INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Sustainability-Orienting Design Support for Farm Machinery Design

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Thesis Submitted to the Department/ Center	:	Design
Date of completion of Thesis Viva-Voce Exam	:	29th April 2021
Key words for description of Thesis Work	:	Sustainable agricultural mechanization, sustainable product-service system design, design for sustainability, agricultural machinery design, smallholder farms, developing countries.

SHORT ABSTRACT

This thesis focuses on sustainable agricultural mechanization development for small farms in developing countries. Statistics show that developing countries are dominated by farm holdings less than 2 hectares in size. The sustainability of these farms is crucial for the sustainability of agriculture in these countries. Mechanization of these farms is the need of the day considering the rising cost and shortage of labor. Studies show that mechanization increases farm power availability, cropping intensity, and food grain production while saving time, labor, production costs, post-harvest losses, seeds, and fertilizers. Thus, mechanization offers the possibility of increasing farmers' income. Due to the lack of economies of scale, it is not feasible for these farmers to own agricultural machinery (AM). Their AM needs are also very different from that of large, heavily mechanized farms. Thus, these small farms need the development of AM that can be hired as per need, i.e., a product-service combination offering. Also, the context demands that the said AM-based product-service system offer support infrastructure and product-services (for allied processes) so that the farmers can cost-effectively adopt it. Thus, the context calls for AM and its allied service ecosystem's design as a sustainable PSS.

This thesis presents a framework (D-SAM, Design for Sustainable Agricultural Mechanization) and a set of guidelines (G-SAM, Guidelines for Sustainable Agricultural Mechanization) for the sustainability-oriented design of AM along with its associated service ecosystem following an S.PSS design approach. D-SAM helps in strategic analysis, including a sustainability assessment and priority setting, ideation process, design and engineering of the product, service, and system, and the sustainability improvement or worsening assessment of the redesigned SAM offer. G-SAM helps in the sustainability assessment of the existing scenario, sustainability priority setting for the design, and the ideation process. It puts forward three perspectives for assessment and design in front of the designer: 1. S.PSS design; 2. Design for a sustainable agricultural outcome; and 3. Environmentally sustainable product design. G-SAM provides open-ended ideation cues to guide, educate, and inform a designer during the design process. The assessment is conducted using rapid sustainability assessment (RSA) indicators. G-SAM integrates the analysis and design ideation phase in its construct as designers perform analysis and ideation simultaneously.