THE *SHIFTING* NEXUS OF GLOBAL AGRICULTURE

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Session 3:

Envisioning Tomorrow's Agricultural Markets

Envisaging Tomorrow's Agricultural Markets Under Climate Change (Remarks)

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Thanks very much. It is really an honor to be here. I learned a lot yesterday personally. Someone asked me what my message will be. I am a bit different in terms of how I spend my day from many people here. The World Bank, as probably most people know, is basically a public-sector, international institution, intergovernmental organization that grew out of World War II. The World Bank financed the bullet train in Japan, which many people don't know. It contributed to the reconstruction of Europe.

In fact, the part of the Bank I work for is really the International Bank for Reconstruction and Development. There are five parts. In 1960, they added the International Development Association (IDA), which is the concessional part, the part you think of as the donor. It's really rather a bank for other countries that puts money into it every three years and lends it out at very concessional terms to the 60 poorest countries in the world.

Then there is the International Finance Corporation (IFC), which might be of more interest to many here. IFC is part of the Bank group that makes loans to the private sector in developing countries and is set up in a way that it can take somewhat broader risks than most private-sector institutions could.

Someone was asking me yesterday, "So what's your message? What are you really going to say?"

I was thinking, first of all I want to be humble about messages, but on the other hand, the big concern yesterday, I was very struck by the fact, was the worry about the downside. I interpret that as the uncertainty the sector faces, and that is a real concern. But I think you don't need to be too worried about the downside. I think the real problem from the standpoint of the world's consumers is the other way – and particularly poor consumers.

The outlook for prices is pretty bullish if you are a producer, subject to the uncertainty.

If we just look at some factual-type data, in the sense we've seen a lot of projection models in recent years, and there are some top-notch-type modelers at this conference, a model is a useful coat hanger to check the consistency of tens of thousands of assumptions. There are too many to really do a sensitivity analysis of all of them. But you take your best guess and then you tell a good story.

To tell a story, let's look at some inconvenient facts. One that could be convenient or inconvenient, certainly in the 1990s you had a situation with respect to major grains in the world, where output was slightly larger than utilization, on average (Chart 1). These are all average figures and in any one year, of course, it's different. But there is this trend and there was a trend of building up stocks for a while and certainly not depleting them.

Chart 1
Average Annual Growth in Percent

Annualized Growth (%)	1991-2000	2001-2005	2006-2011	2012/13(e) to 2013/14(e)
World Grain Utilization	1.7%	1.5%	2.3%	USDA: 4.7% FAO: 2.9%)
World Grain Output	1.8%	1.5%	1.8%	USDA: 7.7% FAO: 6.5%

Source, USDA. While growth rates over these short term periods may be significantly influenced by start and end points, the longer-term growth rates since 1970 suggest that the period after early 2000s was different.

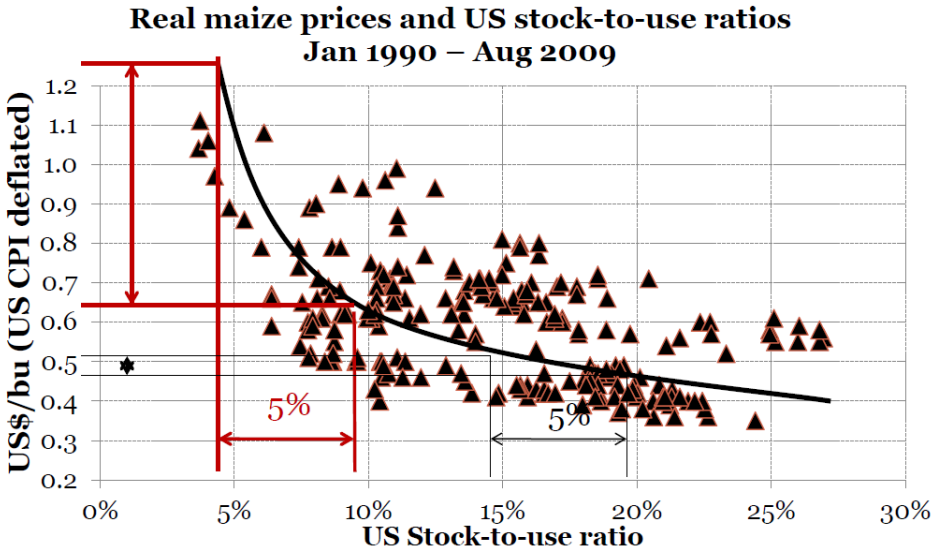
Then, in the early 2000s, it was more or less balanced. But starting in 2006, there was a period of stock drawdowns that was quite pronounced. With those drawdowns, you all know here, the result was very low stocks of cereal, particularly maize. Other than rice, certainly maize and wheat were historically quite low among the exporters who were actually in play.

Now this year, whether you take USDA or FAO, the projections are all very bullish in the sense output will outstrip consumption. So you'll get some price decline. Even there, as most people know here, uncertainty is still very high. I read the other day that 40 percent of the corn in the Corn Belt is going to be in the critical pollination process in the next couple weeks. If the weather suddenly gets very hot and very dry, we all know what that might mean.

Here is basically a correlation (Chart 2). This is not an analytical result. Some colleagues at the UN's Food and Agriculture Organization (FAO) did this and I like it. It

makes the point that prices tend to be high when stocks are low. Now which comes first is an interesting issue. I'd claim in the story I'd tell here that people get nervous. The trade gets nervous when you get down to operating levels of 5 percent maize in store. People get quite nervous. I guess that is one of the take-home messages I'd make is risk-aversion, whether you're talking about a small-holder farmer in the African savannah or a major corporation. Risk-aversion is a very costly behavior and we're in the midst of a lot of risk aversion, which is a real cost to the world.

Chart 2



Source: FAO, Schmidhuber 2011

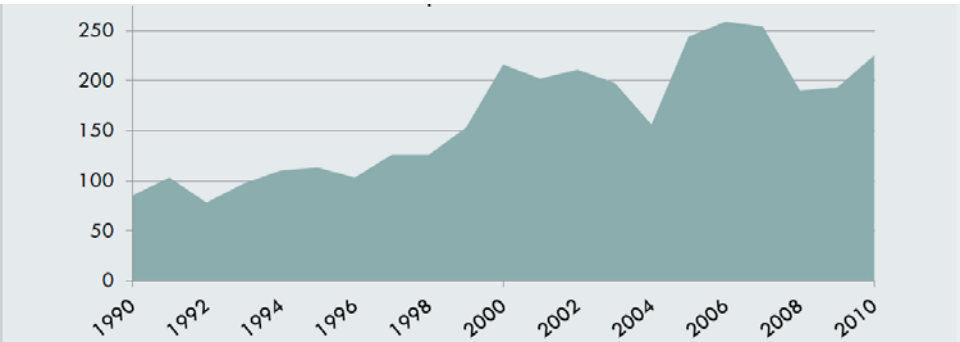
There has been a lot of talk about the Black Sea region and the southern cone of Latin America. If you are talking about wheat, almost all of the growth in exports in the world since 1990 has come from these nontraditional wheat-exporting areas. Their market share, which was about 11 percent back in the start of that period, was projected to be 35 percent in the coming years. It was 28 percent in 2010-11. That is where the growth is coming from.

These areas are naturally much more subject to climatic variation than the traditional exporting areas. Even without climate change, you have a volatility aspect. A similar story could probably be told for maize.

I wouldn't stake my professional reputation on the accuracy of this kind of figure, because who knows if maybe the reporting has changed, but there does seem to be a preponderance of evidence that reported occurrences of weather disturbances have really

gone up (Chart 3). I don't think there is too much doubt about that, as a descriptive kind of thing. And policies have certainly added to grain price volatility. We were talking about Ukraine. Whoever had some money, some skin in the game in Ukraine, certainly has lived with that fairly recently in addition to inadequate investments.

Chart 3
Number of Reported Droughts, Floods and Extreme Temperatures



Source: www.emdat.be . These reported events may reflect both increased occurrence and improvements in reporting.

There are 20 countries in the world that have biofuel mandates. It is not just the United States. This is growing and it's not going away. From an economic point of view, that just adds further inelasticity to demand. In 2008, you had countries building up public grain reserves in the face of rising prices, which is exactly what you should not do. But they were doing it. That is risk-averse behavior.

You have unpredictable releases on the world market. More than half the world's rice and wheat stocks are in two countries in Asia – we think, we don't actually know – India and China. And you get unpredictable releases through public-sector activity in both of those places, whether it's rice in India or corn, as in 2001, from China. We'll see more of that.

Under the French presidency, agriculture actually came into the G-20, which is like the security council for economic issues on the international stage, and has occupied a fairly prominent place since then, particularly surrounding these issues of uncertainty and volatility. The bottom line message from my personal point of view on international grain prices is that, sure, you've already gotten some slackening this year, but the uncertainty is still there and the factors driving it really haven't gone away.

We've had an issue for a long time that, in developing countries, especially the emerging ones, the demand is outstripping their supply, even though they're investing in

supply response. That is probably going to continue for some time and that's going to keep prices high, on average, in my opinion.

Getting to the World Bank, at the end of the day, agricultural decisions are not just a trade matter anymore. Everybody cares intensely about this. And there is still something on the order of 870 million hungry people in the world. There are 165 million children under age 5 whose development is stunted now. Every day, some children exit that under age 5-category and some come in. This is a continuing process. It was 250 million in 1990, so there has been a little bit of progress.

But this is a lifetime task. People who are stunted, people who have mental problems because they lack full cognitive capacity because of malnutrition in the first 1,000 days of life, basically pay the price for the rest of their lives, however long they live. Any cost that is incurred this year will be paid for over the next 80 years on an amortized basis, if you want to be cold about it.

The world managed to reduce extreme poverty, which we define as incomes equivalent to less than $1.25 a day in 2005 dollars. The world did a great job since 1990. Forty-three percent of the citizens of the world live below $1.25 a day. Implicit income in 1990, now I think, is down to about 21 percent. A lot of that is China. We'll come back to China, but it is not exclusively China.

The real issue is that what is happening with climate change – and this will be one of my take-home messages -- and its relationship to food and to risk-aversion is such that we risk losing all of that. We could easily go right back. I'll try to elaborate a bit on that.

The facts are the world really does need more food and, if you take almost all the projections of models that don't really take into account climate change, that take the world as it is now and not the world as it is becoming, we've got a population increase.

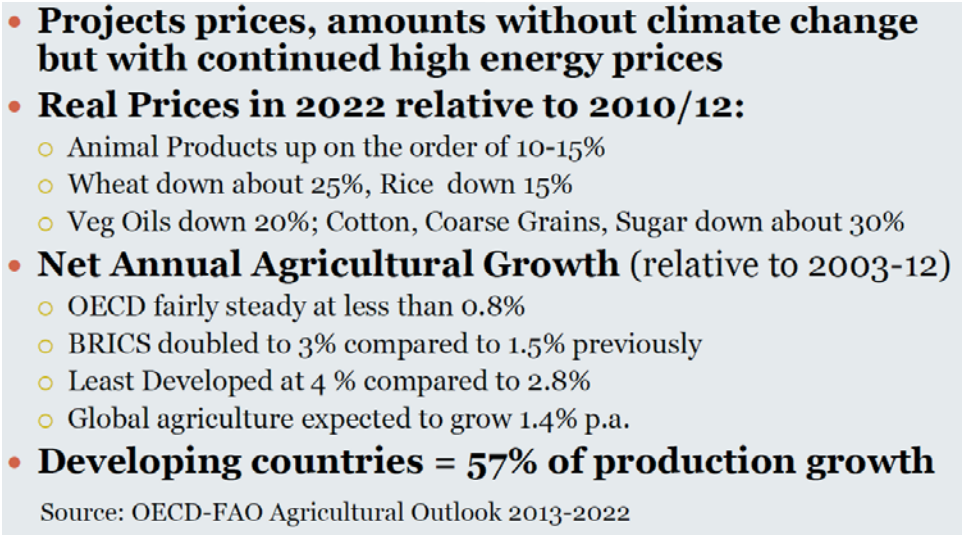
A few years ago, FAO said we needed 60 percent more food staples now rendered up to the present time – that would be 50 percent more by 2050. Those are a lot of cereals, 2 billion tons. We need 200 million tons of meat and 130 million tons of oilseeds. Unlike when this happened before, when similar sets of circumstances came together in the 1970s, we don't have the same resource elasticities we had then.

