Guys: This document comprises two items. Although the first item uses the example of Brazil, its content is also applicable to the rainforests of Africa. (Note: the level of soil fertility in Mato Grosso is *atypical*. Note also the interrelatedness of the consequences of human activities across the planet—meaning YOU are also part of the problem (or the solution).)

Item 1

Soybean Agriculture Threatens Biodiversity in Brazil

Sep 15th, 2009 by *Plant Talk*

Scott A. Mori, Ph.D., Nathaniel Lord Britton Curator of Botany, has been studying New World rain forests for The New York Botanical Garden for over 30 years. Over the course of his career, Dr. Mori has witnessed an unrelenting reduction in the extent of the tropical forests he studies.

On August 22, an image showing a small green patch of forest in the midst of a treeless area prepared for soybean cultivation appeared on the front page of *The New York Times*.
The accompanying article explained that the fertile soils underlying forests in the state of Mato Grosso, Brazil, are suitable for supporting large soybean plantations. As evidence of the magnitude of the forest destruction, the author noted that an increasing demand for Brazilian soybeans led to the conversion of 700 square miles of forest to soybean fields in that state during the last five months of 2007 alone!

The future of plant and animal diversity in Latin American forests depends on an understanding of how fragile the plant/animal interactions of tropical ecosystems are and the role human consumption plays in altering natural ecosystems. The relationships between plants and animals in the tropics are so closely co-evolved that man's utilization of tropical forests almost always results in some loss of biodiversity. Soybean cultivation is an extreme example, because in this agricultural system soybeans entirely displace the plants and animals that formerly occupied the destroyed forests.

Trees remaining after forest destruction such as the Brazil nut tree above, photographed by W. W. Thomas, do not effectively reproduce. While this tree and others like it may still live for many years, they no longer produce the next generation of trees because the forest conditions needed for the pollination of their flowers, the dispersal of their seeds, and the growth of their seedlings into adult trees no longer exist.

In his book *Hot, Flat, and Crowded,* Thomas Friedman writes: "We are the only species in this vast web of life that no animal or plant in nature depends on for its survival—yet we depend on this whole web of life for our survival." Yet, human beings as a society do not universally acknowledge or accept this.

Clearly, the increasing human population and increased consumption throughout the world is not compatible with the preservation of biodiversity anywhere. In contrast to the soils of Mato Grosso, many tropical forests grow on soils that are so nutrient poor that they will never support high human populations without massive inputs of fertilizers and pesticides. If tropical areas are not productive enough today to contribute significant support to a world population of 6.5 billion, how will it support a population of 9 to 11 billion humans by 2050? In short, residents of the tropics and the world in general will not be able to protect biodiversity at acceptable levels if both human population growth and consumption are not controlled.

Globalization has placed environmental pressures on the world's ecosystems that were unforeseen 20 years ago. Two forces that stimulate the demand for Brazilian soybeans illustrate how developments in one part of the world can negatively impact forests, such as those of Mato Grosso, in other parts of the world. In the first place, much of the demand for Brazilian soybeans comes from the emerging Chinese market, and in the second place, conversion of soybean acreage to corn fields in the United States to meet the demand for biofuel production has caused soybean buyers to turn more and more to Brazil for their supplies of this legume. Hence, all large-scale agriculture, water utilization, carbon emission, and other resource uses in a globalized world must consider the impact they have worldwide.

Finally, the true cost of tropical forest exploitation must be considered in any scheme to modify tropical ecosystems for human profit. Simply stated, in the long run, consumers will have to pay more for oranges, soybeans, bananas, etc. to offset the loss of ecosystem services formerly provided by the forests that large-scale agriculture either replaces or modifies. The increased prices will need to include the cost to establish reserves of tropical ecosystems large enough to

1) maintain the ecosystem services they provide and 2) protect the biodiversity they harbor. As an example, the cost of maintaining tropical forests to continue to sequester carbon must be shared by the entire world as part of the global effort to control climate change.

Biologists now have enough knowledge about tropical forests and the conditions under which they grow to determine which areas are appropriate for sustainable agriculture and cattle grazing, which areas should be managed as extractive reserves, and which areas should be set aside as biological reserves. It is no longer the responsibility of conservationists to demonstrate that tropical rain forests are valuable because they provide ecosystem services to the entire world. It is incumbent upon those who wish to "develop" the forests to demonstrate that the use they propose justifies the accompanying loss of biodiversity and ecosystem services that will occur when they are exploited for individual human gain.

Encouragingly, The New York Times article noted there's a growing recognition that the world has to act together to set aside forest reserves as well as to pay farmers to keep private land in forest. A leader in this effort is Norway, which has created a fund committed to provide up to $1 billion for conservation in the Amazon.

Scientists at The New York Botanical Garden and throughout the world collaborate with their Brazilian colleagues to describe the plant diversity of Brazil, one of the world's most biologically rich countries. Knowing the names of species, understanding where they grow, and identifying which are the most threatened allows the Brazilian government to establish the reserves needed to identify areas where the greatest numbers of plants and animals can be protected.

http://www.nybg.org/wordpress/?p=3901

Link to the New York Times article:
http://www.nytimes.com/2009/08/22/science/earth/22degrees.html

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Item 2
Impact of Climate Change on Agriculture - Factsheet on Sub-Saharan Africa

African countries are particularly vulnerable to climate change because of their dependence on rainfed agriculture, high levels of poverty, low levels of human and physical capital, and poor infrastructure.

The negative effects of climate change on crop production are especially pronounced in Sub-Saharan Africa, as the agriculture sector accounts for a large share of GDP, export earnings, and employment in most African countries. Furthermore, the vast majority of the poor reside in rural areas and depend on agriculture for their livelihoods. (Source: "Setting Priorities for Public Spending for Agricultural and Rural Development in Africa," IFPRI, 2009)

The crop model indicates that in 2050 in Sub-Saharan Africa, average rice, wheat, and maize yields will decline by up to 14 percent, 22 percent, and 5 percent, respectively, as a result of climate change.

Irrigation water supply reliability, the ratio of water consumption to requirements, is expected to worsen in Sub-Saharan Africa due to climate change.

Without climate change, calorie availability is expected to increase in Sub-Saharan Africa between 2000 and 2050. With climate change, however, food availability in the region will average 500 calories less per person in 2050, a 21 percent decline.

In a no-climate change scenario, only Sub-Saharan Africa (of the 6 regional groupings of developing countries studied in the report) sees an increase in the number of malnourished children between 2000 and 2050, from 33 to 42 million. Climate change will further increase this number by over 10 million, resulting in 52 million malnourished children in 2050.

Additional investments to increase agricultural productivity can compensate for many of the adverse effects of climate change. Sub-Saharan Africa needs 40 percent of the estimated 7 billion USD per year in additional global agricultural investments, the majority of that for rural roads.

Source: International Food Policy Research Institute, Climate Change: Impact on Agriculture and Costs of Adaptation, 2009
http://www.ifpri.org/publication/impact-climate-change-agriculture-factsheet-sub-saharan-africa