



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.
Thesis Title: Ergonomic Design Modification of 'Pedal Operated Paddy Thresher' Adoptable for Agricultural Needs of Northeast India
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Thesis Submitted to the Department/ Center : Design
Date of completion of Thesis Viva-Voce Exam : 27th November 2015
Key words for description of Thesis Work : Ergonomics, product design, anthropometry, isometric strength, agriculture, CAD and DHM, physiological parameters

SHORT ABSTRACT

Paddy threshing in the northeastern region (NER) of India is carried out usually by traditional methods such as bullock treading, beating or crushing the grain by hand or foot, which requires an enormous human effort. These discomfited situations expose workers to many risk factors from ergonomics point of view. Furthermore, pedal operated paddy threshers available in this region are not suitable for the local agricultural workers due to anthropometric incompatibility, substantial weight and lack of portability features. Therefore, aim of the present study was to develop a prototype of 'pedal operated paddy thresher' adoptable for agricultural need across all terrains in NER; and India, at large, using strategies of ergonomic design interventions. To achieve the aim, objectives were articulated as (i) To develop anthropometric and biomechanical (relevant to pedal operated paddy thresher operations) normative database of Assamese agricultural workers; (ii) To simplify the working mechanism of the pedal operated paddy thresher by replacing power drive (gear-based) with chain-based mechanism ensuing unaffected or better performance; and (iii) To evaluate the superiority (in terms of operational force, anthropometric compatibility, working posture, performance, efficiency productivity, cost effectiveness, portability in diverse terrain etc.) of the proposed design intervention in comparison to existing one through both laboratory and field testing. To fulfill the objectives of the present research a case study has been carried out in Assam. The research was conducted into three phases i.e. (i) anthropometric and biomechanical data collection, (ii) design intervention of pedal operated paddy thresher, and (iii) evaluation of the proposed intervention. The systematic evaluation of pedal operated paddy threshers under laboratory and field conditions (viz. direct measurement, observational method and subjective assessment) was validated for operational ease, efficiency, and better productivity. The significant contributions of the present research towards agricultural research include (i) Design and development of first-of-its-kind indigenous isometric vertical leg strength measurement device along with subsequent normalization of its measurement techniques; (ii) Development of anthropometric and biomechanical reference database for Assamese agricultural workers (sample size - 200, male - 130 and female - 70); (iii) Application of digital human modeling based approach in design of agricultural machinery in Indian scenario; and (iv) Fabrication of ergonomic, cost effective, portable and user friendly pedal operated paddy thresher; and testing under both laboratory and field conditions to assess its usability, performance and acceptability among farmers.