Many of the technologies that were around were low-hanging fruit that could be extended broadly. You had the possibility of expanding land much more easily than you have now. You still have possibilities, but they are not as easy as they were before. You

need 150 cubic kilometers more water per year. That's the real constraint, because that is what we're really running out of. And you need a lot more fertilizer (this is from colleagues in FAO).

Here's the typical medium-term, 10-year projection (Chart 4). I am not endorsing this projection particularly, but it's one that is widely known. It's the joint OECD-FAO agricultural outlook, if you go to either website of those organizations. FAO is the UN Food and Agriculture Organization. The OECD is the Organization for Economic Co-operation and Development. They do a joint ten-year outlook every year. Their projections basically do not take climate change into account and they think it is appropriate to assume that oil prices will stay basically in the $90-$100 a barrel range.

Chart 4
OECD-FAO Agricultural Outlook to 2022



On the basis of that, it is animal products that are the winner globally, in terms of producer prices. They'll go up on the order of 10 to 15 percent; just about everything else goes down. That is because the considerable production capacity of the world comes to bear under these kinds of assumptions. It's the BRICS – Brazil, Russia, India, China, and South Africa – and you could probably add Mexico and a few others – the BRICS are where growth will double to 3 percent a year. The least developed at a much lower base will have higher growth rates. And the OECD, which includes the United States, will sort of muddle along at about 0.8 percent. Now, developing countries over this 10-year period will account for 57 percent of the production growth.

I actually started as a livestock economist at one point. In the early 1980s, the developing world – including China, India, and so forth – accounted for only about a third of the world's meat consumption. Now I don't know; I'd have to ask the FAPRI guys, but I'm guessing it is about 70 percent. Once I remember a conversation where the Minister of Agriculture of Germany at the time was there and the person at the time was very surprised to learn that it wasn't the Common Agricultural Policy that was determining the prices his pig farmers were getting. It was whether Shanghai was having a good year or not. That's the reality of the world we're in.

Biofuel use in this OECD-FAO view, is up more than two-thirds over a 10-year period. At 28 percent, biofuels are projected to consume quite a bit of the world's sugar and other things go toward biofuels as well. Most production gains, if you believe in the consistency of their 10,000 assumptions, really come from productivity, except for sugar and milk. Eighty percent of the increase in meat will be from developing countries, mostly from short-cycle, monogastric-type, grain-consuming animals, as will three-quarters of the growth of milk, which will be predominantly in China and India.

When I started out, who knew China was going to be a major milk producer and consumer? A little bit of modesty in this business is never a bad thing. Taking the China factor, if you want to call it that, we always look at China with a sense of disbelief and skepticism but also awe. It is a fact they feed 20 percent of the global population on 9 percent of the arable land and 6 percent of the water. They are very conscious of that.

They have expanded agricultural output by 4½ times, which is the only reason they could pursue a labor-intensive manufacturing export strategy. This is a fact that is always overlooked, but they would not have been able to do that if they hadn't been able to transfer food at the same time as they transferred people from rural areas. The number of malnourished fell by 100 million, even though the population increased by 200 million. Agricultural consumption growth is likely to continue to outpace population growth, which maybe seems like a small number (0.3 percent), but you multiply that by 1.3 billion and it is actually a pretty big number.

The uncertainties are especially large and here's where I'm getting to the point. Most of China is in the tropics and it's very subject to climate change. In fact, Southeast Asia, generally, is one of the areas most subject to climate change. When you take the importance of China plus its physical location, that adds to the uncertainty.

I found out a month ago, while I was sitting with Patrick listening to a Chinese presentation, something that surprised me, and I thought I knew something about pork statistics. China still hasn't surpassed the European Communities as a per-capita consumer of pork, but they are projected to do so by 2022. Milk consumption and dairy imports are projected to rise. Particularly, if you are in the service industries that support the development of dairy industries or you are in the investment business to support the development of dairy and monogastric livestock in these countries, it has been a good time for a long time and it's going to continue to be a good time for some time. Cotton is a different matter. We'll talk separately about that.

Things seem to be looking up. If you take the OECD-FAO view, which I think is a consensus view over a 10-year period, things seem to be looking up for producers and for consumers. If you hadn't had the green revolution, you would have had another 2 billion people that would have died from starvation. It's a time for optimism and agriculture can hold its head high.

We have had widespread improvements in total factor productivity for some time and significant improvement in global economic policies surprises people. On the whole the developing countries have gotten much better in the last 20 years and the developed countries have gotten somewhat worse. Generally, agricultural policies are much more open in developing countries.

There has been a seriousness of purpose since the food-price spikes in 2008 that wasn't there for a long time. We still eliminated a lot of hunger and poverty in the world. It has been very concentrated and south Asia and Africa are missing the bus to some extent. But, in the rest of the world, there have been many achievements. These big emerging countries are far more open than they used to be.

We are talking about markets. If you consider three markets – labor, land, and capital – what happens when you take closed economies like China, Russia, and India in 1990 and in the space of a few years they become part of the global markets? You're adding a lot of labor, not much capital, a fair amount of land (but probably less proportionately than elsewhere), and far more tied up in restrictions.

So how does that play out on relative factor prices? It's not too good if you're a working wage earner in the richer countries. As we know, they tend to stagnate. It has been very good for profits and for land markets. I was trying to figure out what you were saying

about land markets. You'd expect the value of land will go up, but I found someone presented a slide yesterday, showing what you had to pay for prime farm agricultural land in different countries. I found it interesting that gradient has persisted so much. That is a very interesting fact. It would be interesting to know—to get the high-tech guys to work on that—and explain why that is.

Yet, apparent acceleration in climate change may threaten much of what has been achieved. Really, we could go backwards to 1990. That's a worst-case scenario, but it could certainly happen. A climate change of 2 degrees, which is what we all thought was going to happen by 2050, could reduce food per-capita in the world with the population growing at 10 to 20 percent.

Events in Southeast Asia in the big river deltas that grow rice suggest this is going to happen by 2030, instead of 2050. It is actually accelerating. We could easily see sea level rises of 70 centimeters, which in places like the Mekong or the Irrawaddy are devastating. The effect on developing countries in their overall economies is going to repress their trade demand. Climate change of 4 degrees apparently is a real possibility. I have no idea personally, but this is what I read from serious people. That could be absolutely catastrophic.

The respected authorities claim you could have globally, on average, a 5 percent decline in cereal yields for every degree of global warming. If you are going to have 4 degrees of global warming, that's pretty serious. It's bad enough with 2 degrees. You have large parts of the world that are going to have to change what they are doing.

A fairly careful IFPRI study basically shows that if the world went along in the mode of business-as-usual without climate change, you would expect to increase food production in South Asia by about 50 to 60 percent by 2050, as we think would be necessary (Chart 5). Whatever needed to happen would happen and we'd do it. With climate change, you don't get any of those gains, you actually go backwards. As you can imagine, you have tolerance for being a little bit off and you're still in trouble.

Chart 5
Estimated Impacts of 2 Degree C. Climate Warming on Cereal Yields in South Asia by 2050

Crop	Production in 2000 (mmt)	Projected annual yield growth WITHOUT climate change	Projected annual yield growth WITH climate change
Rice	120	0.9%	-0.2%
Wheat	97	1.6%	-1.3%
Maize	16	0.6%	0.1%

Note: Assumes no additional CO_2 fertilization effect under climate change.
Implies about a 1/3 decrease in cereals production per capita under CC!
Source: Nelson et al. 2010 (IFPRI)

In the Southeast Asia Rice Bowl, rice is not very important in world trade. It is hugely important in world eating and it's all concentrated in Asia. And, to Asians, it really concentrates their attention very quickly. Some things that have already happened in recent history, where you have salt water intrusion, you have storm surges, and you've had major losses (Chart 6).

Chart 6
Recent Flooding and Salt Water Intrusion in the SE Asia Rice Bowl

Delta	Land area of Basin (km2)	% of area with recent storm surges	% of area with recent river flooding	National % of Global Rice Production in 2013/14 (e) (FAO est.)
Irawaddy, Myanmar	20,571	73%	37%	4%
Mekong, Vietnam	40,519	24%	91%	6%
Chao Praya, Thailand	11,329	7%	35%	5%

Note: The 3 countries are projected to account for 42% of gross global rice exports in 2013 (FAO). Sea level rise is projected to exceed 30 cm well before 2050 with rice cropped area losses in the range of 6-12%.
Source: World Bank, 2013 and FAO, 2013.

The World Bank obviously works in the tropics area and works in developing countries. Basically, our clients get it. When any of us talks to the agricultural folks – in Southeast Asia you talk to the Head of State – one of the first things they say is, "What are you going to do about climate change?"

This is their issue and they know it. When you go out of the tropics, it is off the radar screen to a large extent. But that's because it's their issue and it is already beginning to come in.

Now some conundrums for agriculture under climate change are that, if you include forestry, fisheries, and so forth in agriculture – productive landscape management – that's 30 percent of total greenhouse gases. It's not just the coal plants. Agriculture is not entirely innocent in all of this. One of the conclusions from this is that global greenhouse gases can only be controlled at scale with help from agriculture and forestry, because it is the only sector that can actually remove more carbon dioxide from the air than it puts in.

You can cut down coal plants, but they can't remove that carbon dioxide. That's why, when agriculture got dumped out of the climate change funding again after coming in briefly in South Africa, it got dumped again in Doha recently. This is a real problem, because you cannot mitigate climate change without agriculture. It you exclude the world's small holders, you go to Africa and they say, "What, you want our farmers to actually participate in mitigation? You've got to be kidding. It's not our problem. Go talk to your coal owners."

The difficult fact is that, if agriculture were not part of mitigation generally, everyone would have to do 40 percent more in all the other sectors. They're not making any effort now, so they are not going to do 40 percent more. If it were only agriculture, if you were only changing European Community policy around so there were no subsidies for things that add greenhouse gases, and there were subsidies for things that reduced greenhouse gases, that's only 50 percent of global agriculture in the developed countries and the northern countries. So they would have to do twice as much, if you exclude the smallholders.

The bottom line is that this is a general problem. It has to be addressed as part of agricultural development generally, even for smallholders in Africa. There is a need everywhere going forward for climate-smart agriculture. But there are plenty of ways that you can pursue both adaptation, which everyone is interested in in the developing world, and

mitigation at the same time. Certainly, the way that policy and incentive structures interact with that is really quite important.

Donors and governments are examples. Basically, the farmer as an individual private entity and all the people who interact with farmers that are business entities is where action has to occur. So it has to be in a climate. The public role, whether it is from an agency perspective like the World Bank or a national government, is to facilitate these responses and to facilitate them in a way that this is what people do and this is what they want to do.

