Challenges & options of feeding the future in a changing climate & biodiversity loss: global view

Abstract

Climate change is happening due to natural factors and human activities. It expressively alters biodiversity, agricultural production, and food security. Mainly, narrowly adapted and endemic species are under extinction. Accordingly, concerns over species extinction are warranted as it provides food for all life forms and primary health care for more than 60%-80% of humans globally. Nevertheless, the impact of climate change on biodiversity and food security has been recognized, little is explored compared to the magnitude of the problem globally. Therefore, the objectives of this review are to identify, appraise, and synthesize the link between climate change, biodiversity, and food security. Data, climatic models, emission, migration, and extinction scenarios, and outputs from previous publications were used. Due to climate change, distributions of species have shifted to higher elevations at a median rate of 11.0 meters and 16.9 kilometers per decade to higher latitudes. Accordingly, extinction rates of 1103 species under migration scenarios, provide 21 - 23% with unlimited migration and 38 - 52% with no migration. When an environmental variation occurs on a timescale shorter than the life of the plant any response could be in terms of a plastic phenotype. However, phenotypic plasticity could buffer species against the long-term effects of climate change. Furthermore, climate change affects food security particularly in communities and locations that depend on rain-fed agriculture. Crops and plants have thresholds beyond which growth and yield are compromised. Accordingly, agricultural yields in Africa alone could be decline by more than 30% in 2050. Therefore, solving food shortages through bringing extra land into agriculture and exploiting new fish stocks is a costly solution, when protecting biodiversity is given priority. So, mitigating food waste, compensating food-insecure people conserving biodiversity, effective use of genetic resources, and traditional ecological knowledge could decrease further biodiversity loss, and meet food security under climate change scenarios. However, achieving food security under such scenario requires strong policies, releasing high-yielding stress resistant varieties, developing climate resilient irrigation structures, and agriculture. Therefore, degraded land restoration, land use changes, use of bio-energy, sustainable forest management, and community based biodiversity conservation are recommended to mitigate climate change impacts.

Keywords: adaptation, conservation, ecosystems, extinction, greenhouse gases, habitat fragmentation, precipitation, species range shifts, global warming, wild relatives