Keynote Speech

Global Food Security and Climate Change

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Agriculture is the sector most vulnerable to climate change because of its high climate dependence. All the expected climate changes -- higher temperature, more frequent floods and droughts, and sea level rises -- will negatively affect food production. Climate changes will also give rise to more frequent outbreaks of pests and diseases in agriculture as well as saline soils due to the intrusion of sea water, which will lead to serious food insecurity. In order to reduce the use of fossil energy, part of farmland may be used to grow crops to produce bio-energy. In addition, the growing scarcity of water, particularly in rapidly growing Asian economies, can be a major threat to the sustainable production of the main food staples. Thus, if the current trend continues, we will face higher and more volatile food prices, which, in turn, will lead to more widespread poverty and food insecurity, and even to serious hunger and famine in poor countries. Furthermore, high food prices will lead to further deforestation, which currently accounts for 18% of the emission of greenhouse gases (GHGs), and other unsustainable uses of land in order to increase food production.

By now there is no question that the world climate will change. While so far we have been concerned primarily with the mitigation of climate change by reducing the emission of greenhouse gases, we now have to consider not only mitigation but also adaptation to climate change, particularly in the context of agriculture (see Figure 1). What is needed is the development of heat-, salinity-, flood-, and drought-tolerant and pest- and disease-resistant varieties and production methods. Biological sciences must play a critical role here by identifying useful genes and incorporating them into varieties that are potentially high-yielding. The creation of C4 rice, which uses less water and absorbs nutrients more efficiently, can be another major innovation. By allocating sufficient resources, it will be possible to develop appropriate technologies. A good recent example is the development of a submergence-tolerant rice variety, which incorporates the so-called sub1 gene.

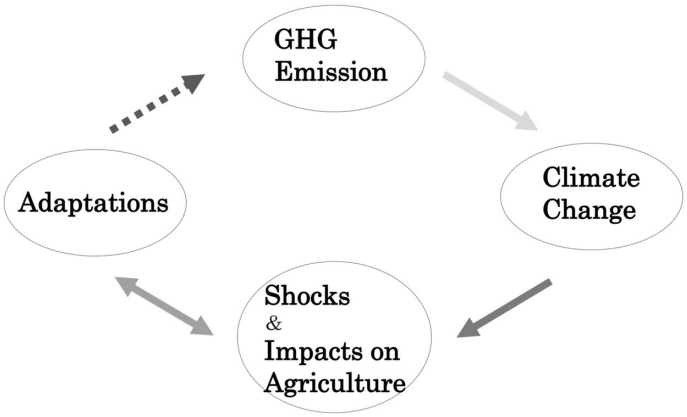
The poorer the country, the weaker will be the institutional and technological systems for the adaptation to climate change. Since basic scientific knowledge is a global public good, international effort to support scientific activities is needed. Also needed are adaptive research and extension to develop and disseminate location-specific technologies, particularly for environmentally unfavorable areas, which are ubiquitous in poor regions of Asia and most parts of sub-Saharan Africa.

Successful adaptation will mitigate the adverse impacts of climate change but it does not affect the climate change itself. However, sustainability of agriculture and, hence, sustained food security in poor countries cannot be achieved without reducing the GHG emissions. It

is also true that a substantial reduction in the GHG emissions in the world as a whole cannot be achieved without the participation of developing countries in the post-Kyoto framework to reduce such emissions. Their participation is also crucial for the efficiency of global efforts to reduce GHG emissions based on carbon trading.

Given this context, it is extremely important to recognize that adaptive research and extension are local public goods, which means that targeting support for adaptation in developing country is possible. In order to persuade the developing countries to participate, developed counties should use ODA judiciously and selectively to support the efforts to adapt to climate change by those developing countries which are willing to contribute to a reduction in the emission of GHGs. Thus, as is indicated by the dotted line in Figure 1, strengthening the adaptation and linking it to the reduction in the GHG emissions should be a new challenge to mitigate climate change and realize global food security.

Figure 1. Structure of the Problem



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