To conclude, the message for agricultural policies is that food price volatility is a long-term phenomenon now. The fundamental reason is that inadequate supply response in developing countries to growing demand and increased long-term investments of private investors in productivity and market access are key, but that is not enough. There are issues of building trust and mutual benefit, which got hurt in 2008, increased attention to risk management, specific promotion of climate-smart technologies and policies, and a shift of policy incentives to promoting a triple win.

It actually is possible to increase productivity to get greater resilience and mitigation of climate change. This can be done and it can be done without a lot of additional cost, but we have to show that, demonstrate it, and make the case that it is necessary. That is what the World Bank group is trying to do in its different ways. Thank you.

Envisioning Tomorrow's Agricultural Markets (Remarks)

Ray Wyse
Senior Director Trading and Oilseeds
Gavilon

Good morning. It's a pleasure to be here and get a chance to talk about agriculture and agricultural markets.

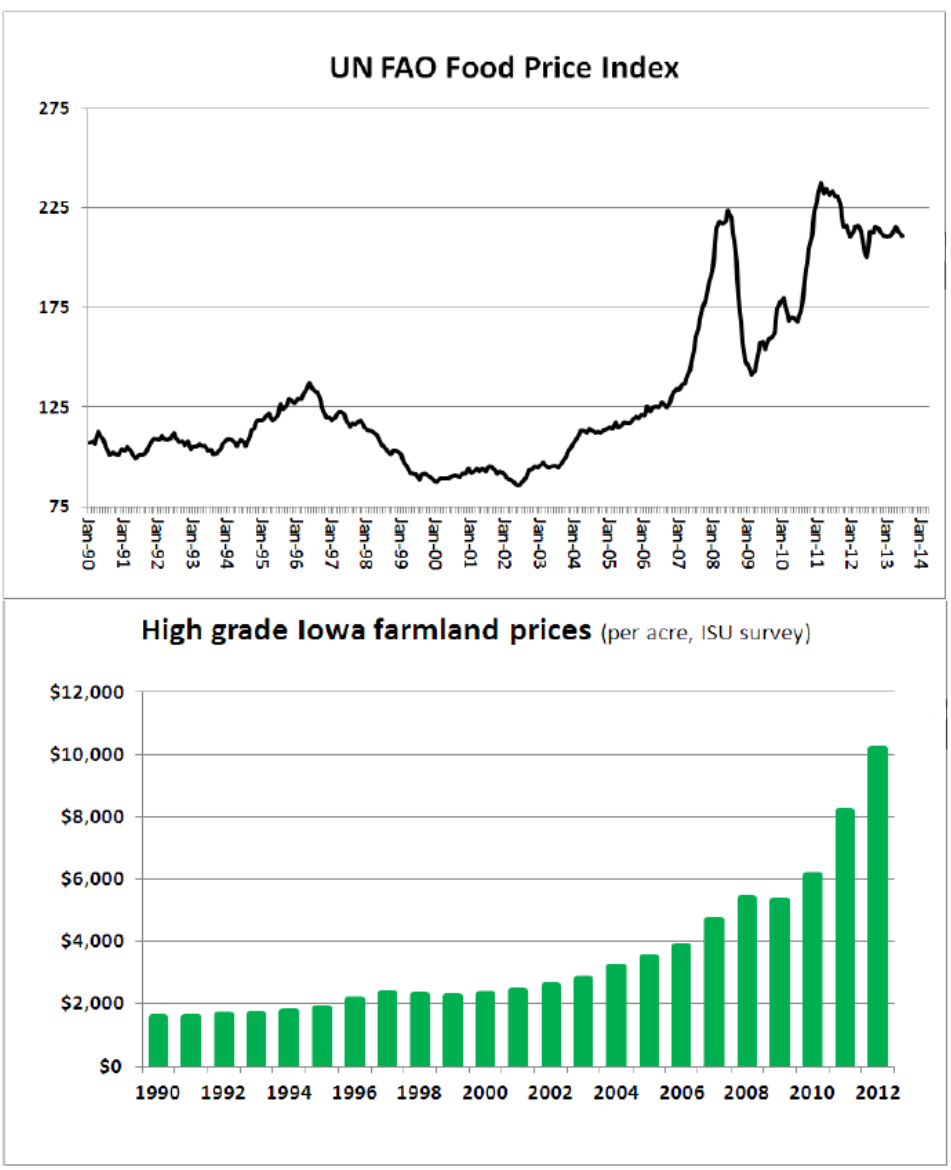
I make my living trading commodity futures. That is basically what my day job is. I spend a lot of time thinking about what price is going to do and how it is going to do it. It is not just some theoretical or abstract nature for me.

The point of the conference, or the title of the conference, is the shifting nexus of agriculture. If we look at the definition of a nexus, it is a series of ties or connections or the core of a group of connections. I am going to lay out a few things to work through and take a look more at the supply side of the argument that people have made to see how that impacts things going forward. The demand is potentially impressive, but I've got a lot of problems with some of the forward demand numbers that are being used.

I am going to hit three basic things. We want to know where we are going, what the direction is for the agricultural market, because we have to figure out where we're at. So where are we? How did we get here? Next, we are going to look at the challenge of feeding the world. How big of a challenge is it? And then we are going to tie it all together and see what the implications are for U.S. agriculture out of all of this.

As we look at things going forward, the United Nation tracks the Food Price Index and it has effectively tripled since 2005, with 2005 being the launch point (Chart 1). That was when the Renewable Fuel Standard (RFS) came out in the United States and that was the inflection point on price. The EU biodiesel program, or Renewable Fuels Program, was started around the same period of time and that's what kicked it off.

Chart 1

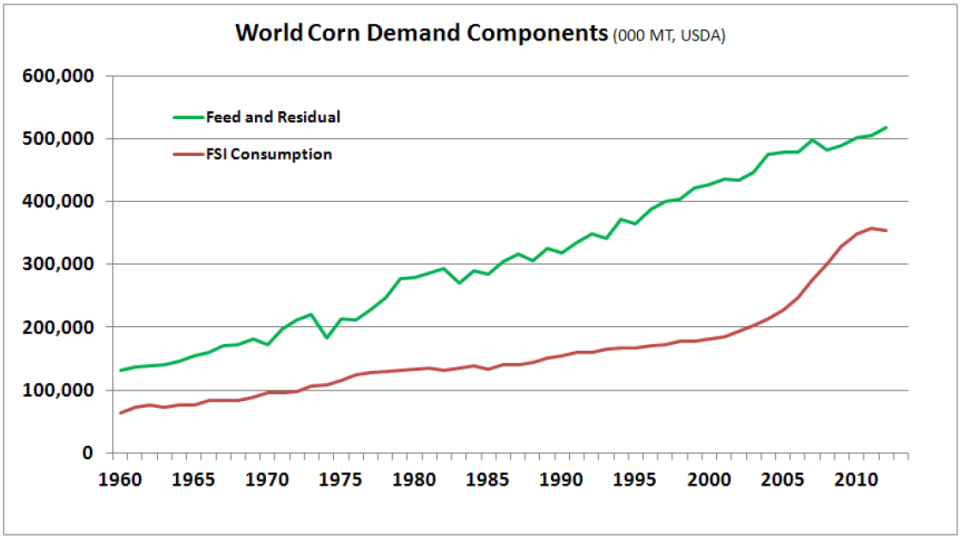


Iowa high-grade farmland prices are up about fivefold over that same period of time. Obviously price has moved, so how did we get here? One of the presenters yesterday talked about liking to use corn as a benchmark. That's the way I look at it too. If the grain markets were the equity markets, corn would be like the S&P 500, soybeans would be your NASDAQ, and maybe wheat would be like the Russell 2000, or some smaller component.

USDA breaks down global demand into two primary demand categories – Feed and Residual and the Food, Seed, and Industrial (FSI) Component (Chart 2). As you can see, Feed and Residual is effectively what we feed the animals to make milk, meat, and eggs. That number increases because either more people are eating more meat or there are more

people eating meat. It is generally pretty steady. Because it has the residual or fudge component in the balance sheet, it tends to move a lot more in a noisy fashion. The FSI component has ethanol in it. You can see on the chart that something happened in 2005 that is pretty unprecedented in the way it moved.

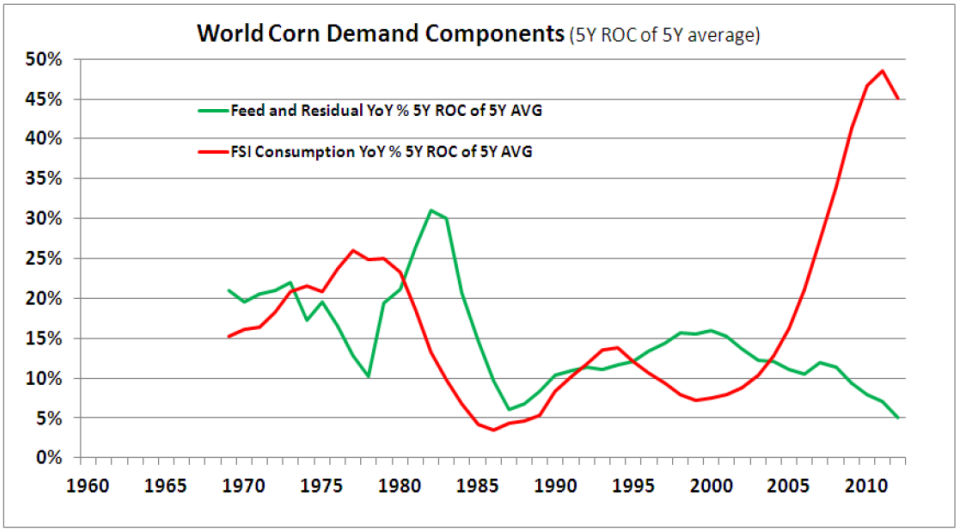
Chart 2



I was trying to figure out how to put in perspective just how big that increase in demand was. A lot of times when I look at things in agriculture, I tend to look at them over a lagged period. This is because, as we incent new consumption or try to price in new demand, oftentimes you need a series of successive years of returns to attract the capital to get it in. I like to look at a five-year moving average of the actual demand component and then look at the change over a successive five years.

Effectively, to annualize those numbers, you can just divide them by five. But I don't want to do too many more gymnastics than we need to. The natural demand component – the green line of Feed and Residual – has been hanging around in that 5 to 15 percent level and has actually been declining (Chart 3).

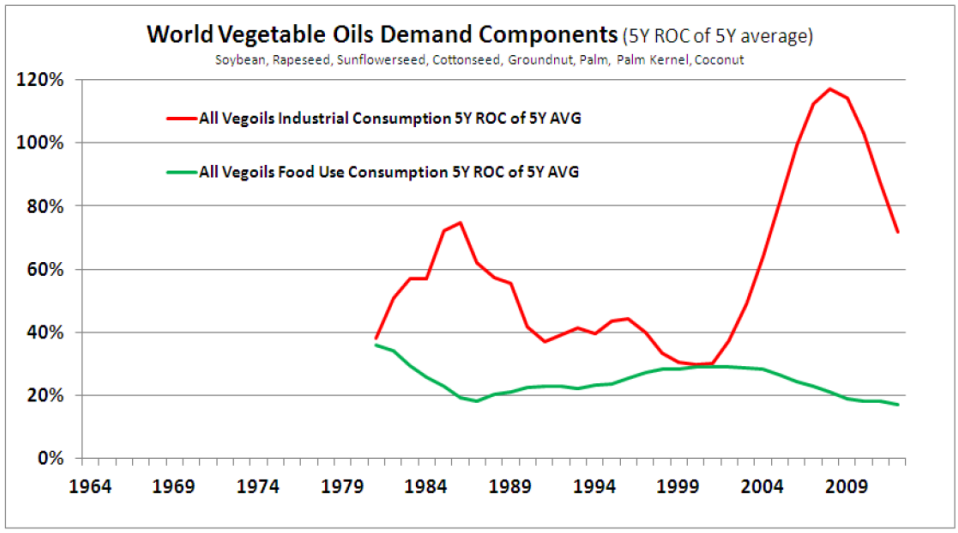
Chart 3



You can see the shock when the ethanol component came through. It is absolutely unprecedented in modern times to have a demand shock like that. It has sent a lot of signals to people around the world to change behavior and either ration demand, find alternatives to consumption, or to bring new land into production.

