Thank you Debbie, and it’s a real honor to be with the cutting edge of research and action on how AG can be both productive and sustainable—those in this room are the real front lines of change for our country and planet, and you are certainly unique in this space.
GHI is a private sector voice advancing a conversation about productivity, sustainability and food and nutrition security to meet the needs of our growing world. GHI is also joined by consultative partner organizations that share their knowledge and experience in global agriculture, conservation, nutrition and the needs of small-scale farmers, providing insight to GHI policy research.
We advance dialogue through our annual Global Agricultural Productivity Report, or GAP Report, which is released each year at the World Food Prize in Des Moines Iowa. We serve as a resource with information on our website, globalharvestinitiative.org and I’ve brought a few of our GAP Reports here for any of you that wish to take them.
As you are well aware...our agriculture and food systems are facing significant challenges:

Volatile agricultural business cycles make it difficult for farmers to manage risk and plan for the future.

Conflict is disrupting agricultural production and generating widespread human suffering.

Climate change is exacerbating extreme weather events that destroy rural livelihoods and disrupt food production.

Million of people around the world struggle with hunger and malnutrition, while zoonotic disease threatens human health.

It is imperative that we work together to produce the food, feed fiber and biofuels we need for a growing world...and to do it sustainably.
GHI has adopted the National Research Council’s approach to sustainable agriculture, focusing on four components. It must:

- Satisfy human needs.
- Enhance Environmental quality.
- Sustain the economic vitality of food and agriculture systems
- Improve the lives of people in the agricultural value chain and society as a whole.
We need food and agriculture systems that meet the needs we have today, while enabling future generations to meet their own needs.

Improving productivity can help farmers manage risk and strengthens their capacity to balance current demand and future needs.
In order to meet the demands of nearly 10 billion people in 2050, we will need to increase global production of crops and livestock by 60 to 110 percent from 2005 levels—AgMIP estimates are used.

There are several strategies that farmers can use to meet this demand.

They can open new lands for agricultural production, extend irrigation into new areas, or increase the amount of agriculture inputs they apply on existing land.

Or they can increase their productivity.
When we say we want to increase agricultural productivity, we are not talking about producing more.

Productivity is distinct from output, which refers to the gross amount of crops or livestock produced.

It is also different from yield, which measures the amount of output per unit of production – usually land.
Productivity in agriculture – which we measure as Total Factor Productivity, or TFP, tracks changes in how efficiently agricultural inputs are transformed into outputs.

So TFP increases when more crops are produced, but the amount of land, labor and fertilizer used remain constant. This is a reflection of investments in R&D and in adoption of better practices on farm.
Why is it important to track TFP growth?

TFP is an indicator of how well agricultural innovations are being adopted.

An increase in TFP could tell us that more farmers are improving their soil health management practices, so they can produce more while using the same amount, or less, fertilizer or land.

An increase in livestock productivity could indicate that more farmers are giving their livestock efficient feed varieties and using better animal health care practices.

Since TFP tracks how efficiently we are transforming inputs, such as land, into crops and livestock – it is an indicator of how sustainably we are using our agricultural resources.
Here is a great example of the relationship between increasing demand – productivity growth – and sustainability.

Investments in India’s dairy sector have made it the world’s largest dairy producer.

As you can see, the demand for milk in India is skyrocketing, so farmers need to increase their output in response.
India already has 90 million dairy cows and buffalo. Simply adding more animals to meet demand is not an environmentally sustainable solution and has major implications for greenhouse gas emissions, feed production and water use.

Focusing on increasing the productivity of India’s dairy cattle would help address both challenges – increasing output to meet rising demand, while minimizing the GHG impact of milk production.
GHI estimates that to sustainable produce the food, feed, fiber and biofuels we need in 2050, agricultural productivity needs to increase by 1.75 percent every year. Our GAP Index tracks our progress toward this goal.

For the fourth straight year, global agricultural productivity has not grown fast enough to sustainably meet our needs. While this gap looks small now, you can see it’s impact grows over time.

We are particularly concerned about the productivity growth rate in low-income countries, which has been declining steadily for the last three years. While TFP has increased substantially in these countries for several decades, opening up new land for agricultural production is the primary way that farmers increase their output.
Another way to look at the importance of productivity as a foundation for sustainability is to track its contribution to agricultural output over the past 60 years.

In Low-Income countries, productivity is growing and is a large share of the growth in ag output. But what is of concern is the amount of land expansion as well as the amount of inputs per land (fertilizer, crop protection, labor) required for ag output.

In High-Income countries, we see that a productivity strategy accounts for growth in ag output, while land expansion and inputs per land as a share of output have declined.
We know that globally, agriculture and forestry production are the source of nearly one quarter of greenhouse gas emissions.

Most of this comes from deforestation and land use change, methane produced by livestock, and poor soil management.

