

THE ASSESSMENT OF CUTTING-EDGE DESIGNS TO ENHANCE THE EFFICIENCY OF MECHANICAL TEA HARVESTING

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Tea (*Camellia sinensis*) is a major plantation crop in Sri Lanka, contributing significantly to the economy being a top global producer and exporter. Although manual tea plucking ensures high quality, it faces challenges due to rising labor shortages and costs. Mechanical harvesting addresses these issues but often compromises the tea quality, yield, and regrowth rates. This study aimed to assess the effect of blade designs for mechanical tea harvesters to enhance the efficiency and regrowth rate while maintaining the quality of tea. The study was conducted in an upland tea plantation in Nuwara Eliya with seven treatments: T1 (Manual plucking), T2 (Straight edge), T3 (Serrated edge), T4 (Blunt edge), T5 (Cutter bar), T6 (Modified straight edge), and T7 (Modified serrated edge). Each treatment was evaluated based on performance parameters such as theoretical field capacity, actual field capacity (AFC), field efficiency, leaf damage percentage, selectivity, and regrowth rate. The evaluation will be conducted in a field pruned two years ago and harvested one week prior. Plots measuring 10 m × 2 m will be used, and the experiment will be replicated thrice with skilled laborers. The results revealed that T1 achieved the highest selectivity (95.5%) and regrowth rate (0.025 kg week⁻¹) but had the lowest AFC (0.0058 ha h⁻¹) with 62.57% field efficiency. Among mechanical methods, T5 demonstrated the highest AFC (0.0161 ha h⁻¹) and 87.26% field efficiency but high leaf damage (44.6%) and lower selectivity (54.5%). Modified edges T6 and T7 showed promising regrowth rates (-0.525 and -0.35 kg week⁻¹) and moderated leaf damage (42%), indicating their potential for improving mechanical harvesting efficiency while balancing productivity and quality. These findings suggest that assessed cutting-edge designs can enhance mechanical harvesting efficiency, reduce labor costs, and sustain tea quality, benefiting Sri Lanka's tea industry.

Keywords: Regrowth rate, Selectivity, Tea plucking