That is really pretty mundane when you compare it and look what happened on vegetable oils (Chart 4). USDA breaks vegetable oils out into industrial consumption, which is where the biofuels component falls in, and your general food use consumption. You can see the spike we had on that basis was over two times the actual shock for that component we had on the corn side.

Chart 4



This spike was driven primarily by the biodiesel program in the United States and Europe and, to a lesser extent, in Brazil. You can see the growth rates are actually starting to taper off a little bit.

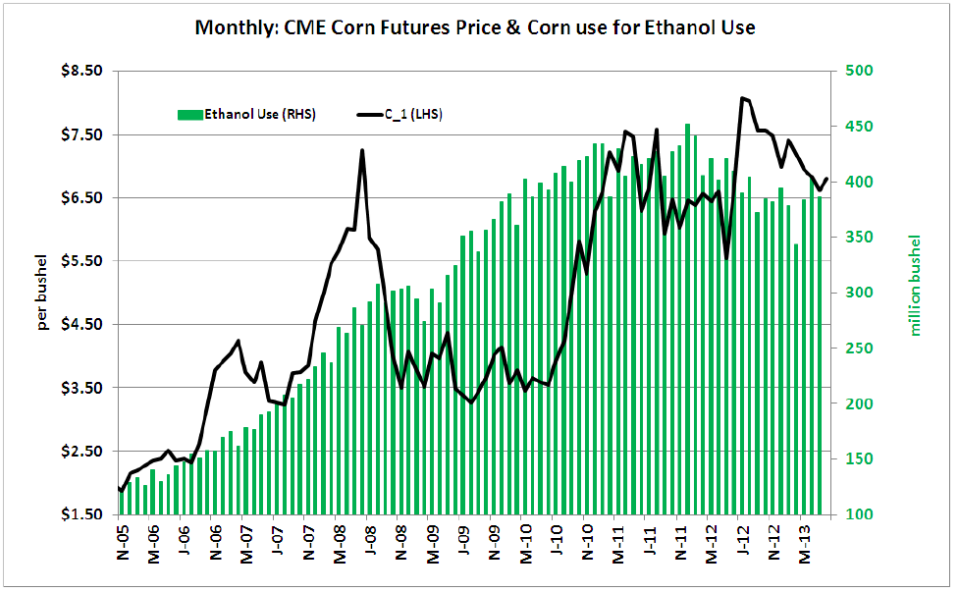
It is interesting that just last week Europe was the real leader on renewable fuels globally. Then, last week, the European Parliament's environmental committee put a motion forward where they are going to halve their target. They had targeted having 10 percent of their transport fuel from renewable sources by 2020. They put forward to halve that to 5.5 percent. That goes in front of a full vote of the European Parliament in September, I believe. There are some things changing. We are starting to see people pull back on a legislative standpoint.

All of this demand both in the United States and in Europe was created with a stroke of a pen in a legislative chamber. And it can be undone. That is important to remember as we go forward.

How does the world respond to these demand increases? The price of corn has almost tripled. It matches the UN FAO Food Price Index pretty closely.

Showing the monthly use of corn for ethanol in the United States, it has a fairly high R-squared value (Chart 5). You begin to see how we are starting to slope down the use of corn demand in the United States. We've had to ration, as gasoline consumption is cratering in the United States. Where it is starting to chop sideways, we're also chopping sideways with that price of corn.

Chart 5



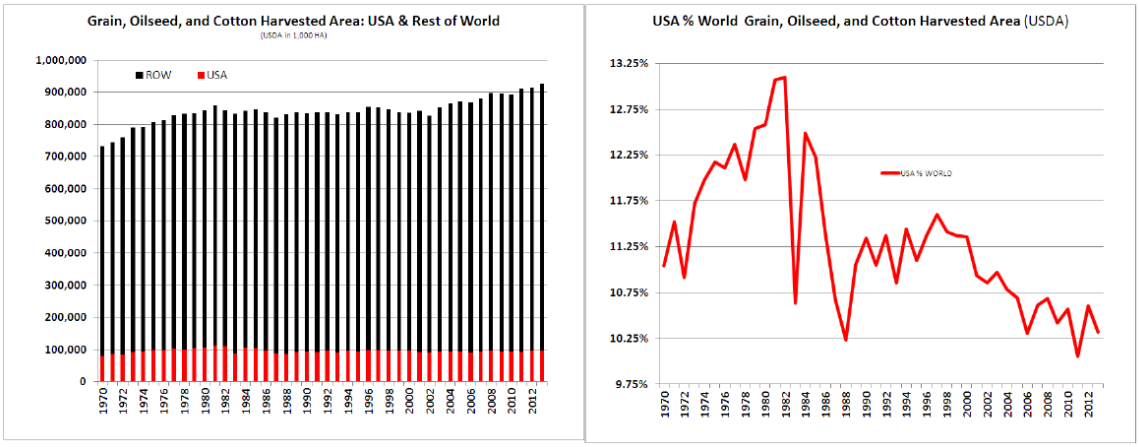
It's not solely about biofuels. It would be disingenuous and not particularly nice to blame the biofuels industry for this. We have had a lot of moving parts. Investor demand for commodity futures has been huge. In the passive commodity indices, there has been a significant amount of money – billions of dollars – flow into our market.

That's another place, too where the trend is changing a bit. We are starting to see an outflow of that money, as people look at their returns over four to five years and realize they've given most of it away through the roll yield of rolling futures forward each month. That's something to keep an eye on, but it has certainly driven price up.

Global monetary policy has been extremely accommodative over the past five years. That has wrested people out of sitting in fixed-income assets and cash to try to seek a higher returning asset like commodities, land, and various different things. In view of the weaker U.S. dollar, the dollar has lost 30 percent of its value since 2002. Most commodities are denominated or trade globally in the dollar. So that has had an impact as well.

How have people responded to this? Where are we in terms of land use and land value? The left-hand-side chart is basically the grain, oilseed, and cotton harvested area in the United States and the rest of the world from the USDA, with the United States being the red component at the bottom (Chart 6). I looked at the major food crops. You can see them listed there. What's interesting, if you look at the U.S. component of that, the right-hand chart is the U.S. market share of that area. Our share of that area peaked at about 12½ percent on a sustained basis in the late 1970s and early1980s.

Chart 6

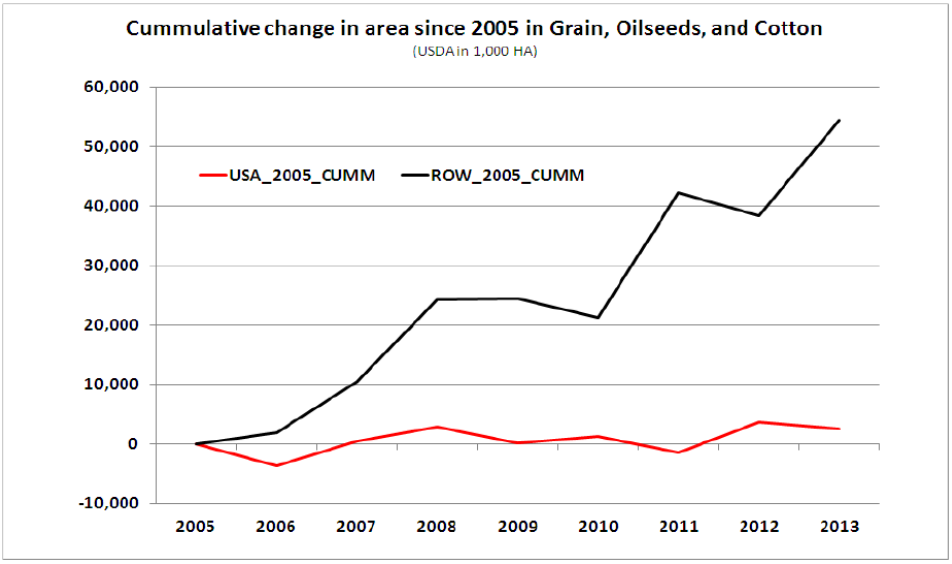


Then we put a grain embargo on the world. Guess what happened. We started to lose market share. We're becoming steadily less relevant in the world market. That is part of

that whole shifting nexus. Price is increasingly becoming determined outside of our borders and not inside our borders.

How has the world responded since these huge price signals we've seen in this increased demand? Beginning at the 2005 inflection point, I looked at the cumulative change in area and broke it out by the rest of the world, which is that upward-sloping line, and the United States, which is the red static sideways line (Chart 7).

Chart 7



While the United States accounts for 10½ percent of that big pie of global land, we've contributed less than 5 percent of the incremental demand growth over that period of time since we've had the supply shock. Again, we're becoming less relevant.

Here we are. The prices of crops have gone to historic levels. We have land prices at all-time highs. The world's farmers responded heroically to the need for them to come there. At the same time all this stuff has happened, and we've brought all this productive capacity online, demand is starting to flatten. We're seeing the Europeans back away from biofuels use. We're certainly living in interesting times.

The setup is, as we said, there is a little bit to be concerned with on the downside, but as we go forward we are going to take a look at the challenge of feeding the world.

Basically, who hasn't heard of the challenge of feeding the world? You are really seeing it promoted and now we even have a professional wrestler in the game, through DowElanco's Drive to Feed the World Program. In all seriousness, though, the Drive to Feed Program is excellent. It is focused around animal agriculture and it is one of the most

aggressive voices getting out there, combatting some of the myths and half-truths that a lot of people are purveying about animal agriculture.

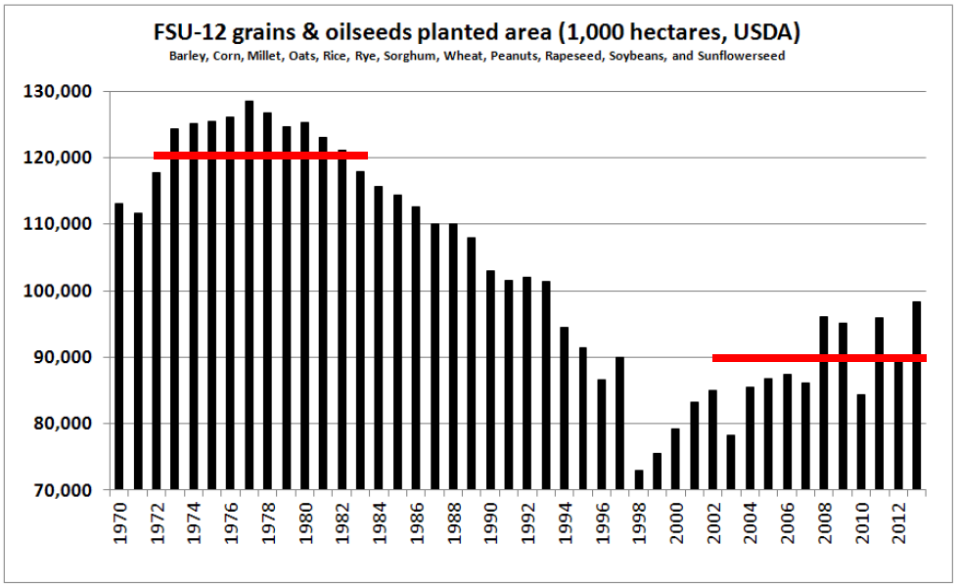
While I really respect that, when you are driving down the road and see this whole series of semis going by for the DowElanco thing with [Bill] Goldberg's picture on the front and the Drive to Feed the World, I just can't help but think "bubble." It really makes you want to lean the other way when you're seeing this. What if someone threw a party and no one came?

