Mr. Chairman, ladies and gentlemen!

I am deeply honored to have received your gracious invitation to attend the International Students Summit on Food, Agriculture and the Environment in the New Century, and to deliver this speech for this grand event today. I would like to extend sincere thanks to the ISS Organizing Committee for allowing me to express my thoughts to the distinguished participants in attendance from the global partner universities of the Tokyo University of Agriculture and the general body of TUA, and distinguished representatives from various agricultural organizations, including the Japanese press.

Born and raised in a small farm in the mountain region of Nepal, I have been a student of food, agriculture and environmental sciences for over 35 years. I have lived, studied and worked on both sides of the world—the developed world and the developing world. So, in some ways, I feel that I am destined to speak today on the lessons of the 20th century and my vision for higher education in agriculture in the 21st century. In doing so, I will speak today on the basis of my own experiences and on my perspective on issues facing undergraduate education in food, agriculture and the environment.

I will divide my talk into three distinctive areas. First, I will share with you some facts about world population, food production, and our environmental situation. Second, I will outline the historical development of agricultural higher education and how the system has evolved to address the world’s changing food needs. Third, I will discuss the major issues and challenges facing the agricultural higher education system and the future of agricultural higher education systems in the 21st century.

World Population, Food Production and Environmental Conservation

Looking back on the 20th century, we see a century of war, peace and prosperity.

The world witnessed two world wars and conflicts within nations and between countries. We also witnessed major ideological differences on the politics of development—conflicts between capitalist and socialist philosophies of development and change.

The world also witnessed major achievements in world peace and harmony—establishment of international organizations such as the United Nations and emergence of regional consortiums of independent and free nations such as the European Union, the South East Asian Association for Regional Cooperation, and others. Foundations and non-profit organizations established a spider-weblike network to deliver services related to education, healthcare, economic development and poverty reduction, to name a few.
The 20th century was a period of immense prosperity in the history of humanity. After several decades of faster-than-exponential growth, the world’s population has begun to stabilize. Meanwhile, extreme poverty has been receding, although hunger still persists in many parts of the developing world. The world’s economy has witnessed unprecedented growth in all service sectors, including education, agriculture, commerce and trade, technology and healthcare.

Food production has kept pace with the needs of the growing world population—1.6 billion people in 1900 grew to over 6 billion people in 2000, but the population growth rate has slowed in many countries. Of course, agricultural colleges and universities around the world have played significant roles in meeting the food and fiber needs of the growing population through their research, education and extension.

**Historical Development of Agricultural Higher Education**

The system of higher education in agriculture evolved over a period of over 150 years. Although an exhaustive review of literature is beyond the scope of my presentation, I would like to share some facts that will likely be of interest to this audience. One of the earliest schools of agriculture was established in Texcoco, near Mexico City, in 1854 (now Universidad Autonoma de Chapingo). In 1855, the Michigan Legislature passed a bill to establish the Agricultural College of the State of Michigan, which became the first institution of higher learning in the United States to teach scientific agriculture (MSU, 2006). This college, established under the Morrill Act of 1862 (Fields, et al. 2003), became the prototype for 69 other land-grant institutions to “teach men the way to feed, clothe, and enlighten the great brotherhood of man.”

Toward the end of the 19th century and the beginning of the 20th century, the wave of higher education in agriculture spread around the world. In 1891, the Tokugawa Ikueiko School was founded in Kojimachi, Tokyo, with specialized two-year training courses in agriculture, commerce and general science; these courses laid the foundation for Tokyo University of Agriculture. China Agriculture University’s College of Agriculture was founded in 1905, and the College of Agriculture of the University of the Philippines was started in 1909.

During the late 1910s and early 1920s, colleges of agriculture were established in Europe. Wageningen University was founded in 1918. In that same year, a Department of Agriculture was created within the Kyiv Polytechnic Institute, currently the National Agricultural University of Ukraine.

Although some form of agricultural education and training was taking place through various institutional arrangements, most countries in South and Southeast Asia developed formal systems of higher education in agriculture during the 1940s and 1950s. For example, although the Advance Academy of Agronomy and Forestry was founded in Taipei in 1919, it took some 50 years and several restructurings for it to evolve into National Chung Hsing University in 1971. The development of many colleges and universities followed a similar history. The Faculty of Agriculture under the University of
Indonesia (presently Bogor Agriculture University) was established in 1940. In Thailand, Kasetsart College, established in 1938 under the Ministry of Agriculture was detached and designated as Kasetsart University in 1943. The College of Agriculture under the Kyungpook National University was established in Korea in 1946. Hanoi Agricultural University was established in 1956 as one of the national universities of Vietnam.

