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Oral testimony of Catherine Swoboda on behalf of the
American Society of Agronomy
Crop Science Society of America
regarding the National Science Foundation budget for Fiscal Year 2012.
Prepared for the U.S. House of Representatives, Committee on Appropriations,
Subcommittee on Commerce, Justice, and Related Agencies

Thank you for offering the American Society of Agronomy and the Crop Science Society of America the opportunity to comment today. Many of our member scientists' fundamental research depends on grants from National Science Foundation's Biology (BIO), Geosciences (GEO), and Education and Human Resources (EHR) Directorates.

The American Society of Agronomy and the Crop Science Society of America testify today in support of the funding level put forth for the National Science Foundation (NSF) in the President's Budget request of \$7.767 billion as this budget level is consistent with the amount, \$7.8 billion, authorized in the recent America COMPETES law (P.L. 111-358).

Basic Science Research in BIO and GEO Supports Solutions to Grand Challenges

Adaptation to variable weather and climate patterns

Throughout history, farmers have adapted agricultural systems to changes in the environment. However, recent extreme and unpredictable weather events linked to unprecedented climate change have outpaced land managers' ability to adapt. Increases in frequency and intensity of precipitation, elevated temperatures, drought and other extreme weather events are negatively impacting crop yield and quality.

These negative weather impacts can be seen in here in America. Just last January, in Florida, one-third of the winter fruit and vegetable harvest was lost when the state suffered 13 consecutive nights of below-freezing temperatures, significantly driving up produce costs to consumers. Such extreme weather-events can act as "*a threat multiplier for instability*", leaving the already most volatile regions of the world even more vulnerable to instability due to greater hunger, violence, and crime¹.

Some of the overall impacts to cropping systems include:

- ***Drought*** will limit the productivity of over half of the earth's arable land in the next 50 years, adversely impacting crop yield².

- **Elevated temperatures** can shorten the period of grain-filling (limiting weight gain in the grain) and reduce pollen viability^{3,4}.
- **Carbon dioxide (CO₂)** is a fundamental requirement for plant carbohydrate production and overall plant metabolism. Because of the continued climb in CO₂, many plants will be more productive with the exception of tropical grasses like maize, sugarcane, sorghum, and cellulosic biofuel crops, which do not respond as much to CO₂ increases may not see positive responses to increased CO₂. Benefits, however, may be counterbalanced by other pressures—biotic and abiotic, which accompany climate change and continued release of CO₂.
- **Biotic stresses** such as plant pathogens- viruses, bacteria, and fungi are highly responsive to humidity and rainfall, as well as temperature. As the seasons lengthen and winters moderate due to climate change, adaptation zones of invasive animal, plant, pathogen, and insect species are likely to increase as over-wintering and movement of pests and pathogens occurs more rapidly.

Adapting crops and cropping systems to new seasons, temperatures, gases, and biotic stresses will require crop- and region-specific ***crop adaptation technologies and strategies***. Basic science ***approaches for adapting crops to climate change exist including:***

1. Improvement of crop cultivars; and
2. Development of new methods of managing the crops in the field.

We need to capitalize on these known approaches and seek out additional advances to overcome the challenges to agricultural production. We hope that you will continue to strongly support funding for NSF and especially the BIO, GEO, and EHR Directorates as the work performed in these directorates will be essential for developing technologies and strategies for crop adaptation.

Thank you again for providing us with the opportunity to testify before the House Appropriations Subcommittee on Commerce, Justice, and Science Today.