**8 April 2021, Climate Emergency Institute, update on climate change and food security**

By Peter Carter

8 April 2021, Mirage News, **Study calls for urgent climate change action to secure global food supply**

https://www.miragenews.com/study-calls-for-urgent-climate-change-action-to-541098/

**Excerpts from the study regarding multiple adverse impacts of global climate change on world food security**

***Annual Review of Public Health Climate Change, Food Supply, and Dietary Guidelines*** Colin W. Binns, et al, 1st published 26 January 2021, Volume publication April 2021

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1. INTRODUCTION (excerpt)

Since the publication of the previous ARPH (Annual Review of Public Health) articles on this subject, world events have illustrated the fragility of global initiatives against climate change; efforts to reduce the rate of change stall as major countries withdraw or do not meet commitments outlined in the Paris Accord (85). The rate of climate change is increasing: 2015–2019 was the hottest five-year period on record, resulting from ever-increasing CO2 emissions (152). There has been increased crop damage from storms, droughts, floods, salination, landslides, and wildfires on all continents. The loss of plants and animals from these events, together with the concentration of cropping on fewer hectares, reduces biodiversity (62). These changes will increase climate-related strain on food supplies and nutrition and health, with the coronavirus disease 2019 (COVID-19) pandemic imposing additional health and economic burdens

2. IMPACT OF CHANGES IN CLIMATE ON FOOD PRODUCTION AND SUPPLY 2.1.

Changes to Global Food Supply In a series of reports over the past 15 years, the IPCC has provided scientific evidence of the effect of climate change on global food supplies (2, 50–55, 57, 59–71). Hotter climates will shift production toward the poles and will also cause faster plant growth and ripening and decrease nutrient density. Areas of dry land will increase, while some regions will have increased rainfall (80). The amount of arable land in use is almost at a maximum. Increasing environmental degradation, desertification, soil depletion, overgrazing, rising sea levels, urban development, roads, and industrial use may reduce land further. Saltwater encroachment will affect some particularly low-lying, but highly productive rice-growing areas of Asia. As a result, agricultural productivity will have to increase. Adverse weather events including storms, hurricanes, droughts, flooding, landslides, and erosion will increase in frequency and severity, which will damage crops and disrupt harvesting, transportation, and storage. Transport will be disrupted owing to adverse weather events, increased fuel costs, conflict, and political issues. Spoilage and bacterial damage, including Listeria, Salmonella, and mycotoxin contamination, increase with rising temperatures and increased numbers of extreme heat days (100). Mitigating this damage will require improved agricultural practices and better processing, packaging, and storage. Agricultural yields depend on crop protection measures. The main purpose of pesticide use is to increase food security by controlling pests and weeds, and these will increase with climate change. The increased number of insects, including locust plagues, will cause crop damage, decrease crop yield, and result in greater costs with increased chemical residues (43, 153). Pesticide use will increase, and higher temperatures and adverse weather may cause faster dissipation (41). Contaminants may enter food at several stages of agriculture, processing, packaging, transport, or storage. New toxic residues (emerging contaminants) in food are increasing as a consequence of changes in industrial processes, intensifying agricultural practices, environmental pollution, and climate change (57). Chemical contaminants have become a food safety concern, owing to pesticide residues and environmental contaminants (74). Climate change will have a serious negative impact on crop productivity as the level of warming progresses (80). Productivity of both commercial crops (maize, rice, and wheat) and crops such as millet and sorghum will be affected. Impacts will vary depending on CO2 concentrations, fertility levels, and region (80). A meta-analysis shows that adoption of improved farming practices and technologies such as improved varieties, planting at optimal times, and improved water and fertilizer management has the potential to reduce the negative impact on crop yield (3). With this scenario, climate change may not add significantly to the challenge of food production for the majority of countries except for some potential hot spots around the world. However, massive investment, policy, and institutional support will be required to facilitate adoption and scaling-out of such practices and to address climatic variability (3). Food variety will decrease, as measured by the “food diversity index” (47). Diverse food systems are more resilient in enhancing food security in the face of climate change. They are important for nutrient cycling, carbon sequestration, control of soil erosion, reduction of GHG emissions, and control of hydrological processes (97). For human nutrition, food diversity is important, especially for children, because it increases the likelihood of meeting nutritional needs, including intakes of phytochemicals, and decreases the impact of contaminants and toxicants (83, 123). Potable water supplies will decline owing to decreased rainfall, salinization, pollution, increasing population, and industrial use. This decline will affect water-intensive production systems, and dairying will be the most affected (67, 73). Decreases in milk production will reduce the availability of an important source of calcium and high-quality protein. At the same time, osteoporosis will become more prevalent in aging populations, which may require additional interventions. Decreases in the dairy herd may have a public health by reducing the production and use of infant formula. More irrigation is a strategy to increase food production, but the lack of water will limit its expansion (38). The global food system contributes 25% of GHG emissions, with the largest source being livestock production. The food and agriculture industries project that an increase in demand for meat is likely to undermine efforts to keep global average warming below a 2°C target (114). How GHGs are accounted for may differ in the country of production compared with the country of consumption. For example, the GHG production of Hong Kong is underestimated as imports of meat are ignored. GHG emissions hidden in meat and dairy products, which are all imported into Hong Kong, demonstrate that consumption is about 59% higher than the city’s total GHG emissions using conventional production-based calculations (155). Nuts have important benefits for nutrition, but yields will decrease with climate change (4).

2.2. Oceans, Fish, and Seafood Fish and seafood, containing protein, a high level of omega-3 fatty acids in fatty fish, and micronutrients, are important components of a healthy diet (148). Fish provide at least 15% of the daily average intake of animal protein for 4.5 billion people, and in 2010 it provided more protein than cattle and poultry combined (13). For some populations in West Africa, island states, and coastal Asia, fish consumption is over 50% of the total animal protein consumed; small fish, eaten whole, are also an important source of many micronutrients (76). As ocean health changes, sustainable production will decrease, requiring more effort to reduce pollution (42). The world’s oceans are changing because of increasing acidification (dissolved CO2), increased fishing, minerals and petroleum extraction, and increasing use for aquaculture (35, 106). Ocean acidification has the greatest effect on calcifying organisms, including mollusks, corals, and plankton (25), which affects species higher up the food chain. Acidification can affect the growth and life span of some fish, such as sea bream, and can reduce plankton size, which decreases the growth of species such as anchovy and sardines (6, 31). Catching and consuming fish are generally localized activities. Nine of the top 15 countries for marine capture are in the Asia-Pacific region, accounting for 87% of the global catch (52, 78). The EAT-Lancet Commission on healthy diets recommended 28 g per day of fatty fish for the protective effect of omega-3, but only the East Asia-Pacific region currently achieves this goal. The 2010 dietary guidelines for Americans encourage individuals to double their intake of fish (94), which would require a doubling of the current production to meet these recommendations (148). The oceans cannot supply these recommended levels of fish; the maximum sustainable catch has already been exceeded, with 30% of ocean wild fish stocks overfished and 60% fully fished (52). Wild fish stocks face compounding pressures from pollution, loss of habitat from coastal developments, and increased eutrophication. Increasing sea temperatures will result in the migration of stocks toward the poles (59). Aquaculture is the only method available to increase fish production, and currently two-thirds of production comes from Asia (excluding China). Changes to fish feeding methods and growth patterns may alter nutritional content, with reduced lipids, vitamin D, omega-3 fatty acids, and proteins (59, 81, 103, 134, 148). These changes will need monitoring and research to reduce the environmental impacts of mariculture (52).