Soon after gaining its independence in 1947, India approached the United States to ask for help with establishing a system of higher education similar to the U.S. system of land-grant colleges and universities. By the early 1970s, India had established nine new agricultural universities in a massive pioneering effort to redirect its system of higher education. The wave of agricultural education spread around the world as almost all countries realized the need for a system of higher education in food, agriculture and the environment. As a result, hundreds of state-funded agricultural colleges and universities have emerged during the past 30 years. Today, we estimate that the number of agricultural colleges and universities exceeds well over 1,000, and each year over 100,000 students graduate with 4-year degrees in subjects related to food, agriculture, and environmental sciences.

In summary, soon after gaining some form of independence in the 20th century, most nations called for a new system of higher education to serve the needs of their general populations and to guide their progress toward achieving new social and economic goals. Agricultural colleges and universities, to a great extent, represent this new system of education.

What have been the major accomplishments of institutions of agricultural education?

Agricultural colleges and universities have played significant roles in serving humanity. Their contribution to advancing knowledge and educating students in science, technology, agriculture, forestry, veterinary medicine, food and nutrition, and other areas of scholarship has been remarkable. They have been key players in food security worldwide through research and development. Their research has transformed the present food chain for our society—production, processing/packaging and distribution. Their research has shown that poverty, food security, environment and disease are linked in a vicious cycle. They have played key roles in dissemination of new knowledge and technology to serve the needs of the general public. They have been the link between grass-roots needs and national priorities. Their alumni have been the prime movers in academes, in governments and in businesses. Simply put, these agricultural colleges and universities have served the needs of the general public and guided progress toward achieving social and economic goals.

What are some of the challenges facing these agricultural colleges and universities?

As I noted previously, most nations established agricultural colleges and universities to serve the needs of their citizenry soon after achieving some form of independence in the 20th century. Because those educational institutions were created to serve the needs of
people, population growth and its distribution have had major impacts on their performance.

Let me share with you some facts about the changing human population in recent times.

- The world’s population today is almost four times its size in 1900. If 2005 fertility rates remain constant to 2050, approximately 5.3 billion people will be added to the current population of 6.4 billion (Cohen, 2005).

- Populations are growing most rapidly where such growth can be afforded the least—i.e., in many sub-Saharan African countries and in a number of countries in Asia, Latin America and the Caribbean.

- The world’s urban population will roughly double in the next half-century, from 3 billion to 6 billion. About three out of four people in developed countries will be living in urban areas, and the populations of developing countries will follow this trend. Almost half of the population of the Philippines, for example, now lives in urban areas (Population Reference Bureau, 2006).

- The relationship between population growth and demand for food is direct. Similarly, poverty, environment and health are related. One agricultural worker today feeds herself and one city dweller, on average. In 2050, she will have to feed herself and two urbanites (Cohen, 2005).

These demographic trends have direct effects on the quality of life worldwide. Cities are becoming more crowded and polluted, and the reliability of safe food and water supplies has become uncertain. The productivity of agricultural lands and fisheries is declining as these areas become increasingly degraded and pushed beyond their production capacity. The world is afraid of the loss of plant and animal species—biodiversity—due to the loss of forests, wetlands and coastal mangroves, and the destruction of coral reefs. Today, we hear reports of destruction from flash floods, landslides, windstorms and tidal waves, and these environmental problems are caused mainly by increased population pressure on the land (Population Reference Bureau, 2006).

The challenge today is not only to produce enough food to feed the growing population but to produce and supply safe food—safe not only for us but also for the environment.

