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CLIMATE CHANGE AND FOOD SYSTEMS

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CLIMATE CHANGE AND FOOD SYSTEMS¹

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There is wide scientific evidence that global climate is changing in part as a result of human activities, and that the social and economic costs of slowing down global warming and of responding to its impacts will be large. However, there are large uncertainties as to when and where and how climate change will impact on agricultural production and food security.

The projected climate change will result in mixed and geographically varying impacts on crop production. The Food and Agricultural Organization of the United Nations (FAO), in collaboration with the International Institute of Applied Systems Analysis (IIASA) has developed the Agro-ecological Zones (AEZ) methodology, a worldwide spatial soil suitability database. The AEZ approach has been used to quantify the regional impact and geographical shifts in agricultural land and productivity potentials, and the implications for food security resulting from climate change and variability. The analysis indicates that on average, many Industrialized countries stand to substantially gain in production potential, while many developing countries are expected to lose.

In the developing world, climate change would lead to an increase in lands that are arid and lands with moisture stress. In Africa for instance, there are 1,080 million hectares of land with a length of growing period of less than 120 days. Climate change would by 2080 result in an expansion of such land by 5-8%, equivalent to 58 million hectares and 92 million hectares respectively (IIASA, 2002).

The FAO/IIASA study indicates that the developing world would experience an 11% decrease in cultivable rainfed land with consequent declines in cereal production. Sixty-five developing countries, representing more than half the developing world's total population in 1995, will lose about 280 million tons of potential cereal production as a result of climate change. This loss, valued at an average of US\$ 200 per ton totals US\$ 56 billion, equivalent to some 16% of the agricultural gross domestic product of these countries in 1995. Some 29 African countries face an aggregate loss of around 35 million tons in potential cereal production (FAO/IIASA, 2001). In the case of Asia, the impact of climate change is mixed: India loses 125 million tons, equivalent to 18% of its rainfed cereal production. China's rainfed cereal production potential of 360 million tons, on the other hand, increases by 15%. Among the cereals, wheat production potential in the sub-tropics is expected to be affected the most, with significant declines anticipated in Africa, South Asia, and Latin America (IIASA, 2002). Of course, the above-mentioned estimates refer to potential cereal production. Changes in actual cereal production are more difficult, if not

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impossible, to assess, but the changes in production potential indicate an increasing stress on resources induced by climate change in many developing countries already hard-pressed.

The industrialized nations will see a considerable potential for expansion of suitable land extents and increased production potential for cereals only when considering the use of “new land” at high latitudes. These potential increases are mainly located in North America, Northern Europe, the Russian Federation, and in East Asia (IIASA, 2002). The positive growth in cereal production potential in the Northern Hemisphere tends to buffer the impact of anticipated production shortfalls in the South, hence the impact of climate change on global cereal prices is expected to be moderate. But the distributional effects will be overall negative for the developing world.

Alterations in the patterns of extreme events, such as the increased frequency and intensity of droughts, will have much more serious consequences for chronic and transitory food insecurity than shifts in the patterns of average temperature and precipitation. These rainfall deficits can dramatically reduce crop yields and livestock numbers in rainfed production systems that are common in the semi-arid tropics. Localized increases in food prices could be frequently observed. Subsistence producers growing orphan crops, such as sorghum, millets, etc, could be at the greatest risk, both from a potential drop in productivity as well as from the danger of losing crop genetic diversity that has been preserved over generations. Humid areas are also vulnerable to climate variability. They can suffer from changes in the length of the growing season and from extreme events, such as tropical cyclones. Food insecurity and loss of livelihood is further exacerbated by the loss of cultivated land and nursery areas for fisheries by inundation and coastal erosion in low-lying areas of the tropics.

Climate change impacts on agriculture could increase the number of people at risk of hunger. The impact of climate change on food security will be higher in countries with low economic growth potential that currently have high malnourishment levels. In some 40 poor developing countries with a combined population of 2 billion, including 450 million undernourished people, production losses due to climate change may drastically increase the number of undernourished, severely hindering progress against poverty and food insecurity (IIASA and FAO, 2001). These low-income food-deficit countries often do not have the resources to finance food imports in order to fill the gap in requirements. Some of the severest impacts seem likely to be in the currently food insecure areas of sub-Saharan Africa with the least ability to adapt to climate change or to compensate for it through greater food imports (FAO, 2003).

Land-use changes and the development of improved bioenergy systems that have already been identified as important means of achieving sustainable rural development among small and poor land users also have a significant potential to contribute to climate change mitigation through sequestration and carbon substitution. Results from the empirical studies of carbon sequestration and bioenergy efficiency indicate that there is considerable heterogeneity in the opportunity costs and sequestration/substitution productivity over varying land uses and agro-ecological zones. Thus, there is considerable variation in the returns to carbon offsets for poor producers. Carbon emission offset payments, also known as “payments for environmental services”, may serve either as a means of overcoming financial barriers for reducing the lag time between expenditures and returns in the adoption of perennial cropping systems, or for other measures to reduce vulnerability to climate change and ways of promoting adaptation of production systems and society to climate change impacts. In other cases, carbon offset payments offer a means of diversifying incomes, allowing producers who are operating traditional pastures to obtain a higher source of income by refraining from deforesting to expand pasture area, or moving into the production of bioenergy crops.

FAO in close cooperation with others will continue to monitor the relationships between climate change and food systems. As more data becomes available and policies and research lead to further action

at the local level, mitigation and adaptation to climate change measures will hopefully reduce vulnerability of the rural poor and open new opportunities for development and food security.

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