viewpoints resulted. The identified challenges, trends, and needs for their industries are summarized below. This is not intended to be a transcript of the entire meeting but rather a synopsis of the concepts discussed, to encourage further dialogue and thought.

## **Issues and Trends**

- *Consolidation of the industry* will continue. Agriculture will move increasingly toward high volume/low margin situations—economies of scale will be important.
- *World events and world markets* will continue to have a major impact on Arizona agriculture; thus we must become better marketers.
- *Governmental regulations* will continue to multiply.
- *Urbanization* will affect land and water availability.
- *Endangered species* issues and *environmental challenges* will persist.
- *Dietary issues* will remain important.
- *Technical advances* and practices in agriculture will continue to increase; agriculture is a highly technical industry.
- *Homeland security* issues will increase in importance.

## Needs in Arizona Agriculture

- *Research* on new plants, arid land plants, and growth methodology
- *Control* of diseases and pest introduction
- *Education and training* of the current agricultural and natural resources employees
- *Agricultural literacy programs*
- *Support* for Cooperative Extension
- *Programs* that explore compensation for losses due to regulations
- *Development* of agricultural policy
- More *genetically engineered* crops and animals (neutraceuticals, pharming, etc.)
- *New products/new packaging*; new technology across the board
- *Dissemination* of agricultural information through a variety of educational programs, ensuring appropriately educated individuals for the future work force.

## Round-table Discussion

These sessions focused on five themes: 1) global economy, 2) public policy, 3) biotechnology, 4) information technology, and 5) demographics. Following is a summary of findings and recommendations developed by participants in these groups.

### 1. Global Economy Issues and Recommendations

- ***Changes in the global economy.*** Continuing change in the global economy creates management challenges for Arizona agricultural producers. These challenges are important because the global economy affects many if not most sectors of Arizona agriculture, including cotton, vegetables, dairy, beef, hay, and tree crops. Products from all of these sectors are exported, thus the strength of the export market affects the prices our farmers receive. Exchange rates determine the demand and price for our products. International regulations influence requirements our producers must meet. The global economy rather directly affects the domestic prices faced by Arizona producers even if they do not export.
- ***Fluctuating exchange rates.*** Fluctuating exchange rates create special challenges for our exporters but also affect domestic prices, at times putting downward pressure on commodity prices, and at other times offering incentives for greater production.
- ***Quality issues.*** Foreign demand creates special challenges to maintain or improve product quality. Specific quality issues include 1) pests and disease which could trigger sanctions, 2) quality needs of particular foreign consumers, 3) stable and consistent supply, 4) development of new products that give Arizona producers a competitive edge, and 5) the need to provide information to build interest in our particular products.
- ***World Trade Organization (WTO) and North American Free Trade Agreement (NAFTA).*** These and/or other international institutions and policies will always play a vital role in regulating international trade. We must be alert to the rules imposed by them, and in some cases help in shaping those rules. WTO will soon take up issues related to GMO-related trade restrictions that could affect the demand for our wheat, cotton, and perhaps other products. WTO rules also affect our domestic farm policy because it must be WTO compliant—a major factor especially for farm subsidies for the cotton sector.

- ***Special interest policy and science-based responses.*** Special interests at times move to negatively affect our trade through various trade barriers based on alleged problems with our products. We need to provide science-based evidence to address these issues.

Specific areas to be addressed regarding global economy issues:

### ***Teaching***

Students need a curriculum to meet the needs of a global economy. That curriculum might include courses or course material on:

- Different cultures
- How international markets work
- Exchange rate effects on the market
- International institutions such as the WTO and NAFTA
- The importance of product quality and product differentiation
- Business ethics
- On-the-job experience, including international internships or other foreign experiences

### ***Research***

Research is needed on:

- Products that help differentiate Arizona products from competitors
- Trade policy impacts on Arizona producers
- Farm subsidy effects on those outside production agriculture
- Product quality influences on foreign sales and prices of Arizona products

### ***Outreach***

Outreach should provide user-friendly, science-based information on:

- General workings of international trade, and how it affects the Arizona agricultural industry
- Specific trade rules and their effects on Arizona agriculture
- Product quality and effect on international demand for Arizona products
- Exchange rates and their effects on Arizona
- New products or product quality that can improve foreign demand

## **2. Public Policy Issues and Recommendations**

- ***Establish a system of consistent monitoring of resource conditions, including data quality control.*** Resource conditions include rangeland health and conditions, ecosystem health, forest health, water, wildlife, and recreation. Data quality control would include storage and retrieval of data. There is a need for development of a coordinated program of rangeland monitoring that federal and other agencies can adopt. Data should be collected in a standardized way and reported in a standardized way. This will help reduce conflicts between ranchers and agencies and provide for informed public policy.
- ***Perform ongoing real-world, real-time public policy analysis, particularly economic analysis.*** CALS should help advise agricultural businesses, in an objective way, of the economic effects of farm programs on the agricultural industry. Economics and policy have

become a significant determinant of farm income. There is a need for better understanding of the broader effects of policies. While the outreach activities of the Department of Agricultural and Resource Economics in CALS were noted as a strength in their recent departmental review, more policy analysis would be beneficial.