Today, farmers produce more food than we can consume, thanks to agricultural scientists and engineers who have developed new and improved plant materials and animal stocks, have invented new forms of plant nutrients and pesticides, and have developed irrigation systems for better yields. Although we have the technology needed to grow enough food to feed our planet’s growing population, we must work to improve food distribution—supplying food where it is needed most. More importantly, we must work hard to ensure that every person has access to food.
Food safety is also critical. In the United States, an estimated 76 million people contract food-borne illnesses each year. The economic burden due to *Salmonella* infections alone is estimated at $2.8 billion annually (Adhikari et al., 2004). We have learned from experience that fear alone of SARS (severe acute respiratory syndrome), avian flu, *E. coli*, *salmonella* and mad cow disease tainting the food supply can undermine public confidence, depress commodity prices and disrupt international trade. The fear of contamination itself can put a producer out of business. Consumers are demanding traceability in the food supply chain from the farm to the table. The outbreak of foot-and-mouth disease in the United Kingdom a few years ago resulted in the slaughter of over 6 million sheep, cows, and pigs, and had a ripple effect on meat consumption and rural livelihoods.

There is growing public concern about the negative environmental and human health concerns of many of the intensive agricultural technologies that focus solely on improving farm productivity (Bawden, 1996). Examples of such technology are on the rise in concentrated animal feeding operations near many urban centers. A Worldwatch Institute researcher (Nierenberg, 2005) has documented the harmful effects of such factory farming and explains the range of consequences for the environment, human health and communities.

Mr. Chairman, Ladies and Gentlemen,

Let me now focus on the impact of changing demographics on the system of agricultural higher education—i.e., the agricultural colleges and universities where we work. How could the participants of this International Student Summit—the emerging leaders of agricultural education—address these challenges? Despite enormous achievements and societal contributions, our colleges and universities are at a crossroad and facing a serious crisis. Let me summarize that crisis.

**Our students:** Traditionally, rural farm communities have been the primary sources of our student populations. With an increase in urban and suburban populations, the majority of our students are no longer rural-based, and they bring with them neither the farm experience nor an interest in production agriculture. Thus, the majority of them are no longer interested in farming upon graduation.

In the United States, most agricultural colleges within land-grant universities have experienced a decline in undergraduate student enrollments (Manderscheid, 1988; National Research Council, 1997. We have seen a gradual decline of enrollments in the disciplines of general agriculture, agricultural engineering and mechanization, natural resources, plant science and animal science. Student interest in production agriculture majors is waning. At Michigan State University, majors such as packaging, building construction, agribusiness management and biosystems engineering are gaining in popularity. Further, a significant number of our students come as transfer students from other colleges within or outside of the university, and the number of students coming directly from high school is also declining in agricultural colleges.
In most agricultural colleges and universities in developing countries, on the other hand, there is tremendous pressure for student enrollment. Some colleges have imposed a system such as an entrance examination to admit students. Unfortunately, this system can hurt a student who comes from a remote rural village and who was raised in a farm family, simply because he or she may be unable to compete with suburban school graduates in entrance examinations in which math, science and probably English skills are tested.

**Our curriculum:** Traditionally, undergraduate curricula in agricultural higher education were either discipline-based or professional majors. Disciplinary majors have included areas such as agronomy, agricultural engineering, animal science, horticulture, etc., which have had one or more established national journals and a professional society. Professional majors tended to focus on vocational orientation, with the bulk of graduates entering the world of work following graduation (Bawden, 1996). Examples include agribusiness, agricultural communication and food marketing (Manderscheid, 1988). This distinction is important in designing our general curricula. What type of work will our graduates be doing upon graduation? To give one example, how many semester credits of math, calculus, statistics or chemistry should we require for graduation? Should we be preparing students to enter graduate school or prepare them for employment? Obviously, this has implications for resource requirements—the number and types of faculty hires, and the size of laboratories and farms/experiment stations to maintain.

We know that curriculum development is a dynamic process and that we should be continually updating curricula as new knowledge becomes available. Accordingly, we need to upgrade our textbooks, lab equipment, chemicals and manuals, and computer hardware and software. We also need to invest in faculty development programs to keep our faculty members current in their fields. Despite increases in general undergraduate enrollment in many developing countries, there has been no new support for curricular improvement. Our buildings are aging, our labs are rusted, and our faculty members lack vigor without funds to support their development or exchange programs.

**The pedagogy:** We have witnessed major structural changes in the content and style of instructional delivery, from hierarchical, test-based, instructor-driven, passive-knowledge-transfer types of instruction to present-day learner-centered, online instruction. I would like to share my memories with you about my meeting with Dr. Noboru Iwamura in 1981, who shared with me how the higher educational system has taught students. Although a physician, he had lived and worked in the rural areas and observed how the way we teach farming has changed. According to him, until the 1950s, colleges and universities taught more in a pure and literary posture, and the goal was to provide learners with “technical know-how.” The pedagogy then encouraged rote memorization of facts and principles. The main goal at each level was to prepare students for the next level.

