207/B

Testing and evaluation of design parameters of sickles used for paddy harvesting in Sri Lanka

D A N Dharmasena and K P D C H Kaushalya

Department of Agricultural Engineering, Faculty of Agriculture, University of Peradeniya, Peradeniya

The sickle is one of the most important grain and grass harvesting hand tools used in many Asian countries. A significant number of small-scale farmers still use sickles for paddy harvesting although combine harvesters and reaper harvesters have been introduced during the recent past. The hilly topography (12% of total paddy lands: 9-10% of total production), smallholdings (about 18% of total paddy lands) and soggy soils limit the use of harvesting machinery in a considerable proportion of paddy lands in the country. The sickle is a curved metal blade, with a serrated cutting edge attached to a round very short wooden handle handgrip. Variations of sickles are used in different regions of the country and different countries as well. The Eastern Province of Sri Lanka contributes 21.4% to the annual rice production and is one of the few commercial rice producing areas in the country. Farmers have higher preference for a specific sickle called the "Matta Sickle" (MS) than the traditional "Sinhala Sickle" (SS) and the Imported Molded Sickles (IMS). However, SS and IMS are still used by many small-scale farmers while the MS is mainly used by the eastern contract harvesting labourers. This study was carried out to investigate the ergonomic and mechanical design features of the three types of sickles mentioned above, to establish appropriate design specifications of the best type for future use as there is no such standard established in the country. Traditionally, manufacture of both MS and SS types are done by the local blacksmiths using the dimensions based on experience. This study was conducted in two phases; collection of information from sickle users on ergonomic design features through a survey and laboratory evaluation of mechanical design features and cutting forces. A convenient sample of fifty farmers was randomly selected from Uhana and Muwangala villages in the Ampara district for the survey. Specific sickle design features were investigated in the laboratory using 25 sickles of each sickle type. The cutting force required for cutting a drinking straw was determined using a dynamometer coupled to a load cell and a data logger. In addition, the cutting forces of tender Guinea grass were also measured by coupling a load cell to the sickle. According to the results, 80 percent of the farmers use MS and it is ergonomically a better design than the other two types. Further, the lowest cutting force is required for the MS. The Serrate Pitch (0.88 mm) and the Bevel Angle (200) significantly reduce the cutting force.

dand@pdn.ac.lk Tel: 0812395465 / 0714418707