Constructing an innovative theoretical framework for tea grower's adoption of carbon sequestration practices using PLS-SEM

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Carbon sequestration in agricultural soils is crucial in mitigating the adverse effects of global climate change and enhancing soil fertility. Among various crops, tea plantations show significant promise in adopting carbon sequestration practices. Consequently, the Nilgiris district of Tamil Nadu was purposefully selected for the study, involving 120 tea growers chosen using the snowball sampling method. A theoretical framework was developed to assess the factors influencing tea grower's adoption of carbon sequestration practices. Partial least squares-structural equation modelling (PLS-SEM) was employed to analyse the gathered data. The results demonstrated that factors such as 'knowledge', 'attitude', 'innovativeness', 'perceived benefits' and 'perceived need' had a significant and positive influence on tea grower's adoption of carbon sequestration practices. In contrast, 'social influence' had no significant effect, underscoring the importance of increasing awareness, providing financial incentives, establishing pricing structures, and implementing government policies related to soil carbon sequestration.

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protect carbon from microbial activity[3]. Under specific conditions, tea agroforestry has an estimated annual carbon mitigation potential of 0.86 mg (860 kg). Shade trees play a significant role in carbon sequestration in India, accounting for 57.3% of the sequestration, while tea bushes contribute 42.7% (ref. 4). Carbon sequestration practices in tea cultivation include better fertility management[5] soil and water management, soil and plant management, and biodiversity and micro aggregation enhancement[6]. Moreover, 68% of the publications in the analysis that focused on soil carbon management failed to consider farmers' capacity demands, including resources, knowledge and skills[7]. Therefore, this study aims to identify the factors that influence tea grower's adoption of carbon sequestration practices.

Theoretical framework

The theoretical framework for the study was operationalized based on three theories: theory of planned behaviour[8], theory of reasoned action[9] and technology acceptance model[9,10].

Theory of reasoned action