- ***Identify and quantify the benefits of open space--including agricultural land--to Arizona's economy and quality of life. This includes identifying the management tools available to protect open spaces, and land and aesthetic values.*** The need to quantify the value of all types of open spaces, including the value of agricultural land to urban areas, was stressed. There are not-so-obvious public benefits that are not being measured. Information is lacking regarding the costs borne by landowners responding to public desires. Issues having to do with riparian areas have not been addressed since the last public document was prepared by CALS in 1986.
- ***Proactively develop ways to adapt agricultural practices to drought and global changes.*** Agriculture needs to be able to adapt in responding to climatic and other global changes. Which crops should be grown? What additional genetic management is needed?
- ***Work on identifying appropriate government policy toward agriculture with respect to homeland security.*** There is currently no organized focus on agricultural security. Food security is particularly important.

### **3. Biotechnology Issues and Recommendations**

Questions addressed stakeholder concerns and expectations in agricultural biotechnology:

#### ***How has agricultural biotechnology affected you to date?***

- Public perception of genetic improvement technologies is still an important unresolved issue that will need attention in the future.
- Two technologies (BTgene in cotton and Round-up resistant crops) have already significantly reduced the cost of insect and weed control in Arizona. The BT gene has been particularly beneficial to cotton growers and to the environment.

#### ***What are some of your expectations for agricultural biotechnology?***

- Improvement in plants and animals that will lead to cost saving through reduced inputs (e.g. pesticides, water, etc.). This will also have beneficial effects on the environment.
- Modification of plants and animals that will lead to development of new products or markets.
- Changes leading to improved product quality (e.g. improved nutritional content).
- Improvements in production per unit of input.
- A focus on the special needs of Arizona agriculture in CALS biotechnology programs.

***What are the concerns of your industry or constituents about these technologies?***

- Issues still exist regarding the acceptance of biotechnology, and uneducated or uninformed perceptions of biotechnology by the general public both in the United States and abroad.
- Valid concerns (e.g. possibility of gene escape) need to be addressed.
- More public education is needed regarding these technologies and their safety.

***What should be the role of CALS in facilitating development/adoption of biotechnologies for the benefit of Arizona agriculture?***

- Provide outreach to educate consumers of biotechnology products.
- Interact more directly with private sector in the application/development of biotechnology products.
- Provide independent/objective reassurance of the public about private sector biotechnology products.
- Prepare the future biotechnology workforce.

Specific areas to be addressed regarding biotechnology:

***Teaching***

Many of the departments in CALS offer educational programs in fundamental life science areas such as cell and molecular biology, genetics, and genomics. Undergraduate students in CALS can obtain a B.S. degree with a focus in the life sciences that will qualify them to work in biotechnology industries/laboratories. M.S. and Ph.D. degrees also provide opportunities for research careers in agricultural biotechnology. Yet CALS currently offers no *specific* degree programs in agricultural biotechnology at either the undergraduate or graduate levels.

***Research***

Most of the funding for research activities of relevance to agricultural biotechnology comes from federal grants. Few (if any) CALS research programs endeavor to directly develop biotechnologies that will have immediate application in agriculture. Rather, research efforts tend to focus on discovering the function of genes (functional genomics) that may be useful in modifying plants, animals, or bacteria in ways that will have agricultural benefit.

Additionally, research efforts are directed towards improving our knowledge of genomes (structural genomics) and the understanding of how genes are controlled (regulated) at various times during the life cycle or in response to environmental stresses. The most likely outcome from these approaches is the identification of useful genes and an understanding of how to control the expression of these genes for the benefit of agriculture. Applying this knowledge to produce a profitable agricultural biotechnology will most likely be done by privately owned biotechnology companies.

Note that the development of insect-resistant (BT) and Roundup-resistant crops was relatively easy and possibly even a bit lucky. Improvement of an organism by genetic modification through insertion or regulation of specific genes is neither routine nor simple yet. The knowledge needed to be successful in doing this is being developed in universities and elsewhere. CALS has and will continue to invest heavily in the generation of that knowledge.

