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# Global Climate Change, Local Impacts

More and more, climate change is impacting our experience in the field. Growing seasons are affected by intense rains, longer periods of drought and heightened temperatures. These changing weather patterns add stress to crops and negatively impact yields. Highly variable weather patterns make decision-making and planning for a growing season challenging.

## Climate change presents agriculture with a two-fold challenge:

1. **ADAPTATION:** How to adapt farming systems to remain productive in a changing growing environment
2. **MITIGATION:** How to reduce the impact of agriculture through reducing greenhouse gas emissions

Through its portfolio of products and services and commitments in The Good Growth Plan to improve crop efficiency and soil health, Syngenta is actively involved in both dimensions of the challenge. These contributions can be grouped into five major categories.

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| **1.** |  | Tools that enable state-of-the art conservation farming practices which simultaneously improve the resilience of production *(adaptation)* and reduce the impact on soil, water and air quality *(mitigation)* |
| **2.** |  | Tools that improve the overall resource-use-efficiency of farming in terms of various "footprints" through land and resource use efficiency *(mitigation)* |
| **3.** |  | Tools that allow farmers to address the new challenges presented by a changing climate *(adaptation)* |
| **4.** |  | Metrics and benchmarking tools that help farmers assess the effect of their production practice choices on sustainability *(mitigation)* |
| **5.** |  | Technologies that allow farmers to help provide biofuel alternatives with a reduced carbon footprint *(mitigation)* |

## Enablement of State-Of-The-Art Farming Practices

The health and quality of farmed soils are enhanced through practices such as reduced mechanical tillage, the use of cover crops, and diverse crop rotations. Those conservation practices require herbicides and herbicide-tolerance traits technologies and benefit from fungicide and insecticide seed treatments to manage key pests during crop establishment. Over time, soils so managed become better at capturing and retaining moisture as well as nutrients, and better aerated so that overall yield is improved as are yields under drought stress. The net carbon footprint of such farms is also reduced.

## Improved Resource-Use-Efficiency

Elite plant genetics, useful pest-resistance traits, and crop protection agents are means through which Syngenta helps farmers to increase their overall crop yields. Those yields in turn enhance the use-efficiency of the resources involved including land, energy, water, nutrients etc., and reduce impacts such as greenhouse gas emissions on a per unit output basis.

## Meeting the More Extreme Challenges Presented by Climate Change

Farmers are facing new invasive pests, diseases vectored by those pests, and increased pressure from pests whose development is accelerated by warmer temperatures. With its broad portfolio of insecticides, fungicides and herbicides, Syngenta provides the tools farmers need to deal with these enhanced pest challenges. Syngenta's active discovery investment insures that such protection can continue and even improve. Through both marker-enhanced selective breeding and stress-tolerance trait development, Syngenta is also providing crops like Agrisure Artesian® corn which offers high yield under normal circumstances with reduced yield loss under drought stress.

## Metrics and Benchmarks to Guide Sustainable Farming

Farming sustainably involves complex decisions and practices selected to meet the needs of specific circumstances. Through its AgriEdge Excelsior® program growers have the means to assess their individual efforts in terms of greenhouse gas emissions and soil health and other sustainability metrics in Land.db® from Field to Market®. Participants in AgriEdge Excelsior can also compare themselves to Sustainable Solutions benchmarks. At the same time that the growers are getting this information, they are also aided in documenting their stewardship and conservation practices in ways that can meet the needs of downstream customers.

## Technologies that Reduce the Carbon Footprint of Biofuel Production

The net energy efficiency and greenhouse gas reduction benefit of ethanol use compared to fossil fuels can further be improved through the use of Enogen® corn enzyme technology. Ethanol plants typically have to source the alpha amylase enzyme they need for ethanol production separately from the seed, but with Enogen, they get it directly in the corn. By incorporating Enogen, plants have been able to increase both their throughput and yield – in a 100-million gallon plant, Enogen corn-enabled efficiency improvements can reduce carbon dioxide emissions by more than 100 million pounds[1], helping to make ethanol more sustainable.

[1]Calculations based on Enogen trial and commercial results at Midwest ethanol plants.

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