A Bright Future in Agriculture: Expanding the Minds of Future Leaders in Space Agronomy, Biotechnology, Food Safety and Human Nutrition*

DEEPAK BHATNAGAR

USDA/ARS/SRRC, 1100 Robert E. Lee Blvd.

New Orleans, LA 70124, (E-mail: dbhatnag@srrc.ars.usda.gov)

Good morning. It is a pleasure for me to be here to talk to you this morning. And I thank all of you (on behalf of USDA) for being here to listen to what we have to say about the Department of Agriculture and the career opportunities it provides for people such as yourself. The best part is that these opportunities are service oriented and yet fun to undertake.

As has been stated, my name is Deepak Bhatnagar. I am a Research Geneticist with the Agricultural Research Service of the Department of Agriculture. My speciality is Food Safety and my basic task is to do research and examine the genetic make-up of a fungus that grows on certain crops that, not only in the USA but also throughout the world, produces a very strong cancer causing compound called aflatoxin. My task is to find ways to prevent this fungus from making the toxin in these crops so that we can have a safe supply of food for human consumption and feed for animals as well.

I was born and raised in India and obtained my Ph. D. degree there in a subject called Agricultural Physics; to be more specific in Agricultural Biophysics. I came to the U.S. in 1978 and joined the USDA in 1985 as a young scientist at Grade 11. The Department gave me excellent career advancement opportunities and I took full advantage of them. And after nearly 17 years of dedicated and hard work, I am now a senior scientist at the top of Grade 15 and have been offered the opportunity to advance further in my Agency, ARS. I am indeed grateful for the opportunity I have been given by the U.S. Department of Agriculture.

I said I have obtained my degree in Agricultural Physics. "Agriculture" is generally considered as one subject. But the field of Agriculture has become so complicated that every discipline of science is needed to solve complex agriculture issues.

---

*Presentation made (June 27, 2002) at the USDA workshop held (June 26-28) in conjunction with the 73rd Annual League of United Latin American Citizen (LULAC) and Federal Training Institute (FTI) National Conference and Exposition, Houston, TX (June 23-29, 2002). The Workshop was sponsored by the USDA Office of Civil Rights, Employment Compliance and Technical Assistance Division, Washington DC.

Dr. Charles Onstad got you interested in some basic disciplines of science that are essential for conducting research in Agriculture. Dr. Tom Rivers motivated you to pursue higher education, even beyond a Bachelor's degree, namely obtaining a Ph. D. degree. And Mrs. Lilly Rivera highlighted the benefits of Federal employment in general, and USDA in particular. Now, in keeping with the topic of discussion for today, let me give you a flavor of the challenging job opportunities you will find in the years to come as you enter today the diverse, multicultural workforce of USDA.

The US Department of Agriculture was created and is committed to provide the residents of United States with the safest, most nutritious and plentiful food supply at the most competitive prices. And more recently the Department is extending this objective, and conducting research, to provide the same quality of food supply to the Human race if and when it inhabits space. This monumental effort requires a lot of preparation and a concerted effort of all sorts of skills such as those of microbiologists, engineers of all sorts, geneticists, veterinary science specialists, human nutritionists, physiologists, physicists, chemists, mathematicians, statisticians, computer technologists, and yes even health professionals, psychologists, economists etc., etc. You name it and every scientific discipline will be found to be applicable to modern day agriculture. So, no matter what your interest in education is, Agriculture can offer you a career opportunity.

The subject areas that we need to discuss today are Space Agronomy, Food Safety, Human Nutrition and Biotechnology. These sound like simple words. But for the study of each of these disciplines requires the coordinated effort of all those specialities that I have enumerated earlier. Let me take these subjects one by one:

Space Agronomy. The ARS is currently conducting a significant amount of research on this topic because the type of need of man in space has not been clearly defined. But biologists are using all our fundamental knowledge of plant growth on earth, and working with physicists and chemists, and trying to figure out how these plants will grow in "zero gravity" in space. Experiments are being sent up with the space shuttle to do trial studies. Also, in cooperation with Epcot Center in Florida, experiments are being conducted to grow fruits and vegetables indoors in water, without any soil, mimicking conditions that may be necessitated for plant growth on planets such as Mars.