In particular, CALS has hired faculty members who are working to identify genes that are important for agricultural productivity under environmental stresses (physical and pathogenic) commonly encountered in Arizona and throughout the Southwest. Tools developed through genomics research facilitate efforts to improve plants and animals by conventional breeding programs. However, CALS has a few faculty members who are directly involved in plant or animal breeding. Applied breeding programs have declined at universities across the country and moved to the private sector.

There was strong support for CALS to take a leadership and proactive role in the development of biotechnologies that will have a beneficial impact on Arizona agriculture.

#### **4. Information Technology (IT) Issues and Recommendations**

***How has information technology (IT) affected you to date, and what are your expectations and concerns?*** IT users are now accustomed to communicating rapidly online and to accessing and storing many types of data easily. Agribusiness, like other industries, has benefited from the ability to handle bookkeeping, diagnose field problems, offer training, make presentations, and complete other tasks online. The expectation is that IT will remain affordable and easy to apply across a wide range of agribusiness operations. This is sometimes more difficult to achieve in rural areas where electronic access is limited.

***What should be the role of CALS in solving information technology problems for the benefit of Arizona agriculture?***

- *Education:* To stay ahead, clientele must be taught how to use IT. To provide more equitable public access to IT, CALS should teach more IT to its students.
- *Be the leader in IT:* Be more proactive with outside industries to remain at the forefront of IT. Use Cooperative Extension to provide hands-on information to the public and improve delivery procedures.
- *Offer support and demonstration* for IT technology to industry.
- *Use IT to improve marketing* of the valuable resources that come from CALS and promote the college in a better way; emphasize the value of our research.
- *Maintain strong linkages* with commodity groups and also with the local communities; need improved means to get the message out to CALS constituents.
- *Focus* on CALS areas of expertise. Note that time and money are required to develop information technology programs. Do we need a paradigm shift in the fundamental way we operate, given the technology?

## 5. Demographics Issues and Recommendations

### ***How does agriculture adjust to social changes, i.e., growth of population, ethnic mix, or dietary preferences?***

- Cooperative Extension is in a position to assess and give feedback to research and teaching in these areas.
- The Arizona dairy industry is challenged to know and meet the cultural preferences of a changing Arizona population, in particular, the increasing Hispanic population.
- On many Arizona Indian reservations there is a loss of the traditional culture based on agriculture. The effects of gaming operations on tribal members must be taken into account, and casino-related job opportunities for Native Americans, youth in particular. Fewer youth are interested in the tribe's agriculture.

### ***How can agricultural literacy programs serve agriculture and the general public?***

- Help general public understand the importance and role of agriculture for life.
- Show how agriculture contributes to the community, especially through jobs and products.
- Show where agriculture is headed in the future.
- Show how sustainable agriculture based on a knowledge and understanding of specific practices will work in Arizona.
- Serve the general public and youth through an effective program because education is the key in promoting agricultural literacy.

### ***What are examples of what CALS is doing?***

- CALS is addressing rural/urban interface issues such as the PM<sup>10</sup> problem for better air quality, conducting programs for managing waste water, and offering water conservation programs. In the last five years 12% more water has gone to urban needs compared to agricultural use. It is expected that an additional 20% will move to urban needs in next five years.
- Conducting water quality programs, for example, researching perchlorate contaminants from Colorado River water in lettuce.
- Offering UA agricultural literacy programs through county extension offices in Maricopa County, Graham County, and at the Maricopa Agricultural Center.

### ***What are some consumer-oriented programs that are available from the University of Arizona?***

- *EFNEP* targets to low-income families, largely Hispanic. It teaches how to provide nutritious healthy diets on little disposable income.
- *Ranch-to-Rail program* improves efficiency of beef production, improves meat quality, and ensures the safety of meat.
- *Forest Health* focuses on how to manage forests to reduce fire damage and bark beetle damage.
- *Bone Builders* teaches women (and men) how to improve their bone health, prevent osteoporosis, and decrease health care costs.

Note that CALS faculty are successfully competing for grant dollars to fund new programs to address consumer issues. Cooperative Extension obtains 40% of its budget to supplement dwindling state resources.