The challenge of feeding the world, we're going to look at this and say, "There are two primary components to the supply-side argument – the lack of arable land and the yield growth is flattening." We are going to break it down and will look at each one of them in more depth to see if there is any truth to it.

My father says this one all the time (I grew up on a farm in southeastern Iowa, so I've had all the old sayings and slang has been part of my life), "Farmland, they ain't making any more of it."

Well, are they? In the former Soviet Union, they are not making any more of it, but they certainly are not farming all of it (Chart 8). This chart sums up the 12 countries of the former Soviet Union (FSU-12) as the USDA aggregates it and looks at barley, corn, millet, and all the miscellaneous grains, oilseeds, and rolls it up into one.

Chart 8



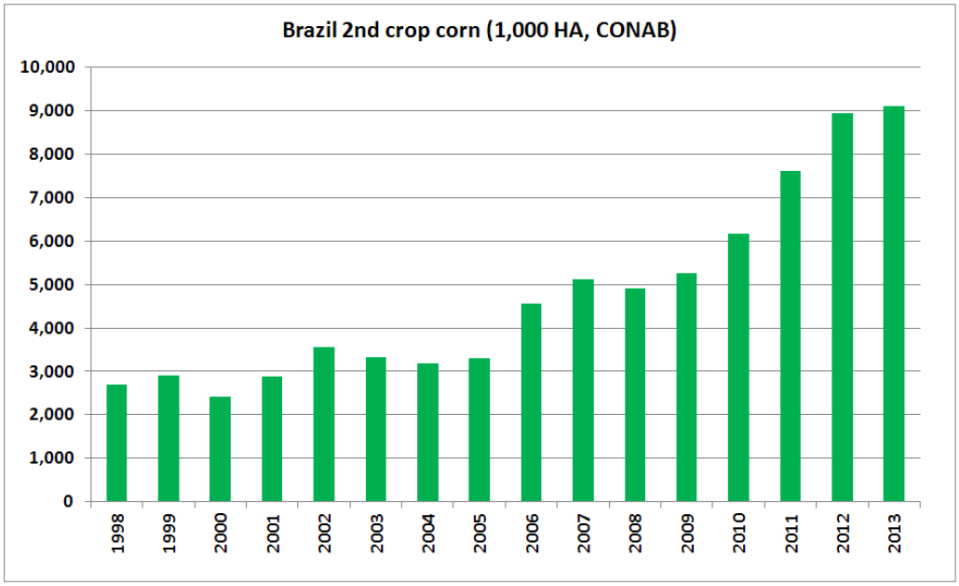
You can see in the late 1970s and early 1980s – and the 10-year-average bars that break out the periods – when the Soviet Union started to collapse, the amount of land being

farmed dropped dramatically. From that peak's sustained level to where we are today, there are 74 million acres that are not being farmed there in the FSU, that are sitting idle.

As we were talking yesterday, you saw the presenter on the quality of land over there and the availability of it, the relatively better infrastructure than Brazil. There is a lot of land sitting there not being farmed. Seventy-four million acres is basically the planted area of the U.S. soybean crop. So there is land out there.

Earlier, I had shown that about 140 million acres have been brought into production in the major crops since 2005. Land is becoming available. But land can also be made available by double-cropping. This is what is happening in a dramatic fashion in Brazil, particularly in the north (Chart 9). These are CONAB's figures, like a Brazilian equivalent to our USDA. From 2004 to the present, they've brought an amount of land into production that is the equivalent of the Iowa corn crop. For the Brazilian farmer north of Mato Grosso, it is almost becoming a requirement that they double-crop to be able to hold onto their workers in the off-season and also to compete with the people around them. The more aggressive farmers are just buying them out and continue to expand if they are not doing that.

Chart 9



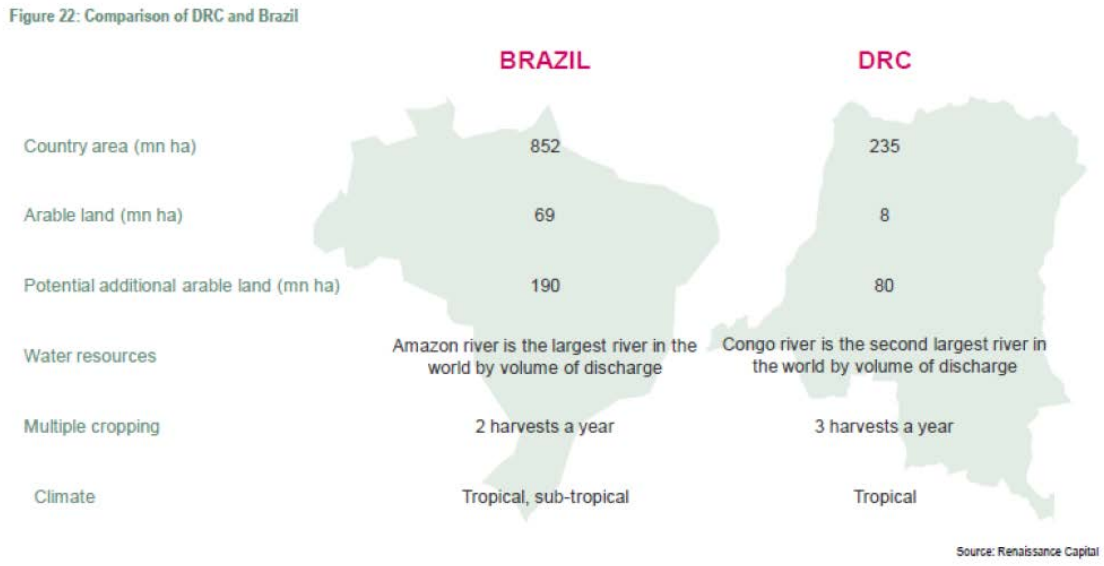
Their cost of production on this second corn crop is really very, very low, because they've made a return on their land for their first season bean crop. They have covered a lot of their machinery costs, so really this double-crop area comes almost like a pure variable-cost game. If they can cover variable costs, they'll grow it.

A lot of times, when people try to do a cost-of-production analysis on Brazilian crops and look at the net return on what the farmer is getting on the corn, when they use the Santos export price, it comes to a value where they can't figure out why they are producing it. That is because they are figuring their return on land, their return on all the equipment, it's an extremely low-cost method for them.

And there are also a lot of other areas of the world where double-cropping can take place that's not being done. You look at some of the regions that spread particularly through Africa, as you spread through Indonesia and Malaysia, there is the ability to double- or even triple-crop grains through that area. One potential area – and it was touched on yesterday – is Africa. A lot of people call the Democratic Republic of Congo the next Brazil.

Renaissance Capital, which is a Russian investment bank, did a great piece on it a few years ago and broke all of this out (Chart 10). If you look at it and compare the arable land area, the arable land area is smaller in the Congo. It is about half of what it would be in Brazil, but they are capable of getting three harvests a year versus getting two harvests a year in Brazil.

Chart 10



They also have a massive river that runs through the middle of it, much like the Amazon. The Congo River has a depth and a draft that are equivalent to what you'd see at Manaus in the north, where the deep-water port is at in Brazil. If you pull up a river map, there is an amazing amount of tributaries that flow into it, so it would make an ideal gathering system.

I'm not on the short list of people to pull up stakes to go to the DRC and start farming. I don't think many of us in the room would be. But, for a farmer from South Africa, it's not that intimidating of a place. Congo Brazzaville and Mozambique, which both border the DRC, have entered into long-term leases with South African farmers over the past few years. This slow, perceptive change is underway.

This sounds like sort of a stretch of the imagination, but 30 years ago, Brazil was a pretty scary place. You had a military junta in place, a rather authoritarian military dictatorship, so it wasn't all that promising. That's only 30 years ago. There is a lot of potential out there in these areas and, as we start to move forward, we are going to see the price signal continue to pull this in.

The price signal has been sent and it is bringing land into production and it will continue to bring land into production, either in an outright manner through the Brazilian pasture conversion or opening up new grounds in the northeast in the MaToPiBa (Maranhao, Tocantins, Piaui, and Bahia) region.

Double-cropping is also coming in in an incremental manner in Brazil, the United States, and other areas of the world. It is also out there potentially as a resumptive matter. So the lands that are in the former Soviet Union will resume being farmed. The lands in Eastern Europe will resume being farmed. So we're bringing in land in a couple of different ways.

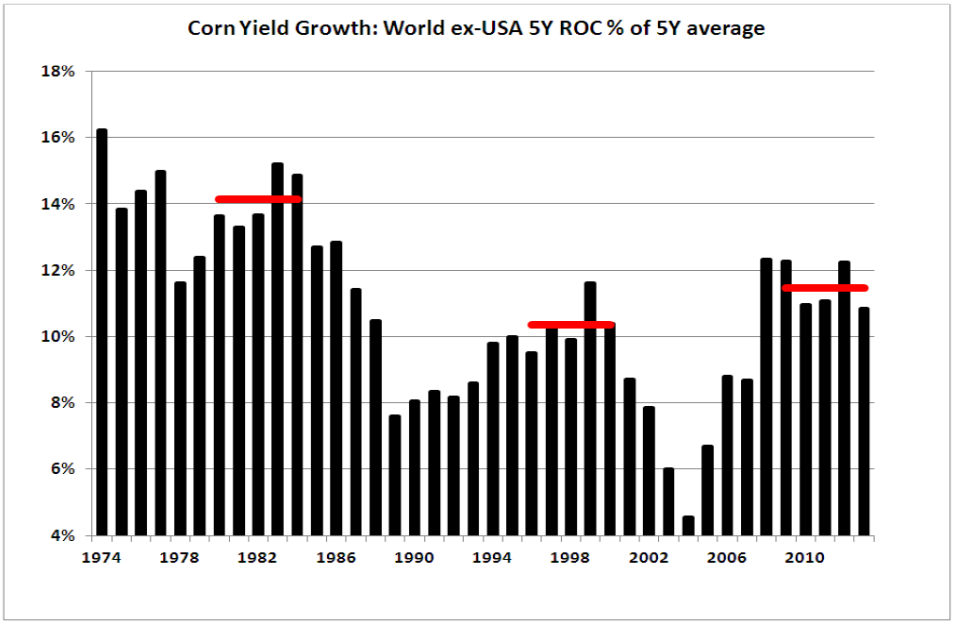
The second tenet is yield growth cannot keep up with demand. The declining yield growth is the second leg of that argument. When you look at U.S. corn yields over the past few years with the extreme weather events we've had, you can understand how people are getting this. This has heightened some of the more Malthusian-bent arguments on this that something is happening.

Part of the fact they miss is that we've moved out of the core Corn Belt area and we are raising corn now in a lot of areas of the United States that is far less fertile ground. So it is natural that our average will drop by some extent as we expand the area.

