Gale A. Buchanan
Chief Scientist, USDA
Under Secretary
For
Research, Education, and Economics
At the International Conference on Sorghum for Biofuel

Omni Houston Hotel, Houston, Texas
August 19, 2008

Good morning. On behalf of the United States Department of Agriculture I want to welcome all of you to the United States and to Houston, Texas. I want to thank you all for participating in this very important conference on Sorghum for Biofuel. I also want to thank Dr. Hussey for his warm welcome and Texas A&M University for their excellent organization of this conference, particularly Dr. Bill Dugas and his team from Texas AgriLife. Of course I would like to thank Eileen Herrera for her excellent job getting things done, all our co-sponsors for their support and participation here this week, particularly the National Sorghum Producers for their support and effort to plan and organize this conference. Dr. Jeff Dahlberg, in particular, is to be noted for the time and support he has given to organizing this conference.

And special thanks to Vice Minister Liu Yanhua from China's Ministry of Science and Technology (MOST) for joining us. I'm especially indebted to Dr. Merle Pierson and each member of the planning committee.

Last month I had the opportunity to travel to Baotou, Inner Mongolia to see some of the great research China is conducting developing cold and drought tolerant varieties of sweet sorghum for biofuel. I was very impressed with the progress China has made in their sorghum biofuels research. We all have a lot to learn from our Chinese colleagues who will be doing a couple of the presentations today and tomorrow. I was disappointed to hear that the Mayor of Bayonner City, Mr. Wang Bo will not be attending the conference, however, other members of the China delegation will be addressing making bioenergy a part of their future.

The U.S. and China have been collaborating on agricultural research in several areas and we look forward to expanding that cooperation into bioenergy. Likewise, USDA has also recently expanded our joint research efforts with Brazil's EMBRAPA to include biofuels. I would like to thank EMBRAPA for their collaboration and support with this conference and look forward to hearing their ideas today and during the break out sessions. I hope we can continue to build on these relationships as well as forge new ones during this conference.

In recent months there have been numerous conferences on bioenergy, particularly biofuels. Many of these conferences dealt with policy. This conference is different. This conference will focus on single feedstock – Sorghum. We chose this feedstock for the following reasons:

1. Sorghum is adaptive and currently grown in many countries around the world.
2. Much is already known about production and cultural practice for Sorghum.
3. Sorghum has great potential for food for humans, feed for livestock and fuel for transportation.
4. There is much interest in sorghum by many.

Sorghum is in the subfamily Panicoideae and the tribe Andropogoneae (the tribe of big bluestem and sugar cane). Sorghum is known as "great millet" and "guinea corn" in West Africa, "kafir corn" in South Africa, "dura" in Sudan, "mtama" in eastern Africa, "jowar" in Hindi, "solam" in Tamil and "kaoliang" in China.

Sorghum is an interesting and important crop. The genus Sorghum has over 30 species. The primary cultivated species in "bicolor." One species is a very noxious weed in the US. That weed is Johnson grass, sorghum halepense.

Most cultivated varieties of Sorghum can be traced back to Africa. Early records dating back to the 10th Century indicate Sorghum was grown in Iraq and was principal food ancient Persia. It was also grown in Egypt and later in Islamic Spain then France. I think you will agree, Sorghum in an interesting crop.

This conference provides a great opportunity for our various institutions and organizations to exchange scientific information, identify areas where we need research breakthroughs, and propose strategies to achieve them. It is also a wonderful opportunity for us to look for ways we might collaborate to achieve our common goal to develop sorghum to its fullest potential as a bioenergy crop.

There are several imperatives to do so. Energy security and global climate change are two of the most important challenges the world faces today. Our reliance on petroleum has left the world's economies vulnerable to oil price fluctuations and contributed to greenhouse gas emissions and other pollutants.

Renewable energy, including the development of sustainable biofuels, is part of the solution to ensuring global energy security for all people.

Biofuels can also help mitigate the effects of global climate change by reducing the amount of greenhouse gases that enter the atmosphere.

Achieving sustainable biofuels production is truly a “Grand Challenge” for agriculture and agricultural science; however it also is a golden opportunity for agriculture, forestry, and rural communities everywhere.

There are many crops being studied as potential feedstocks for biofuels production. In the U.S., corn has been used as the primary first-generation feedstock for ethanol production. However, as the technology for cellulosic production develops we are shifting towards developing a wide-range of biomass feedstocks for the next-generation of cellulosic ethanol.

These feedstocks include dedicated non-food energy crops such as switchgrass, alfalfa, miscanthus, hybrid poplars; agricultural and forestry residues; and municipal solid waste.

Biofuels production, to a large extent, lends itself to regionalization—each eco-region is suited to the production of ethanol from certain feedstocks best suited to its particular climate and growing conditions. This regionalization creates economic opportunities for farmers and rural communities everywhere.

Sorghum in particular, because of its versatility and ability to thrive in dry and even marginal lands, has the potential to empower some of the world’s poorest farmers to become part of the emerging bioeconomy. Sorghum could be an important avenue for many small farmers to increase their incomes, join the global marketplace, and improve their quality of life.

Sorghum is already an important food and feed crop in many places where it could evolve into an all-purpose crop ─ simultaneously being grown for food, feed, and fuel.

Here in the U.S. grain sorghum is used primarily for feed although about 12 percent of domestic sorghum production goes to produce ethanol. According to the U.S. Grains Council, “the United States is currently positioned as the number two producer and number one exporter of sorghum on the world market.”

I quickly add other major producers include India, Sudan, Mexico, Ethiopia, and China, with Nigeria at the top.

Total U.S. production of grain sorghum in 2007 was about 505 million (504,993,000) bushels. The top sorghum producing states are Nebraska, Kansas, Texas, Oklahoma, and Missouri. These top five grain sorghum producing States account for 88 percent of total U.S. production.