***Specific demographic areas to be addressed in CALS:***

- Recruit and retain Native American and Hispanic students. There is a series of social, historical, and cultural barriers that discourage these youth from studying agriculture.
- Figure out how to make a University of Arizona education more attractive to Native Americans by easing the shock experienced when they make the transition from the reservation to campus.
- Present a total picture of agriculture to help students develop a better understanding of the diversity represented by agriculture and the career opportunities available in agriculture in the broader sense including agricultural related industries.
- Seize the opportunity available in this state for the University of Arizona to play a larger role in new crop development, because of the open space and isolation that is possible for testing and other activities.
- Where needed, develop more bilingual English/Spanish materials.
- Recruit and retain Native American, Hispanic, and other minority faculty.

In addition, the group identified seven other issues that need to be addressed by CALS:

- Do a better job of marketing CALS.
- Develop a class devoted to educating students about what a land-grant university does. Less than 20% of students coming to CALS have any agricultural background.
- Correct the misleading image that students (and the general public) have of agriculture. Arizona agriculture is much more than being a farmer.
- Make sure the number of students enrolled in CALS increases proportionately with overall enrollment growth at the UA. Currently there are approximately 1,950 undergraduates and 450 graduate students. Minorities make up just 10% of undergraduate students in CALS.
- Recruit faculty who can relate to and address Arizona desert conditions.
- Publicize more adequately the availability of scholarships in CALS.
- Find ways to help Native Americans grow with the demographic changes in Arizona. CALS has a high retention of Native American students compared to the rest of the University of Arizona. Help these students make linkages between their culture and the rapidly changing demographics.

**Conclusion**

The College of Agriculture and Life Sciences (CALS) expresses sincere thanks to our colleagues and friends who participated in the one-day round-table forum to develop “A Vision of the College of Agriculture and Life Sciences in Arizona’s Agricultural Future 2003-1013.” A special thanks goes to those who provided valuable insight and commentary beyond what is included in this report.

The final question is:

### **Where Do We Go from Here?**

*--Parting thoughts from Dean Eugene Sander*

The UA College of Agriculture and Life Sciences operates in the land-grant spirit established in 1862, which calls for the provision of a high-quality education for all people coupled with research to meet national needs. As we move forward in the 21<sup>st</sup> century, we find, as a result of the round-table, formidable challenges and opportunities await the college and the industry. What can we do to better position ourselves to meet the ongoing demands of educating our future agribusiness leaders while providing relevant research and outreach programs to you, our constituents?

State support for the university system in general and CALS in particular has shown a significant decline. For the first time in years, the state budget ending June 30, 2004 neglected to provide funds for student enrollment growth. Tuition has increased, but the stable nature of our enrollments at the undergraduate and graduate level will not provide for substantial increases in tuition monies flowing to the college.

Federal grants and contracts support the development of evolving technologies designed to keep agribusiness competitive into the future. CALS has shown an amazing ability to compete nationally in this arena, and will continue to do so. But few funds are going to CALS to support public outreach, including Cooperative Extension.

So what do these trends mean to you in the agricultural sector of Arizona's changing and evolving economy? Should CALS operate on an enterprise model where the services provided are driven solely by the availability of money, which may not directly relate to the short-term or long-term needs of Arizona agriculture? We believe this is not in the best interest of CALS or our constituents in the state. Hence, we believe that CALS should make its case for appropriated support from the legislature, especially for Cooperative Extension and state-specified agricultural research.

At the state level CALS proposes a strategic partnership with you, our constituents. This partnership will require our collective focus in two key areas:

1. As the University of Arizona enters into a new era of "Focused Excellence," the university will become less comprehensive and more driven by student demand, perceived quality, and funding opportunities in areas of national priority. Disciplines and areas considered irrelevant as evidenced by either the lack of public or state-defined priorities, student interest, or low quality will be eliminated. Public education on the importance of areas such as dairy science, horticulture, watershed management, and range management must be better understood and considered important by the average person who fails to equate agriculture and the resources needed to support it with the supermarket. Public education on the importance of agriculture in this state is vital to our collective futures. *How can we collectively promote this dialogue?*

2. Focused Excellence will not help the one traditional strength and linkage CALS maintains with our constituents, that being a continued and growing need for timely information and access to professionals in their field of economic endeavor. Such assistance has traditionally been provided through our county-level Cooperative Extension personnel and on-campus experts. The only way to bolster this activity is through sustained financial support at the county and state level to hire faculty and provide operational support for Cooperative Extension programs that you, our customers, believe are important. *How can we collectively promote this need with our Arizona Legislature?*

Teamwork is the key to overall success. The College of Agriculture and Life Sciences needs your support for and interest in our programs if we are to retain a capacity of response worthy of your expectations. Expressing this in a different way, the people CALS assists must take ownership for supporting CALS' three-fold land-grant mission of teaching, research, and community outreach.