We'll break this out and look at some facts on this again. We'll break it into three components. Declining yield growth – Is it true? We'll also look at the leverage of modern crop varieties globally and to what extent we can increase production with them. Then we'll look at crop portfolio optimization, as I like to call it.

The new varieties and the higher yielding varieties are not just about increasing in situ yields, or yields within one field. It increases what can be grown by a farmer across that field. You can go from growing something like a soft wheat to growing something that is more along the lines of soybeans or corn that makes it a lot easier to feed animals. Earlier, I showed where all the incremental growth is coming in the world area since 2005 and how the U.S. share of that component is dropping. Similarly, I looked at corn yields for the world excluding the USA (Chart 11). Taking the five-year moving averages, and then the five-year rate of change, you actually see that we had a high period of growth in the 1970s and 1980s when basic hybridization came through. In the rest of the world, on the five-year average basis, those lines are the average of the five highest years' yield growth in each of those instances. We're actually higher than we were in the 1990s. So yield growth isn't declining. A lot of people are looking at these data in the wrong way. We're not seeing yields decline. We looked at that point.

Chart 11



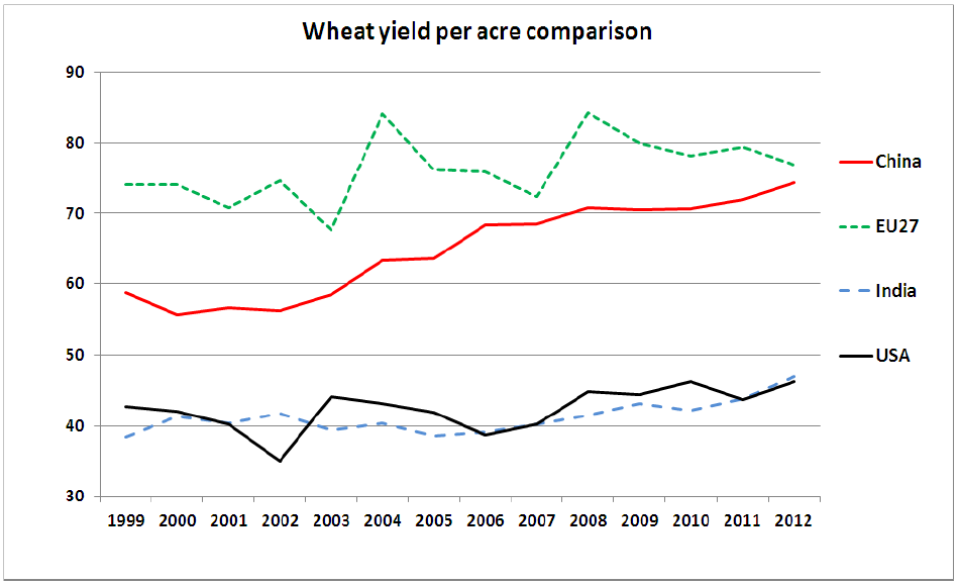
What about the leverage of modern crop farming technology globally? This is another one my dad says a lot so I can roast him on this, "The U.S. has the most fertile farmland in the world." When you look at it on a corn basis, it certainly looks like we have the highest yield in the world. But the corn we're planting in the United States is an equivalent of my I-phone, the multistack varieties. And the corn they're planting in India is like that big, old bag phone the first of us had in our cars. It's not a fair comparison. It's

effectively a microchip now versus planting something my grandfather planted in the 1950s. I don't think that's the way to compare it.

Wheat is a good leveler to look at on a technology-neutral basis. A lot of people in agriculture don't realize, somebody touched on it yesterday, that U.S. wheat yields are on par with India and significantly below China. There is good land out there. We don't have it locked up. Okay, so we accept there is good land out there. But can we gauge how much penetration there is still available? The answer is yes.

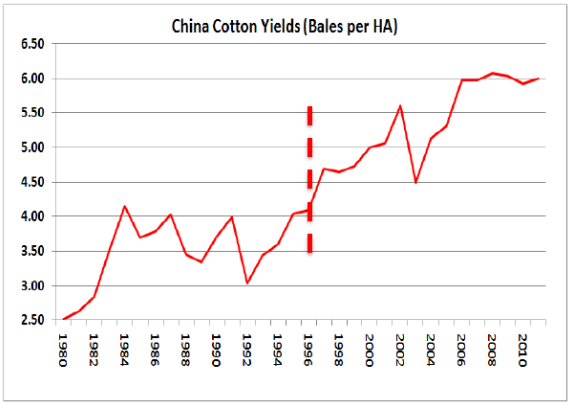
Looking at a map of the world with the Americas on the left and the rest of the world, Europe, and Asia on the right, you see that almost all the penetration of GMO technology is in the Americas (Chart 12). There is very little outside of the Americas. And most of what is outside of the Americas is cotton, potatoes, maize, soybeans or some sort of miscellaneous crop that is not really the core. We can obviously see the answer is yes, there is a big potential to expand.

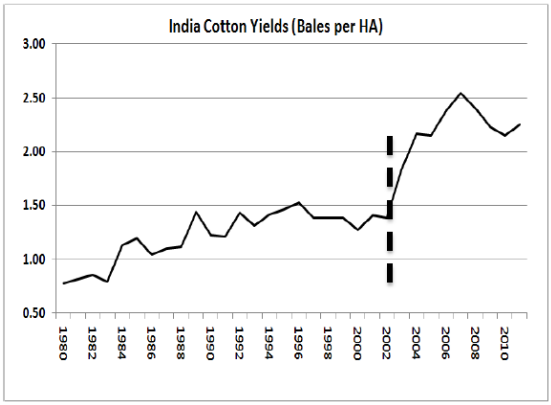
Chart 12



But is there any way to benchmark how GMOs have performed in those regions of the world before? Yes, there is – Bt cotton. Since cotton is the most widely grown crop in these regions that is being used on GMOs, I think it is a good benchmark to use (Chart 13). The vertical dashed line on each chart, with India on the right and China on the left, shows the year Bt cotton went into production in those countries. You don't need a Ph.D. in economics to look at that and realize something changed and has continued to work. You have had just a step change in yield and they have been able to hold onto those gains.

Chart 13



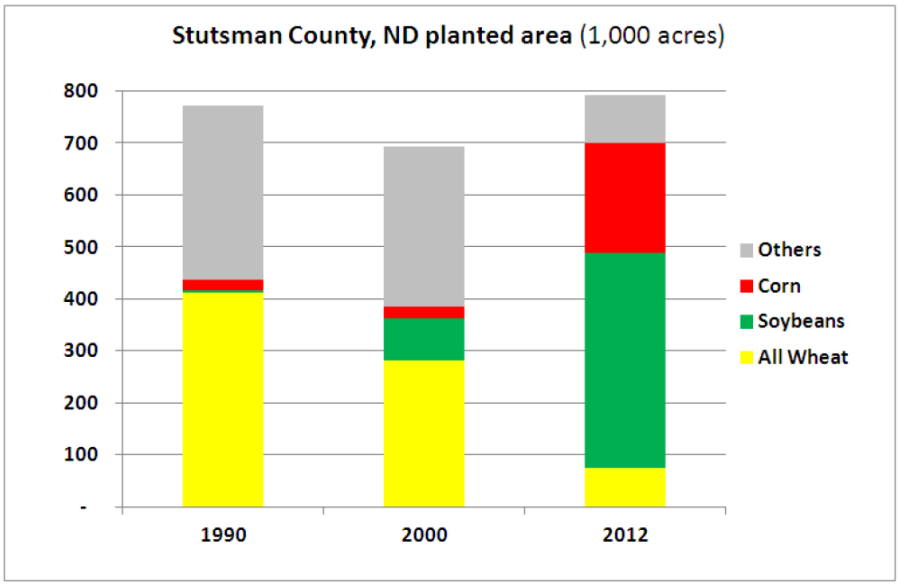


Do GMOs work? Yes. They work phenomenally. They are going to move the needle by a lot, once they get into production out there in the rest of the world.

We can see that we can increase yields through GMO technology. There is fertile land out there. But one of the more subtle points that people miss is the whole thing about modern plant breeding not being about in situ yield increases. It is about a portfolio optimization effect.

I like to use Stutsman County, North Dakota as the best example of this. When we look at 1990, Stutsman County was the largest spring wheat-producing county in the United States and there was all of 3,000 acres of soybeans being grown up there (Chart 14). Someone was trying to grow soybeans back then and had 3,000 acres. I am not sure why. There wasn't a lot. And there was a little bit of corn.

Chart 14



Fast forward to today to 2012. Stutsman County has the most planted area of soybeans of any county in the United States. Corn acres have also gone up dramatically. Wheat is about 20 percent of what it was in 1990. If you think about what you need to meet the meat demand throughout the rest of the world, think about how many heads of chickens you could have fed off the production of Stutsman County in 1990 versus what you can feed off the production of Stutsman County now. That's during a period of time when the absolute sum of all the harvested acres is only up 3 percent.

So through this portfolio optimization effect, we can really start to increase production of the more demanded products globally. As people move from manufacturing and labor jobs in the interior of China their calorie requirements decline. Working a farming job in China might burn 4,000 or 5,000 calories a day and they need to eat a lot of carbohydrates. They need a lot of wheat. They need a lot of rice. They move into a factory job where they are assembling iPhones or something, standing at a conveyor belt all day, they don't need 4,000 calories. What happens is we have less demand for the carbohydrates, more demand for the meat, and this is what portfolio optimization allows.

An article was out just this week that I thought it was really timely. The article describes an announcement that was made back in June. Monsanto is going to spend $100 million to develop a very short-season crop variety that is suitable to grow corn on the Canadian prairies. Obviously that is going to be able to work in North Dakota and South Dakota, as well. The one thing that occurred to me on this was, "Forget about the Canadian prairies." What about double-cropping that in the U.S. delta? We're going to have the ability to start double-cropping corn in the United States in certain regions, once this is developed. That would then allow Brazil to have two corn crops behind their bean crop in some areas of Mato Grosso.

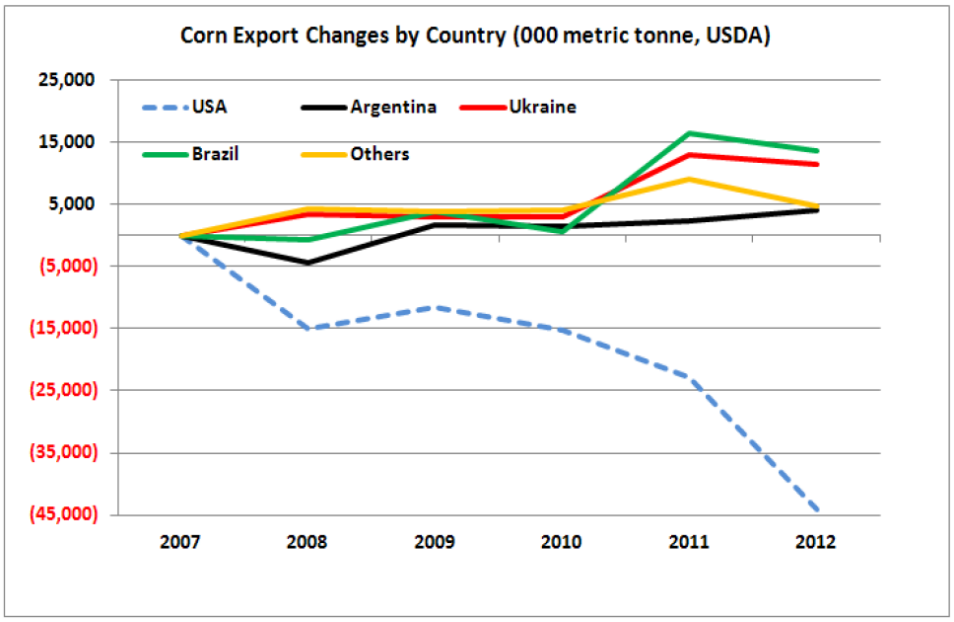
This changing portfolio is something coming up on the horizon. A lot of people don't accept it or haven't thought the whole thing through. But it is going to move the needle on what we need globally. This has big potential.

