RUBBER PLANTATION IN SUB-TROPICAL CLIMATE: A MANAGED SINK OF ATMOSPHERIC CARBON

M.J. Reju, Umesh Chandra*, Jayasree Gopalakrishnan and M.D. Jessy

Rubber Research Institute of India, Kottayam-686 009, Kerala, India
*Regional Research Station, Rubber Research Institute of India, Guwahati-781 006, Assam, India

Received: 29 November 2024 Accepted: 10 February 2025

Reju, M.J., Chandra, U., Gopalakrishnan, J. and Jessy, M.D. (2025). Rubber plantation in sub-tropical climate: A managed sink of atmospheric carbon. *Rubber Science*, **38**(1): 46-55.

The state of Meghalaya in northeast India is suitable for rubber cultivation outside the traditional rubber belt although the climate of the region is sub-tropical. A monoclonal plantation of rubber clone RRIM 600 planted in 1987 in Garo Hills of Meghalaya was evaluated for growth and yield performance. The initial tree stand of the plantation was 1800 trees and over a period of 38 years the plantation lost 803 trees at an estimated rate of 21 trees per year. Assuming that the present annual tree loss rate would continue beyond the present age of the plantation, an estimate of the progress, peak and decline of the plantation as a managed sink of atmospheric CO_2, source of carbon, biomass and oxygen production were worked out. Accordingly, it was assumed that the plantation would reach its peak in the 59th year and then begin to decline its potential as a carbon sink till the plantation comes to extinction in the 87th year due to natural loss of trees. The total biomass accumulated in the area was 1748 tons and per tree average was 1.76 tons. The plantation sequestered 848 tons of carbon and the average of a tree was 0.83 ton. An estimated 46.3 kg carbon was sequestered annually in a tree, of which 36 kg was in the shoot, 6 kg in the root and 4.3 kg as dry rubber. The plantation removed 3112 tons of atmospheric CO_2. A single tree in the plantation removed 3.04 tons CO_2 over the years. Annually, 83.0 kg CO_2 was removed by a tree. The plantation released an estimated amount of 2264 tons of oxygen and a single tree released around 2.22 tons O_2 over the years. The study also estimated that a hectare of plantation in its 18th year with a tree stand of 400 trees accumulated around 182.8 ton ha^{-1} of biomass and a corresponding carbon sequestration of 88.0 ton ha^{-1}. The total CO_2 removal and the O_2 release were 323.6 ton ha^{-1} and 235 ton ha^{-1}, respectively. The annual biomass accumulation and carbon sequestration were 11.1 ton ha^{-1} and 5.7 ton ha^{-1}, respectively. An estimated 21.1 ton ha^{-1} atmospheric CO_2 was removed and 15.2 ton ha^{-1} oxygen was released annually from a hectare. Rubber plantation provides not only livelihood to the farming community but also acts as a managed sink of atmospheric carbon dioxide helpful to mitigate the effects of carbon emission in the atmosphere.

Keywords: Annual tree loss, Biomass assimilation, Carbon dioxide removal, Carbon sequestration, Carbon sink, Oxygen release, Rubber plantation, Sub-tropical region, Timber

INTRODUCTION

The rubber tree, *Hevea brasiliensis* (Willd. ex A. Juss.) Muell. Arg., is a forest tree species that originated from the Amazon River forests. Being a tree crop, a plantation of rubber is a carbon sink that can store carbon as long as the plantation survives. The plantation is also a potent source of carbon that can be harvested as commercial products such as natural poly-isoprene

Correspondence: Reju M.J. (Email: reju@rubberboard.org.in)