This style of teaching and learning changed in the 1960s. Students were required to apply theory to practice—practice planting crops and tending livestock— and to learn how to
problem solve. To teach real-life agriculture, colleges and universities were moved away from crowded cities to places where there was abundant farmland for teaching, research and extension. Students were given their own plots of land so they could practice and apply theory. The best plots of crops or vegetables were rewarded. The courses were labeled “practices of crop production” or “practices of animal husbandry,” and the pedagogy focused more on practice “do-how.”

Toward the end of the 20th century, there was a wide recognition that agriculture students lacked proper understanding of social value and they did not know how to communicate effectively with producers, marketers, and policy-makers; and they lacked ethics, interpersonal skills, teamwork skills, and leadership skills—also called “human-how” skills. As a result, social science and humanities courses offering “human-how” skills were introduced into the curriculum.

**New dimension of undergraduate experience:** In my opinion, finding a balance among technical “know-how,” “do-how” and “human-how” is important but not a sufficient condition of teaching and learning in agriculture. With tremendous growth and interdependence of trade taking place among nations, we have to add a new dimension to our undergraduate curriculum—the international dimension of food, agriculture and the environment for sustainable development. We can call this “international-how.” We need to create opportunities for our students to learn what other nations are doing in order to keep their agriculture competitive in the world market. To be competitive, they must understand how food is produced, processed or packaged, distributed and consumed in other parts of the world. They need to see what technology and services are required for successful business operations. They need to understand the importance of global markets and to find ways to cooperate and collaborate to improve the systems of food production, processing and marketing. At Michigan State University, we strongly encourage and support students to study abroad; 2,787 students participated in 225 Study Abroad programs last year. The College of Agriculture and Natural Resources has over 60 study abroad programs, with 208 students participating last year.

The goal of this summit, in essence, is to enhance such international cooperation. I feel that this summit should help forge linkages and partnerships between our universities. We must develop partnerships to support internationalizing the student experience, collaborating in research and outreach programs, and sharing knowledge and instructional techniques.

**Leadership for change:** Despite changes taking place worldwide in course content and style, at most colleges of agriculture in developing countries pedagogy remains unchanged. We tend to put the blame for such slow change on poor communications infrastructure—e.g., lack of access to the Internet—or on lack of funding. In reality, some administrators of our colleges and universities care less about how their faculty members teach student than about how many grant dollars they bring to the university. In some instances, faculty members follow the priorities of funding agencies, rather than the needs of their discipline or the needs of the society. In light of this, the system of faculty
recruitment, tenure and promotion needs a critical review and the adoption of corrective measures to promote a holistic, student-centered and problem-solving-oriented pedagogy. This requires visionary leadership with commitment to teaching as a profession, leadership from within the teaching profession and leadership that garners support from a wide array of stakeholders.

**Role and linkage within society:** Historically, agricultural colleges and universities in the United States have been performing three primary functions: teaching, research and extension. This is also true for agricultural universities in many developing countries. For example, while signing the basic law of higher education when establishing Bogor Agricultural University in 1961, the president of Indonesia mentioned “Tridharma”— instruction, research and community service— as its core philosophy (IPB: Bogor Agriculture University). This is also essentially true at the University of the Philippines at Los Banos, Hanoi Agriculture University, and several others.

Colleges of agriculture today, however, are facing a hard reality—declining or stagnant government support for agricultural education, research and extension. Bilateral support from developed countries such as the United States of America or Japan has dwindled. Most of our vice-chancellors or presidents question the rate of return on investment for a loan from the World Bank or other regional development banks to support our programs. The work we do in our universities does not match the priorities of NGOs such as the Ford, Rockefeller or Bill Gates foundations. Banks and foundation are more interested in making investments in programs or projects that produce results quickly. Development of human resources for nation-building or for helping the common people living in the outlying villages—the mission of our colleges and universities—requires long-term investment commitment. In this context, many colleges and universities have not been able to keep up with their commitment to public service or extension. Support for agricultural research is also dwindling. As a result, many colleges are asking their faculty members to teach in crowded classrooms, using cheap instructional technology— i.e., lecturing with the occasional use of an overhead projector.

