Challenges and prospects of cotton farming in the tropics: lessons for northern Australia

Abstract

Cotton is the world's most widely grown fibre crop, providing a livelihood for over 100 million households globally. However, its environmental impact has become a growing concern. This study systematically reviewed published research articles in tropical regions to provide insights into the socioecological risks, challenges, and prospects of cotton production for growers and policymakers. We analyzed peer-reviewed articles published between 2005 and 2024 using qualitative and quantitative approaches (gross margin and break-even analysis). We found that cotton production in tropical regions faces significant hurdles, including extreme and unpredictable climate conditions, biodiversity loss, high carbon and water footprints, rising production costs, and social (health) risks. While organic and rainfed cotton have been proposed as eco-friendly alternatives to irrigated cotton, their lower yields raise concerns about long-term economic viability. We estimate that for rainfed cotton, a yield of 2,000–2700 kilograms (9 – 12 bales) per hectare is needed to offset the environmental opportunity cost of land clearing. Given the low yield of rainfed cotton, averaging 900 kilograms (4 bales) per hectare in the Northern Territory, the opportunity cost of cultivation would be substantial, as it comes at the expense of potential earnings from the emerging Australian Government's Nature Repair Market, which rewards biodiversity conservation. Moreover, large-scale land clearing for cotton in northern Australia may trigger trade restrictions on Australian cotton, particularly in the European market.

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