Chapter 39
Soft Computing Methods for Measuring Sustainability in the Agriculture Sector:
ISM Method to Develop Barriers of Agri-Sustainability in India

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ABSTRACT

Agriculture plays a vital role in the development of the Indian economy, and in addition, it contributes around 15% to the nation's GDP. Manually- or mechanically-operated diverse devices and supplies implied for farming machines are utilized in farming process. Still, sustainability is the most important issue in farming. Modern equipment smoke, dust, chemicals, and fertilizers both in manual-driven farming and modern farming are major environmental issues. So, in this chapter, sustainability issues in farming are studied, and a linear relationship between them can be found by interpretive structural modelling, such that the Micmac analysis and model can be developed for barriers of agricultural sector sustainability.

INTRODUCTION

Indian Economy depends on the Indian agriculture sector due to high investments for agricultural facilities, warehousing, and cold storage. Genetically modified crops and Organic farming has improved the fertility of land and crop production rate of Indian farmers. But the small and medium agricultural sector are following the traditional method of crop production as unable to purchase high-cost equipment and the conventional method of farming gives them many physical problems like lungs problem due to exposure to dust, and musculoskeletal disorders. Extreme weather conditions, the heavy workload during their working procedure gives them early old age, bone and muscle problems. So to attain better efficiency

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of performance and to improve the productivity of the worldwide farmers in the agricultural sector it is essential to design the tools and equipment keeping in consideration the farmer's capabilities and limitations. The tools and equipment design should be able to provide more human comfort, of good quality, more output focused and reduce the musculoskeletal injury. Occupational safety is a big issue of discussion for Agricultural workers. The method of working in field in extreme climate(heat,rain), contact with the chemicals(pesticides,fertilizers),the exposure to soil,dust,the contamination due to bacteria,exposure to animals,cattle, injury due to handtools and muskulateral disorders are the most important injuries faced by all Agriworkers. Agricultural workers need sufficient precaution and safety measures at the time of field and machine work, such that no physical damage occurs to them. Most of the Agricultural injuries result from the improper selection and use of hand tools. In the agricultural sector, traditional hand tools play a major role in performing farming activities. The conventional hand tools like spade/ hoe, sickle, hammer, shovel, knife, etc. have been used since the ancient though some modifications are found now a day. As most of the farmers in India are from a poor economic background, they usually prefer conventional methods in farming instead of using the developed power operated machinery. The hand tools are mostly used in all farming activities like land preparation, weeding, harvesting of crops, etc. But tractors and other machineries are definitely solved injury and safety problems compared to the conventional tool. Modern equipment is not sustainable due to high noise, vibration, and pollution. Farming equipment modification, system design is essential to provide a better life to farmers but without environmental protection, social and economic stability is having no meaning. When all over the world is concerned about pollution farming policies must be framed to avoid pollution with improving productivity. As for safety and sustainability like two sides of a coin, both parts are important for the farming sector. So in this paper, an effort is taken to find a linear relationship between the farming processes by focusing sustainability issue, then a comparison between postures are done in conventional and modern farming practices.

BACKGROUND

Adarsh Kumar et al. (2008) have found 576 agricultural-related injuries with 332 i.e. 58% hand tool-related, from 9 villages with 19,723 persons in the 1st phase. Further, in the 2nd phase with more 21 villages of 78,890 persons, it was reported of 54 i.e.19% of hand tool-related out of 282 injuries. It was also recommended to have intervention development and training at block levels about the safety measures of equipment. Prasanna Kumar et al. (2009) have investigated the agricultural accident for six years i.e. between years 2000-2005 of 42 villages of 4 districts in Arunachal Pradesh in India. It was reported to have the accident rate as 6.39 per thousand workers per year with 40% farm implement related injury. S.K. Patel et al. (2010) have reported the agricultural accident rate as 0.8 per 1000 workers per year in Etawah district of Uttar Pradesh in India. Also, it is reported of a lack of study in agricultural injuries in developing countries due to the no availability of compiled information. Nilsson et al. (2010) have analyzed the responses from 223 injured farmers collected by the Swedish Farm Registry as part of a survey sent to 7,000 farms by the Swedish University of Agricultural Sciences and Statistics Sweden in 2004. These data showed that there were no significant differences in injuries incurred between the age groups, but that senior farmers seemed to suffer longer from their injuries. This study highlighted the importance of advising senior farmers to bear in mind that their bodies are no longer as young and strong as before. All age groups of farmers should, of course, be careful and consider the risks involved in their