Climate Change and Agriculture

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Fact Sheet

Climate Change

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Effects of rising seas

Climate change will strongly affect agriculture, but scientists are not sure exactly how. Global model circulations (GMC) shows that doubling the atmospheric concentration of CO_2 by 2030 will increase average global temperatures by 1°C to 3°C. This raises sea levels which inundates coastal farmland and makes ground water and the atoll ground lens saltier, amplifies extreme weather in storms and droughts, shifts climate zones towards the poles and reduces soil moisture.

However, higher concentrations of CO_2 may boost crop productivity by stimulating photosynthesis in plants: doubling CO_2 increases photosynthesis rates by 30% to 100%. Experiments confirm that when plants absorb more carbon they grow bigger more quickly, particularly temperate "C_3" plants such as wheat, rice and soya bean. Response of most tropical C_4 plants such as maize, sorghum, sugar-cane, millet and pasture and forage grasses are not as dramatic. [So, what of tropical rootcrops, the staple food crops for most Pacific islanders?]

Changing climate zones

Climate and agricultural zones will tend to move towards the poles, as temperature increases will be more pronounced in higher latitudes near the poles, and in the mid latitudes where the shift is expected to be between 200 km and 300 km for every 1°C of warming.

Some crop species would benefit from higher temperatures, others may not. Warmer climates interfere with germination and other key stages in the life cycle of some plants. Limiting factors that could affect crops and plants with warmer climate include:

- reducing soil moisture;
- increasing evaporation rates (about 5% for every °C rise in average annual temperature; and,
- soil types in the new climatic zones that would be unable to support intensive agriculture.

Mid latitude yields may be reduced by 10% - 30% due to increases summer dryness. Climate models suggest that today's leading grain producing areas such as the Great Plains of the United States may experience more frequent droughts and heat waves by the year 2030. Extreme weather over extended periods destroy certain crops negating the potential greater productivity from "CO_2 fertilization". In 1988 extended drought in the United States resulted in corn yields dropped by 40% and for the first time US grain consumption exceeded production.

Impact on Pacific agriculture

The impact on yields of tropical crop are difficult to predict. Scientists are confident that climate change will lead to higher temperatures, however they are not sure how climate change will affect rainfall. This is the key constraint on tropical agriculture.

Climate models indicate monsoon rains will move poleward and the inter-tropical convergence zones will also migrate poleward. So, the low latitude countries such as Kiribati have a greatest risk of lower rainfall and soil moisture and heat stress to damage crops and livestock. This may be very important for atoll countries closest to the equator which already have low average rainfall, and for those with coralline soils with very low water holding capacity.

The impact on net global agricultural productivity is also difficult to assess. Higher yields in some areas may compensate for decrease in others but if major food exporters in the temperate zones suffer serious losses this may not be enough. Relationships between crops and pests are hard to predict. So too on how governments and farmers will adopt new techniques and management procedures to compensate for the negative impacts of climate change.

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