We've seen there is enormous productive potential out there that hasn't been tapped yet. There are areas of the world where we can increase crop production. The challenge of feeding the world over the next decades is a big deal, I agree, but I don't see it as that big of a challenge. In fact, we're more than half at risk. In fact, we're significantly at risk of drifting into a period of quite impressive oversupply.

Let's pull all this together and take a look at how this impacts U.S. agriculture and how I think things are going to play out. There are three main themes on this for the impact on U.S. agriculture. "You're going to miss me when I'm gone," which is our export market for corn; how I think we're going to end up being basically the storehouse and the reserve supplier to the rest of the world; and then what we are going to set up for a new price regime.

Since 2007, the cumulative change in global corn exports for the major playing countries shows that, as the U.S. biofuels mandates started to ramp up, we were forced to pull out of the export market and we left a lot of our typical customers hanging (Chart 15). The rest of the world stepped forward and met their demand.

Chart 15

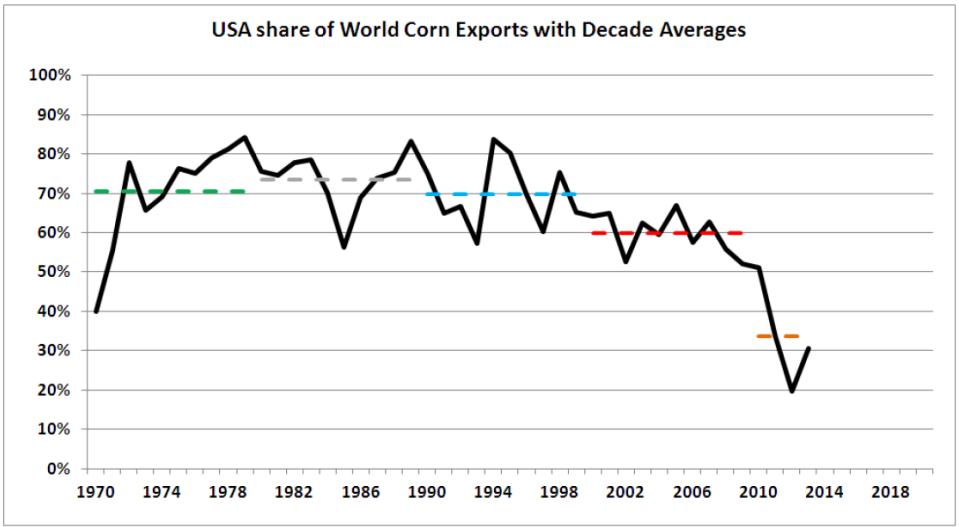


Prior to this, the United States had a very solid relationship with a lot of their customers. They really didn't look anywhere else. They would price things around, but we had a very high perceived quality. It banished the rest of the world. And also we proved to be a very reliable supplier. A lot of countries – Japan and South Korea – would buy a little bit somewhere else once in a while, but they were there with us day in and day out. That is no longer the case. The rest of the world has stepped up and proven they can produce quality and also proven they are reliable suppliers, for the most part.

The trend is not your friend, as it sums up the long-term perspective on the U.S. share of world corn exports (Chart 16). The dashed lines are the averages for each decade.

In the 1980s, we had about 80 percent of the world export market for corn. That has steadily dropped down to the point where we were at 20 percent last year. I don't think we've found bottom on this yet. We're going to pick up this year a little bit and we're going to chop around, but ultimately we start to move lower. That is where we are going to end up being the storehouse and safekeeper of the crops.

Chart 16



To support that argument, I am going to run through this briefly, just a multifactor argument on how it would work. When we as Gavilon look at where we are going to store grain, there are a few things you need. You need robust storage assets to maintain the quality. You need efficient infrastructure to move the crop to market in a rapid, low-cost manner when it's called for. You need a low-cost of capital to finance the inventory storage. And you need a rule of law or low-corruption country to do it in. You don't want to do it where it's going to be stolen.

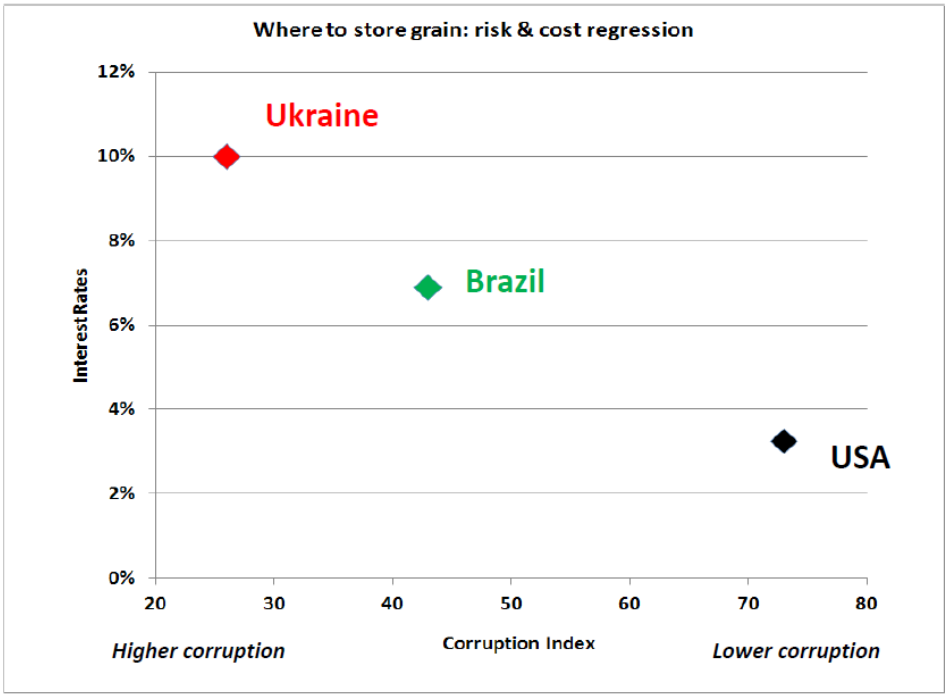
I try to look for corroborating information, so I'm not supporting my own theory, just to make myself feel better. It's a good way to lose a bunch of money. As I broke these down, the robust storage assets to maintain quality is difficult to benchmark in an unbiased manner, but the United States is a clear leader.

The efficient infrastructure – here again it's hard to find an unbiased third party on this for any real data, but I think the 60-day port lineups in Brazil this year and the peak freight rates of some peak-harvest freight traders were as high as $150 a ton, or almost $4 a bushel from Mato Grosso to the port supports the argument that the United States is the leader.

The low cost of capital – there are clear benchmarks that are set in the capital market every second of every day on what interest rates and cost of capital are in various countries.

In terms of rule of law or corruption – Transparency International publishes a Corruption Perceptions Index, which I have used in my model. If we break it out and put it into a scatter chart, with interest rates on the vertical axis and the corruption index on the right, with lower corruption being on the far right and higher corruption, on the left, you have high corruption and high cost of capital in Ukraine (in the upper left as the least desirable place) (Chart 17). You have Brazil drifting over toward that same region. You have the United States as the clear leader of the place to store grain.

Chart 17



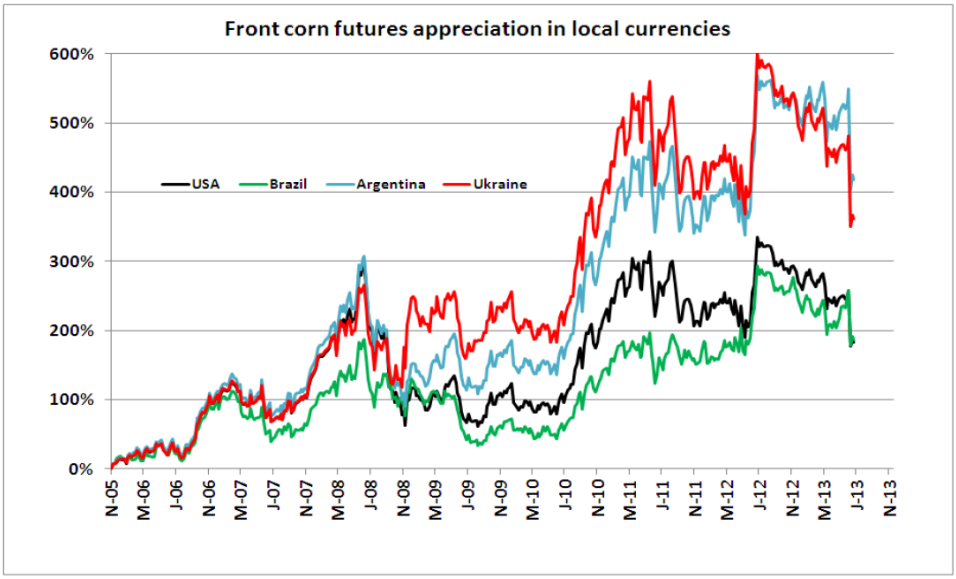
If you include some of the things we are not able to quantify – the 60-day port lineups in Brazil and the high cost of freight from the interior – that probably skews them more to the northwest on the map.

If you look at the export embargos in the Black Sea in recent history, that pushes Ukraine significantly further, too. When their crop comes, these regions of the world are going to clear. They are going to take the world export market and they are going to price in. That is going to force us to continue to hold the grain back, which isn't all bad.

The price moderation has begun. This is something to keep in mind. There are several things driving this. One is the weaker currencies of a lot of our export competitors.

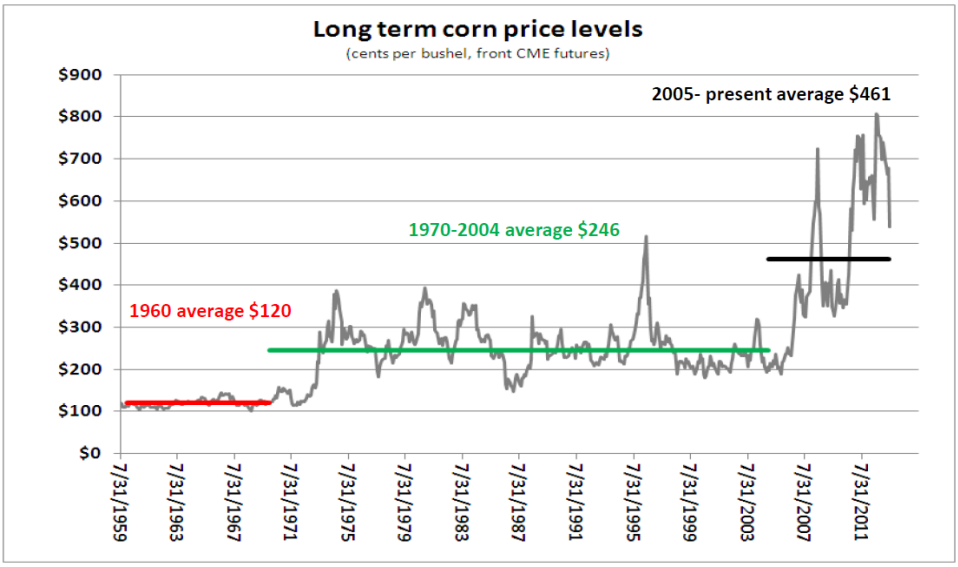
Look at what the Argentine peso has done in the last ten years. The Ukrainian currency has weakened significantly. The Brazilian real is about unchanged over the period since 2012, but it looks like it's about ready to break down quite a bit weaker. All of that serves to increase the local currency price of corn to their producers. The appreciation in front-month CME corn futures prices in local currencies provides some perspective (Chart 18). We have almost a 400 percent increase in price for Ukraine and Argentina since the biofuels program began, and Brazil and the United States are basically right around a doubling in price. If we get into a period of time where we have an imbalance in the markets and we need to start shutting production down around the world, the price signal is going to feel more acute in the United States than it does to the farmers in the rest of the world.