What should be our roles and functions in the 21st century? Should we maintain all three functions — instruction, research and extension? How should these agricultural colleges and universities be funded? Should we depend solely on government funds or seek funds from a number of sources to support our programs? Should we change our organization from “publicly supported” to “publicly assisted” institutions and start charging fees for service? This requires a careful review of the context of each university, a reexamining of our roles and responsibilities in light of changing demographics, and a realigning of our programs so that they may be restructured to better serve our people.

**Keeping college affordable:** Last but not least, our common challenge is to expand college access to low-income and minority students. For a variety of reasons, too many qualified lower income and minority students fail to pursue a postsecondary education simply because they cannot afford it (ACE, 2006). As emerging leaders and policy-makers, we must develop ways to keep college education affordable and accessible.
Distinguished ISS participants,

I have seen a clear need for a continuous cadre of agricultural scientists and professionals in each country who are willing to accept leadership roles, make commitments to devote their lives to agricultural development, and take responsibility to provide safe and nutritious food to our growing population. To achieve this goal and be relevant to the needs of the 21st century, we need your leadership so that our agricultural higher education system addresses the following issues:

**Review and redefine our role** to examine whether our colleges of agriculture should retain all three functions of instruction, research and extension. On the basis of periodic reviews, we must be empowered to change or restructure our departments, teaching-learning style, and faculty size and its development.

**Reaffirm and enhance support** from the legislature, governmental officials and the general public by engaging them or their representatives in developing long-term strategic plans.

**Maintain a balance of the student population** of rural, suburban and urban populations by offering diversified curricula and programs. Urban and suburban students need exposure to farming, food processing and marketing through hands-on experience.

**Restructure the curriculum** from a narrow production agriculture focus to include broader issues facing our society today, such as food safety and marketing, nutrition and the environment, including water and land use issues.

**Internationalize the curriculum** through faculty and student exchanges, study abroad programs and international research collaboration.

**Internships** have proven to be a very effective way to offer hands-on and employment-focused learning experience (National Research Council, 1996). We might decide to require students to have at least one mentored internship experience within their industry or field of study.

**Maintain linkages** with national and international agencies for research and outreach collaborations. There is much stronger network between the national agricultural research agencies and international agriculture research centers such as International Rice Research Institute, Asian Vegetable Development and Research Center or International Potato Center. Many agricultural colleges and universities have not reaped the benefits of partnering with these agencies. Public agricultural extension, on the other hand, has been criticized for being unresponsive to the variation in farmer needs, lack of ownership by the intended beneficiaries, failure to reach poor and female farmers, and limitations in the quality of field and technical staff members. This may be an opportunity for our faculty members to demonstrate exemplary extension or outreach programs in partnership with local, national and international organizations.
Forging/building partnerships with other colleges and universities within our nation and region and internationally helps make better use of our resources. There is no need to re-invent the wheel—we can learn and share from one another’s experience.

Leadership is critical to our success. We need people with open minds, vision and commitment to lead the 21st century colleges of agriculture.

And last but not least, we need to engage our stakeholders in conducting periodic reviews and evaluation to ensure that our colleges are moving in the right direction to best serve our citizens and humanity in the 21st century.

Thank you.

References


American Council on Education. 2006.

http://www.acenet.edu/AM/Template.cfm?Section=Home&CONTENTID=18299&TEMPLATE=/CM/ContentDisplay.cfm


http://www.fao.org/sd/EXdirect/EXan0010.htm


China Agriculture University. 2006. Office of International Relations.


Kyungpook National University of Korea. 2006.  

http://www.fao.org/sd/EXdirect/EXan0008.htm


http://www.prb.org/Template.cfm?Section=PRB&template=/ContentManagement/ContentDisplay.cfm&ContentID=13761


University of British Columbia. 2006.  
http://www.library.ubc.ca/archives/hist_ubc.html

University Putra Malaysia. 2006.  
http://www.upm.edu.my/?l=e&aktvt=content&kat=D&kod=20060401091125147192168147

University of the Philippines at Los Banos. 2006.  
http://www.uplb.edu.ph/?PAGE=about
Universidad Autónoma de Chapingo. 2006.  
http://www.chapingo.mx/mod.php?mod=userpage&page_id=8