I think we all realize the many advantages sweet sorghum has as a biofuels feedstock. In fact sweet sorghum may be pretty close to being “the” perfect biofuel crop. Sorghum produces high yields; is reasonably drought tolerant; is more resilient; and can thrive in many arid environments. Better still, sorghum is already part of established production systems in many regions of the globe. Sorghum is cultivated on 44 million hectares in 99 countries around the world.

Sorghum also has a well established seed industry and sweet sorghum already has a track record as a feedstock for ethanol production in India and Brazil.

Additionally, sweet sorghum has many positive qualities for ethanol conversion such as a higher energy output; higher fermentation efficiency (90-92%); and requires fewer chemicals for conversion.

Here in the U.S. the Department of Energy and its academic and research partners are is active in the area of conversion, exemplified by work of John Ashworth and other colleagues at National Renewable Energy Laboratory (NREL), and he will talk to you later today about their work in biomass. Later this morning, Dr. Anna Palmisano will talk to you about a full spectrum of research the DOE has done that addresses our conference topic: sorghum's use for biofuel.

It is important for USDA and DOE to collaborate. One example of collaboration specifically in sorghum conversion research is the joint efforts of Bill Orts (USDA-ARS Albany) and Blake Simmons (DOE – JBEI, Berkeley CA). They aim to characterize specific attributes of sorghum that make it advantages for the Western states. Dr. Orts will be talking to us later today about this effort.

USDA's Agricultural Research Service (ARS) and a number of our universities are conducting research to expand sorghum's value as an energy crop as well as its use for food and feed. You will be hearing from several scientists today that are engaged in this research.

In addition, ARS is conserving and providing sorghum genetic resources to sorghum researchers from USDA's extensive sorghum germplasm collection in Griffin, Georgia. The sorghum collection is the largest collection for a single plant species in our National Germplasm System. One of the outcomes of this conference is developing opportunities for germplasm exchange.

ARS scientists are evaluating the collection and providing essential data for researchers to aid in the selection of sorghum germplasm. Some of the information being collected includes determining if the accession is a sweet sorghum variety; if it is a high biomass producing variety; and if it will flower during the summer.

So far, 30 sweet sorghum accessions were selected and seed samples have been sent to researchers for further testing. Evaluations are being conducted this year to identify additional sorghum accessions that may also have potential as a biofuel crop.

Other ARS scientists are developing DNA markers and using genomic strategies to discover genes that control key agronomic traits such as drought tolerance; aluminum tolerance; and pest resistance and identifying robust molecular markers linked to these traits.

ARS scientists in collaboration with University of Nebraska researchers have developed a low-lignin sorghum germplasm line which not only makes conversion into ethanol easier but also makes sorghum more digestible for livestock.

Other ARS researchers are looking for new food uses for sorghum. As a food, sorghum is gluten-free and rich in antioxidants. Some varieties contain high levels of cancer fighting phenols and tannins and even exceed blueberries in antioxidant potential. Its slow digestibility also makes it a good grain choice for diabetics.

Researchers are determining the quality and functionality of sorghum flour which will help develop new, high quality foods, especially for the gluten-free food market. These researchers are looking at sorghum's use in cookies, granola cereals, snack bars, and even a light beer.

ARS scientists are also studying the use of sorghum DDGs as a feed for beef cattle and swine.

And ARS is working on improving bio-industrial materials made from sorghum. Sorghum has been used for many years in the production of wallboard for the housing industry. Recently, there has also been an increase in the use of sorghum in the production of biodegradable packaging materials. This again makes sorghum even more versatile.

In addition to ARS' sorghum research programs, USDA funds much of the university-based sorghum research taking place in the U.S. For example USDA is helping to fund the Great Plains Sorghum Improvement and Utilization Center which integrates the sorghum research and extension resources from Kansas State, Texas A&M, and Texas Tech.

USDA is also providing funds to Purdue University to study the ecological benefits of cellulosic biomass production systems including sorghum. They're looking at benefits derived from soil Carbon storage as well as air and water quality.

Kansas Sate University is using wheat as a modeling system for corn and sorghum to understand the genetic pathway for the production of lignocellulose to improve biomass quality for biofuel production.

Kansas Sate University is also conducting sorghum bioconversion research for biofuel production.

That's just a sample of what we in USDA are doing. I know you'll hear a lot more about this research and much more later on in your program. However, what you hear today will only be a small part of all the research being done around the world on sorghum, and I hope you will take the opportunity to talk many experts and stakeholders here for the next few days and learn even more. You will also

have the opportunity to take part in one of four break out sessions to help identify critical knowledge gaps or problems that research can address to improve sorghum's use in biofuels. These breakout sessions are a key part of this workshop, and we look forward to hearing your ideas and establishing new scientific relationships over the next two days.

In closing, I would again like to thank you all for coming together to discuss developing sorghum as a biofuel. Sorghum has tremendous potential for becoming a major crop for the emerging next generation of biofuels.

Perhaps even more importantly, sorghum holds great promise for millions of small farmers to produce a high-value crop that can be used for food, feed, and fuel.

It is well known that successful agricultural production is a primary means for reducing poverty and improving the quality of life - and science is the key to improving agriculture.

We are on the brink of one of the greatest challenges in history. Achieving sustainable energy security requires a major commitment in research, education, and extension. But it also requires the maximum support of every single person on this planet. No one group or one segment of our population will ensure success.

All of you involved in agricultural research now have the opportunity to make a tremendous contribution to the future of the planet. If we work together I'm certain we will be able to achieve our common goals for a cleaner more secure source of energy and a better future for all the people of the world.

I wish you the best in your endeavors.