

CARBON DIOXIDE FERTILIZATION EFFECT AND GREENING OF DESERTS

Rising atmospheric carbon dioxide levels (CO_2) are **greening our deserts** — in other words, many of the planet's arid environments are greener than they would otherwise be if CO_2 had remained constant.

The greening of our deserts is due to the so-called **CO_2 fertilization effect**, which can be defined as the **enhancement of photosynthesis** caused by rising CO_2 levels in the atmosphere.

Photosynthesis is the driving force behind most of the life on our planet. It's a set of chemical reactions used by many plants and some other organisms to build carbohydrates (sugars) from carbon dioxide and water, using light as source of energy. Most forms of photosynthesis release oxygen as a byproduct of these reactions. Photosynthesis is carried out in two steps, 1) the light reactions (need light to work), which use the pigment chlorophyll to capture solar energy and 2) the dark reactions (do not need light to work), which use the energy from the light reactions to fix atmospherically derived carbon dioxide (CO_2) into organic carbon (sugars).



Photosynthesis: Carbon Dioxide + Water + Light \longrightarrow Sugar + Oxygen.

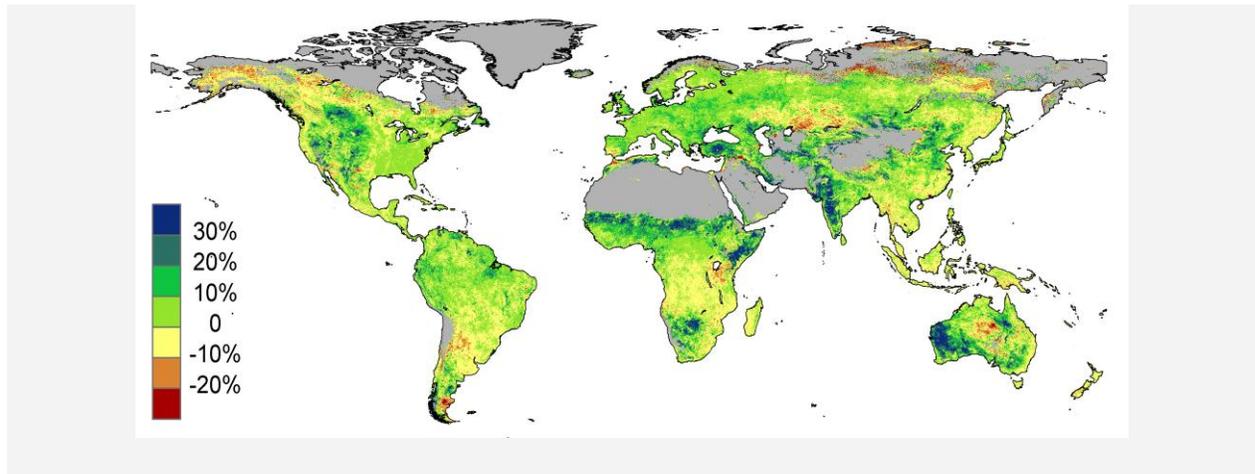
O₂ = Oxygen; CO₂ = Carbon Dioxide; H₂O = Water; C₆H₁₂O₆ = Sugar.

Photo Credit: Wikimedia Commons

Greenhouse experiments have shown that plants, grown in dry conditions, are more efficient at using water under higher CO₂ levels than under lower levels. This led CSIRO (Commonwealth Scientific and Industrial Research Organisation) and ANU (Australian National University) scientists to expect a general increase in vegetation foliage cover across arid landscapes — an increase proportional to the increase in CO₂ levels. They found out about the expected greening of our deserts through satellite observations and published the results of their study (on 19 Jun 2013) in the scientific journal *Geophysical Research Letters*.

Dr. Randall Donohue, lead author of the study, said “If elevated carbon dioxide causes individual leaves to drop their use of water, plants in arid environments will respond by increasing their total numbers of leaves. These changes in leaf cover can be detected by satellite, particularly in deserts and savannas where the cover is less complete than in wet locations.”

Results from the study show that carbon dioxide fertilization correlates with an 11 per cent increase in foliage cover from 1982-2010 across parts of the arid areas studied in Australia, North America, the Middle East and Africa.



Satellite data shows the per cent amount that foliage cover has changed around the world from 1982 to 2010. <http://www.csiro.au/>

Dr. Donohue added, “Our work was able to tease-out the carbon dioxide fertilization effect by using mathematical modelling together with satellite data adjusted to take out the observed effects of other influences such as precipitation, air temperature, the amount of light, and land-use changes.”

The greening of deserts, however, does not mean that climate change is good for the planet. The well-known detrimental effects of climate change, as for example droughts, floods, raising sea levels and shifting seasons, will keep affecting our lives on a daily basis.

Source: <http://theglobalfool.com/carbon-dioxide-fertilization-effect-and-greening-of-deserts/>