Chapter 51
Analysis of Harvesting Sustainability:
A Study on the Indian Agrisector

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ABSTRACT

The existing harvesters for farming purposes are not affordable to small-scale farmers because of their financial reasons. Moreover, there is a requirement of a small, economic, more accessible & effective machine cost and also these are not available in most of the rural areas due to transportation or finance which would be easily operatable by the small scale farmers. In view of this, the present study was carried out by a depth review of literature s and expert concern is taken for existing harvesting practices and machines. Further, on the basis of ergonomic assessment followed by ISM analysis was done for considering the existing and the modified machines.

INTRODUCTION

Farmers work day and night in their fields for their bread and butter, it is only their income source. Day by day their farming process is easy as new equipment and machines have made their farming process easy. The mechanized process has changed their farming process as less labor is required, easy of working procedure, speed of work is also more and less time required. The use of mechanically operated harvesting machines, tractors, threshers is easily available on a rent basis, which very helps full for the nominal farmer and reduced their hard labor. But for small land farmers with land patches, the heavy machines are not useful. Hence, an economic, portable, smaller, easier in operation, versatile & effective machine is required for the small-scale farmers. So in this study ISM analysis is conducted for future machines having suitable features and linear relation is found for their properties suitable for small-scale farmers.

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Literature Review

A number of researchers have made remarkable evaluations of existing or traditional systems as well as modifications in the systems, and also designed suitable harvesting devices for the benefits in agriculture. For instance, a higher field capacity of 0.07 ha/h was reported in a study by improved sickles as compared to the common sickles (Mishra et al., 2013). In the performance evaluation between manual harvesting by the use of sickles and harvesting by the use of power-reaper having actual cutting width of 1.2m, it was found that the actual field capacity along with the labor requirements for the power reaper was 0.24 ha/h and 4 man-h/ha, and for manual harvesting, it was 0.05 ha/h and 28 man-h/ha, respectively (Aung et al., 2014). The utilization of "Naveen serrated sickle" was found to be good in ergonomic aspects, appropriate to ladies with reduced drudgery levels, and useful in improving the efficiency of ladies (Verma et al., 2016). Chavan et al. (2015) have developed a manually operated reaper requiring 20 man-h/ha. Further, the cost of harvesting with this reaper was reported as Rs. 1250.4 /ha, which was much lower in comparision to the traditional method having harvesting cost as Rs 2000/ha. In a design and fabrication of an animaldriven reaper for harvesting of paddy as well as wheat and having cutting and conveying systems operated by engine, it was found that the field capacity and field efficiency was 0.27 ha/h and 84.36% on wheat-crops. Shalini et al. (2015) have made an attempt to design a self-propelled reaper in order to cut soybean plants up to two rows. It was reported that as compared to manual harvesting, the labor requirement was 20%. Hossain et al. (2015) have revealed savings about 97.50% of average time, 35.00% of the cost, and 2.75% of grains, by using combine harvester over manual methods. A better technical, as well as economic performance of a modified BAU self-propelled reaper, was reported than existing BAU self-propelled reaper. The reaper's straw cutting performance in harvesting was not affected at different cutting speeds. While, there was a gradual increment in throwing performances with the increase in the ratio of cutting as well as forward speeds (Noby et al., 2018).

The basic idea of ISM lies in classifying and evaluating the relationships between different variables defining any issue or problem by the use of the experts' knowledge as well as expertise in order to create guidance & order on the relationships nature among the elements of the system (Sage, 1977; Warfield, 1974).

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METHODOLOGY

This research was carried out by an in-depth review of the literature followed by a discussion with the local farmers as well as with the agriculture-related tools & equipment manufacturers in order to get information regarding the available equipment. Moreover, the "strength", of machines or portable Agri equipment found considering the technical features, cost, environmental, economic & social factors for sustainability in agriculture farming.

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