Chart 18



This brings us toward a "great moderation." We're in a period where we are going to moderate prices. We've seen this over time and it can be seen by looking at front-month corn futures over a long period of time (Chart 19). This is just an average. Where the bars are at is the average across that period of time. It is not inflation-adjusted, but in some ways it does inflation adjust. In the 1960s, corn was $1.20 per bushel. It effectively doubled during the 1970s to 2000 – the pre-biofuel boom. And now we've bumped up again to not quite double where we are today.

Chart 19



If you look at any of those periods of time where we were in those price regimes when supply and demand were at equilibrium, we had spikes over and above them around those plateau levels. In general, we would tend to revisit the low end of the range and fall below that average for maybe two to three crop cycles.

It's interesting to think about the implications for land, for farm finance, everything. If we go back to a period of time where that $4.60 level – that lined up with some of the earlier presenters' numbers around a $5 level – if the price of corn spends two or three crop cycles below $4.50 or in the high $3s to $4 range, what is the implication of that for land values, the demand for machinery, the demand for bins and storage assets, a lot of different things farmers have been buying a lot of? There are a lot of things worth considering on that.

To summarize and pull it all together, "How did we get here?" Where we are at is we have extremely high prices of crops and land and we're quite likely to sit back and moderate at or below current levels on prices.

What about the challenge of feeding the world? There is productive land available. It is either idle, or not yet in production, or it could be brought in by double-cropping. GMO and modern farming technology have huge leverage in the rest of the world to increase yields. It's going to move the needle by a lot on supply.

What are the implications for U.S. agriculture? We'll probably become the storehouse to the world. If one company were managing all of the grain infrastructure in the

world, it's what they would do. They would store in the United States and transmit it out. It takes the market awhile to get around to that, but that's the transition we're heading to here.

The price moderation has begun. We've reached a new plateau, but that plateau is spongy and you can go below it for periods of time.

General Discussion (Transcript)

Moderator: Chad Wilkerson
Vice President and Oklahoma City Branch Executive
Federal Reserve Bank of Kansas City

Chad Wilkerson: You talked a good deal about China. China, of course, has been at least a sizable part of increased demand for agricultural products over the past decade or so. How much do you expect that to continue and, if not as much, who is going to fill the gap?

Christopher Delgado: As long as China continues to grow, China has a reduced growth rate of about 7 ½ percent now – they're really slowing down –they really don't have a capacity to expand their production enough to meet that. They have actually done an amazing job with what they have. They are investing massively in water, moving water from the surplus south to the greatly deficit north.

The most important change in China is at the central government level. It seems to me, at least, the thinking has changed from being much more inward looking to being much more outward looking. And I can give you a specific example. One of the concrete things that came out of the French presidency of the G-20 in 2011 was the creation of something called the Agricultural Market Information System, or AMIS for short.

In fact, the current chair of AMIS will be stepping down now as the chief economist at the USDA. So the United States has been a very strong proponent of AMIS. All the world's exporters were big proponents but the importers were a little bit skeptical, as often happens in trade. That took a lot of negotiation and horse trading.

The Chinese in particular are not known for being very open about their grain stocks or their intentions on the public side for grain stocks. We were really quite skeptical in 2011. It took a lot of arm twisting. Finally they agreed and then of course they didn't do very much.

The Chinese have come around completely. They are now some of the biggest proponents. They have invested significantly in actually complying with AMIS. The

Russians were a little bit skeptical of coming in and are beginning to offer financing for AMIS and countries that were very skeptical about this.

My conclusion from this is that some of the major BRIC countries are beginning to think about what the world they need for their benefit looks like. They concluded that market transparency and openness is part of that. That may be a little overly optimistic, but I really believe it.

To answer your question, I do think China will have to remain an importer and they are going to attend to their food safety issues, because their population is demanding it and their transparency is going up.

Marcia Taylor, DTN, The Progressive Farmer: What role does corn/ethanol have in contributing to a lower carbon footprint globally and to reducing the effects of climate change? Does it deserve its reputation for encouraging deforestation of the rain forest, etc.?

Christopher Delgado: From a global perspective, first of all, although ethanol made from corn is obviously the big issue in this part of the United States, the biofuels issue is much broader than just that. As far as the specifics of your question, first of all "I don't know" is the honest answer. Clearly, you have some good things going on in emissions and you have some bad things going on. The net effect is a subject of research that I'm not really competent to comment on one way or the other.

What I can say is that all the projections I've seen suggest that, as long as you have oil at $90 to $100 a barrel, you are going to have rapid growth in the use of agricultural products as feedstocks for biofuels. This will be not just corn and it won't be just the United States. This is growing throughout the world. So it is vital to have research to find ways that are realistic about what the needs are, but at the same time try to mitigate some of the other impacts that might be involved.

Ryan Connors, Janney Montgomery: Ray, you present a pretty compelling bear case for commodities. I may actually step out and sell some corn futures in a couple minutes, so apologies. What would you say are the biggest risk factors to that bear case? In other words, what could go differently in the relatively short term and intermediate term to cause commodity prices, in your view, to sustain or maybe even surprise you to the upside? Thanks.

Ray Wyse: I think obviously weather. The event we saw last year was a lack of rainfall and excessive heat during that sensitive window of time during the growing season. We effectively had a flash drought here. That was five standard deviations from the mean if you look at 50 years of weather data and precipitation data. One of the statisticians here could tell us how often that should happen. It doesn't happen a whole lot. I think Mr. Delgado's point on weather volatility is very prescient and very true. Volatility and weather can cut two ways, right? It can be very bad or very good. It isn't always a downside event. We only recognize it as a downside event.

The other thing I would say on commodity prices would be something messy with the unwinding of our financial policy in the United States. As we start to reel this liquidity back out of the market, and if we would have some unorderly move in the U.S. dollar weaker, that would obviously increase it in nominal dollar terms.

Ken Keegan, Farm Credit Services of America: Assuming your premise is right that we become the storehouse for the world in grain commodities and you have continuing production growth in other parts of the world, what's your view of what that does to volatility? We've gotten used to living in this period of pretty extreme volatility. Does that dampen that? Does that lessen it?

Ray Wyse: There is going to be a steep learning curve, as people start to figure out how that factors into price. What we'll have is a lot more episodic moves lower around some sort of lower mean and base level of price. We've seen it in wheat markets and corn markets here recently. When it becomes apparent that the Black Sea is confident they're at some sort of a stable production level and going to have an exportable supply, they'll come in, hit the world market with guns ablazin', get it priced in, and get it moved.

When those crops are made, we are going to have big moves down. And we'll still have a period of time where we will have government intervention on trying to build stocks. It's something that scared a lot of people to death with the regime changes we saw in the Middle East and North Africa. A lot of the political instability around that and how that meets food policy will increase the volatility.

I think the weather volatility is here to stay. All of us have an iPhone app for the weather channel, so we can see what the weather is doing in the United States. We have great U.S. crop reporting systems. It is easy to track it. In the rest of the world, that is something they do not have. It's a lot harder to track the deterioration of crops or less-than-

optimal environments in the rest of the world. Volatility will be there, but we won't see corn futures double or triple in value over a three-year period of time like we have.

Christopher Delgado: This is in regard to the last question, but also as a comment. I find the vision of the United States as a storehouse very interesting. Of course, that is what we were at one point. But we were that under a policy regime in this country as well as in other countries that that was our role, if you like, and it was very much a public sector and cold war, politics-driven kind of role.

My feeling is that going forward – even if that made sense economically – it wouldn't happen for the same reasons you're out of the pure agricultural sector when you get into this kind of thing. Currently, the majority of rice and wheat in the world at least is kept in China and India. I see them becoming much more market players over time. The action is going to be much more there eventually than here. Clearly, the United States will continue to be a major actor, but it won't be able to play the same role even if the political backing were there for it, which I don't think it is. I find it an interesting and a very intriguing thought. I haven't thought greatly about it, but my initial reaction is a little skeptical.

One point with regard to volatility, it is just in the nature of things that over time grain demand is becoming more inelastic, in effect. There are policy reasons for it, as mentioned previously. As people get richer around the world, as you eliminate poverty, it is true that the share of livestock feed is going up. But, just generally, demand, as people get richer around the world – and we're talking about billions of people – tends to become more inelastic and it is a major factor over time contributing to volatility.

When you have factors on the supply side like climate change, volatility is the outlook. Volatility on food makes governments feel very insecure and they get very risk-averse. As I was trying to say, just like in the 1970s and 1980s risk aversion killed the world. That is going to happen again and it's going to lead to all kinds of behavior in the grain-storage area that are going to encourage countries to not trust us.

Chad Wilkerson: I have a question for both panelists that has been on my mind and I think on the Kansas City Fed's mind. You both have thought a lot about the future of agriculture – both long-term and intermediate-term. The big issue we are continuing to look at is land prices. Very high profitability the last few years boosted land prices. What are your outlooks, particularly for U.S. land prices, in the intermediate term based on the other things you have said?

Ray Wyse: I personally wouldn't be a buyer of land at this value. So many things can go wrong. If you figure it is like a bond with some sort of a coupon payment on it in the form of either cash rent or your own variable income per year and interest rates start to rise and normalize, that can move the needle significantly.

The other thing is it's hard to model it out, but land is what's pledged against almost every loan through the whole agricultural system. Most farmer friends of mine are very tax-averse. So, if you're tax-averse, that means you are cash-averse as well. I don't know many farmers that have enough cash in the bank to plant one year's crop. They have to go out and borrow that. It costs a lot. There are lot of agricultural lenders here in the room. But it's another good saying my dad said all the time, "A banker is someone who lends you an umbrella and then asks for it back when it's raining."

If we get into a period of time here where crop prices pull back, your banker may not be there to hand you the cash each year to plant, as much as you think. It could become a lot more onerous. Again, it is one of the nexuses where there are so many things interconnected. In any healthy market, if you look at a stock or a commodity, a 50 percent drawback in a market is a great place to buy. We've seen no drawback. Trees don't grow to the sky. No asset can go straight up for as long as it has here without some sort of a pullback. That's my thoughts.

Christopher Delgado: I have no idea in terms of the short term, but again I am very struck by that wonderful slide that shows the very wide range of prime farmland prices. That could only persist over time in a climate of risk aversion, distrust, and government regulation.

If that climate is going to continue, I presume that dispersion where you're talking about $15,000 an acre farm prices at the high end can only persist. It seems to me if the world moves toward much more open trade and exchange and trust relations, it will be hard to maintain that kind of differential long term, it seems to me.

But, as I say, I haven't got a clue what farmland values should be or will be any time soon.