And yet, farmers, ranchers and agricultural businesses are in the unique position of being among the most vulnerable to climate change, while at the same time being in the best position to mitigate it!
Together, we have a mandate to transform agriculture into mitigation powerhouse, by using
- Improved crop genetics and conservation practices like cover crops
- Improved nutrient management practices
- Reduced and no-till agriculture systems
- Water management through precision irrigation systems
- Combining livestock production and food crops with agroforestry to conserve soil and store carbon
- Use of feed additives and livestock management practices that reduce methane emissions and store carbon in pastures; and,
- Reducing post-harvest waste and loss
Today climate change has become a leading risk factor for producers and industries along the agricultural value chain.

With unpredictable growing conditions, market uncertainty arises. Yet the need to address and mitigate climate change offers businesses and producers a whole new range of opportunities.

As climate change unfolds across the planet, farmers will need crops that have greater tolerance to heat, drought, pests and require less water. Livestock farmers will need genetically improved breeds and feed products that reduce emissions and help manage manure. Innovative agricultural mechanization and precision systems help farmers apply crop products more precisely and help to implement low or no-till systems.

Private sector investment, innovation and scale will help more farmers, ranchers and forest managers access these tools and contribute to a low-carbon agriculture system.

You will hear a lot more about this tomorrow, so I will just briefly mention it now but Monsanto has made a commitment by 2021 to become carbon neutral, and companies such as Mosaic are partnering with rice growers to reduce greenhouse gas emissions.
and apply fertilizer efficiently.
We know in particular that livestock production poses significant greenhouse gas challenges. Improving the productivity of dairy cows has reduced their GHG emissions and environmental impact and modern dairy production practices in the US require considerably few resources now than in the 1940s:

- 21% fewer animals today—we have gone from 17 million cows to around 9 million today
- 35% less water used in dairy
- only 10% of the land required now to produce the same 1 billion kg of milk
- dairy waste is lowered, with only 24% of the manure, 43% of the methane and 56% nitrous oxide compared with systems in 1944
- as a result, the carbon hoofprint of milk production in the US has been cut by 2/3rds since 1944

The company DSM Nutritional Products has developed a methane inhibitor for feeds and is collaborating with Penn State to test its impact on milk production and initial results have shown that milk protein increased and methane emissions were reduced by 30%

To make the poultry value chain more productive and sustainable, Novozymes has...
developed protease enzymes for poultry feed
-they help poultry increase protein uptake, and improve nitrogen digestion—this leads to less feed per bird, and reduction of nitrogen content by nearly 15% in manure
Commitments in the pork industry by leaders like Smithfield are making a difference in energy use and waste management, while still improving productivity. Smithfield has created a business unit, Smithfield Renewables, focusing on reuse and renewable energy projects across North America and Europe. The company has committed to reducing greenhouse gas across their entire value chain by 25% by 2025.

Smithfield is working with the Environmental Defense Fund to optimize fertilizer use as part of the feed supply chain and transforming animal waste into renewable energy to eventually produce 2 billion cubic feet of renewable natural gas.

The business case for Smithfield’s climate leadership centers upon company values of Responsibility, operational excellence and innovation.
Forests play key roles in the water cycle, in soil conservation, in carbon sequestration and habitat protection, including for pollinators. Yet according to the United Nations Food and Agriculture Organization (FAO), agriculture remains the most significant driver of deforestation. Around the world, farmers and ranchers expand into native habitat, and clear forest and convert grasslands to bring new land into crop or livestock production.

In particular, in Low-Income Countries, forested areas on average are declining relative to agricultural area. The opposite is true in High-Income Countries, where productivity and improved landscape management is beginning to result in more forested area relative to agricultural area.
Productivity in agriculture, combined with specific strategies to develop sustainable landscapes through planning and improved management are required to preserve forests and help them retain their carbon storage potential and to mitigate climate change.

In Brazil’s Para state, the Nature Conservancy has partnered with municipal governments, Walmart, and Marfrig for a Green Growth Compact approach to eliminate deforestation from beef supply chains and with Cargill to expand sustainable agroforestry and cocoa production.

In the Cerrado savanna region of Brazil, Conservation International and Monsanto have worked with local governments and farmers to prevent illegal deforestation, improve crop yields on existing lands and restore critical areas that should not be farmed, using a Sustainable Landscape Approach. This approach has been adapted to other sensitive forest regions in Asia, including North Sumatra Indonesia. Further details of these partnerships for ag conservation and GHG mitigation can be found in GHI’s GAP reports.
Mechanization companies such as John Deere are helping to advance the era of “precision conservation”, where monitors and sensors can notify farmers of potential problems before they spread and maximize the use of water, fertilizer and herbicides all of which protect the environment. John Deere is constantly innovating and investing in considerable R&D to help farmers better use their own data to improve productivity of their farms and livestock operations.

By using genetically enhanced seeds and precision agriculture systems, total crop yield has increased by 135% between 1961 and 2005 globally....but global cropland only grew 27%.

Without these yield and land management technologies, global GHG from agriculture would have more than doubled during this time.
I’ve mentioned the work done by Monsanto on their emission targets and the contributions from genetically improved crops.

