ERGONOMIC ANALYSIS OF TEA HARVESTING USING DIFFERENT TECHNOLOGIES TO IMPROVE PRODUCTIVITY

By

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ABSTRACT

Harvesting efficiency is one of the most critical factors affecting the productivity in tea plantations. Substantial differences in the quantity and quality of leaf plucked by different pluckers have been reported. Hence, an ergonomic study was undertaken in order to identify suitable methods of harvesting tea for improving efficiency and productivity. Innovations such as Great Western plucking basket, plucking shears and mobile weighing have recently been introduced to the plantation sector to increase the worker productivity. Three different combinations of Great Western plucking basket, plucking shears and weighing systems were tested in this study to compare their effects with the conventional methods.

The Lucia Division of the Great Western Estate, Nuwara Eliya District was selected for the study. Sixty pluckers were selected using the stratified random sampling method. The registered pluckers were classified into three categories based on the past plucking efficiency as fast, medium, and slow pluckers, and fifteen pluckers from each strata were randomly selected to obtain the sample of 60 pluckers.

Data collection started on first of July 2001 and was completed by the end of October 2001. Interview schedules were used to obtain information from the pluckers. Unstructured open discussions and focus group discussions were also held during the period of study. A system of field observations was also developed for the data collection. The pluckers were observed in order to estimate the time the spent on different activities performed in the field, standard of tea leaves and harvesting

efficiency. The activities of three pluckers were video recorded and the recorded tapes were analysed to study the movements of the pluckers in the field.

Black tea was manufactured by the orthodox method using medium scale rollers to assess the quality of the made tea. Data processing was done manually and using SPSS and SAS computer packages. Cost-benefit analyses of the innovations were done by using the marginal benefit analysis method.

The results of the study revealed that the effective plucking time ranges from 262 minutes to 275 minutes. It was found that increasing the effective plucking time of a plucker would increase the worker productivity. Fifteen basic elements of plucking motions were identified when the pluckers plucked manually and used poly sacks to collect the tea leaves. The number of motions were reduced to nine when the pluckers used the two innovations tested *i.e.* Backpack type plucking basket- Great Western model (GW basket) and TSTH. The mobile weighing could be used as a means to increase the effective plucking time.

The GW basket and TSTH are recommended with some modifications. Proper grips to both right and left hands on the shear for easy operation are recommended. A change of the height and the width of the GW basket based on the anthropometric features are recommended.

Quality analysis of the processed tea reveals that there were no significant differences among the outputs from the different combinations of harvesting methods tested. According to the cost benefit analysis, introduction of mobile weighing was

found to be economically beneficial and combinations of GW basket and TSTH are recommended.

Mobile weighing is strongly recommended. As an intermediate measure batch-by-batch weighing system and decentralized weighing system are also suggested. When introducing mobile weighing, proper deployment of pluckers in the field and better supervision are recommended to increase the productivity. Changes in the work pattern of the pluckers such as frequent shorter resting period for the pluckers are recommended.

Future ergonomic studies are suggested to determine the suitable bush height for the Sri Lankan pluckers, considering their anthropometric information. Training the slow pluckers extensively by various methods with audio-visual aids in order to improve the effectiveness of plucking is recommended. In addition, incentives and rewarding schemes to motivate the pluckers are also needed. Parallel to improving the worker productivity by using information generated from various research and development studies, living standards and working conditions of the workers should also be improved in order to have a healthier workforce.