Biotechnology. This word simply means gaining knowledge of the techniques that exist in biological processes in nature. This is not a new field of science. But over the years what man has done is to study and understand nature, and use what is already happening in nature and apply it to solve problems. For example, fungi or molds in their natural environments decay wood. Scientists have isolated the enzyme that these molds use for the process; they have mass produced the enzyme, and are using it for environmental clean up purposes. This is biotechnology at work!

All biological processes depend on genes. So biotechnology has become synonymous with gene

manipulation or genetic engineering. Although biotechnology is only a tool, it has become so complicated that it has now considered one of the discipline's of science; and high speed instruments and computers are needed to understand the nature and function of genes. This technological innovation is playing an important role in agriculture, since the benefits of the innovations of last century's technological innovations such as mechanization, chemical fertilizers and pesticides are beginning to wane.

Using this technology, we have already created crops that fend-off insect pests. In the not so distant future, nutritional needs will be met for the developing countries with programs such as the golden rice project, which could significantly reduce blindness related to Vitamin A deficiency. Also, very soon, vaccines against diseases such as cholera could be provided in dietary foods such as rice and bananas, to overcome the costly problems associated with mass inoculations. These are some of the benefits of biotechnology.

Human Nutrition. US Dept. of Agriculture has become aware that consumers are demanding more foods that improve health and the quality of life, improve physical performance, reduce risks of chronic diseases, and increase the life span. And this trend is likely to increase. Research in human nutrition in the last decade has shown that what and how much we eat profoundly affects our growth, development, and aging, and the ability to enjoy life to its fullest. It is estimated that one-third of the 500,000 cancer deaths annually in US are due to dietary factors. Health related costs from diseases linked strongly to diet exceed $300 billion each year. Heart disease alone accounts for $80 billion, and obesity another $86 billion. So, we need to continue to do research on the link between diet and health and how to prevent it (We could certainly use these monies for other programs such as education and building the country's infrastructure). New techniques of biotechnology or molecular biology have enabled us to identify those individuals at greatest risk for nutritionally related diseases, and nutrient gene interactions. We also have the challenge for determining what factors affect our food choices, our eating behavior, and what nutritionists could do to change that behavior. These are some of the multidisciplinary challenges USDA is addressing in its human nutrition programs located throughout the country.

Food Safety. The United States food supply is among the world's safest and most wholesome. And we take it for granted. And no outbreaks of food related illnesses are regularly reported in the news. This is because the Department of Agriculture spends millions of dollars for providing continual monitoring of our food supply by food inspectors, microbiologists, epidemiologist and other food scientists working at international, national, local and city levels. In spite of all this, you will be surprised to learn that between 6.5 million and 33 million Americans are affected each year by food-borne illnesses, resulting in nearly 9000 deaths, and associated medical costs run into nearly $35 billion. Dealing with food safety issues continues to be a challenge for the USDA in this century. Also, consumers do not generally differentiate the sources of their food. They want it safe no matter where it is produced. So, we have to be increasing vigilant about the safety of imported food, particularly fresh produce. To meet these demands USDA is operating

under a Food Safety Initiative (along with other Federal departments and agencies) to use novel methods to detect and reduce pathogenic bacteria, parasites, chemical contaminants and other natural toxins from our food supply. USDA wants that safe food is available to every American at home, when eating out, or in institutional settings, and the knowledge needed to keep that food safe until consumption. This will require engineers, agronomists, food scientists, microbiologists, geneticists, biochemists etc. etc. etc. to develop better farm production systems; chemists, biotechnologists and microbiologists to develop methods for early detection of chemical toxins and microorganisms in our food; psychologists to examine eating patterns etc. etc. etc.

Once again many disciplines of sciences are required to achieve this lofty goal USDA has set for itself to enhance food safety of US agriculture.

In conclusion, these are some of the most significant initiatives we are currently undertaking at the USDA. It is a very exciting, yet very challenging time in Agriculture. New sets of problems, new technology which will require much more and novel intellectual input. We invite you to join our team of the Department of Agriculture as we undertake these and other challenges of this new century. I can assure you that it will be a rewarding experience and a very challenging and demanding career because at the end of the day you will have made a difference in the health, safety, and quality of the life of human beings not only in USA but throughout the world. That is the calling of the employee of the U.S. Department of Agriculture day in and day out. Thank You.