Companies such as Monsanto and DuPont have aligned their corporate goals with the UN SDG Goals and track their commitments to lowering GHG emissions. DuPont has achieved an 8.7% absolute decrease in GHG emissions since 2010 and between 2015 and 2020 will reduce GHG emissions intensity by 7%. Many DuPont products enable GHG emissions to be avoided or reduced. DuPont made a commitment to double R&D investment in programs with direct, quantifiable environmental benefits—investing $640 million by 2017.
Milk production in Sub-Saharan Africa’s has the highest emission intensity in the world. It is three time greater than the global average and almost double that of South Asia.

More than half of the emission intensity in milk production comes from methane produced during the cow’s digestive processes.

Opportunities abound for the private sector dairy industry to partner with farmers, international research institutions, foundations and government to improve the African dairy value chain and reduce emissions. For example, the Center for International Tropical Agriculture, CIAT, has developed special grass varieties for fodder that are drought-resistant, lower methane emissions, and increase milk productivity by 40 percent. These brachiaria grasses are being used in a variety of silvopastoral systems in Asia, Latin America and could be scaled up more widely in Africa.
While Latin America produces more beef than any other region, emissions from beef production are second highest in the world after South Asia. Most emissions come from land-use change for pasture expansion.

I recently visited Colombia, one of the world’s top cattle producing countries, with 23 million head of beef and dairy cattle. On the El Hatico intensive silvopastoral ranch near Cali, the farm has shifted to sustainable livestock and sugarcane production, emphasizing zero deforestation, minimal input use, and high productivity and soil organic matter in their systems. A large supermarket chain, Grupo Exito, is developing a system of certification and buying from locally raised silvopastoral ranchers in order to encourage farmers to make the shift to more sustainable production. Projects such as the Colombian Sustainable Cattle Project, a partnership between Colombian ranchers, and conservation organizations like the Nature Conservancy with funds from the GEF and UK have already resulted in reduction of GHG emissions by more than 2 million tons.

More information on these approaches is contained in our 2017 GAP Report.
Good enabling policies will encourage the private sector to continue to invest in sustainable, lower emissions AG systems.

The private sector does advocate for policymakers to adopt a scientific understanding of climate change to compel prompt effective actions. DuPont and Monsanto are members of the World Business Council on Sustainable Development and are involved with low carbon technology partnerships. They actively engage with the White House, EPA, USDA, DOE and Congress to support renewable energy and the Paris Climate Agreement. DuPont and others have signed advocacy letters to the Secretary of State and President Trump to remain engaged in the climate agreement in Paris.

We have identified five strategic policy goals for improving the productivity and sustainability of agriculture:

Invest in Public Agricultural Research, Development and Extension

Embrace Science-based and Information Technologies

Enhance Private Sector Involvement in Agriculture and Infrastructure Development
Cultivate Partnerships for Sustainable Agriculture and Improved Nutrition and
Foster Capacity for Regional and Global Agricultural Trade

These policy priorities are interconnected and all are required to achieve higher productivity, sustainability, and to reduce food loss and waste along the agri-food value chain. These policies also promote benefits for producers, who need to stay competitive and thrive in an increasingly global marketplace.

Agriculture as a sector is heavily reliant on research and development and extension programs to deliver innovation to farmers and the AG value chain. Farmers need access to proven technologies and practices and public R&D provides foundational results that private sector enterprises can further improve for specific crops, livestock, machinery.

It will be important going forward to address the R&D gap for the lowest income countries and for certain crops and livestock that are produced and consumed by smallholder farmers in developing countries. That is why maintaining investment and support for international research partners, such as the Consultative Group on International Agricultural Research, or the CGIAR system, will be vital to fill the research gap not yet met with private-sector funds.

The CGIAR research system consists of 15 research centers across the world, each focused on different crops, livestock, forestry and aquaculture. Research performed in these centers not only benefits smallholder farmers, but also farmers in the US and other developed countries.

We must also embrace science based and information technologies that help producers manage the ever-present risk in agriculture. Public policies that support the development, customization and dissemination of these technologies and techniques are essential—precision technologies and modern crop and livestock breeding methods also require updated regulatory systems.

Policies that incentivize private-sector investment in infrastructure are crucial to agriculture. Public private partnerships to develop roads, waterways, rail and ports help reduce transaction costs. Highspeed broadband enables farmers to use precision systems and gain access to information so they can manage weather and market risks.

We must also foster regional and global trade in agriculture through policy and investments in trade-capacity building. Forward-looking trade agreements efficiently move products from areas that efficiently produce food to consumers. Helping smallholder farmers access new markets is a start towards increasing their incomes.
Finally, governments must cultivate partnerships for sustainable agriculture and improved nutrition. Development assistance programs are moving beyond a “project” approach to become more market-driven. Programs such as Feed the Future are helping connect farmers with local and regional and global private sector to build their business capacity and agricultural productivity.