

# **DESIGNING, DEVELOPMENT AND PERFORMANCE EVALUATION OF A MANUALLY OPERATED LEAFY VEGETABLE SLICING MACHINE FOR DOMESTIC USE**

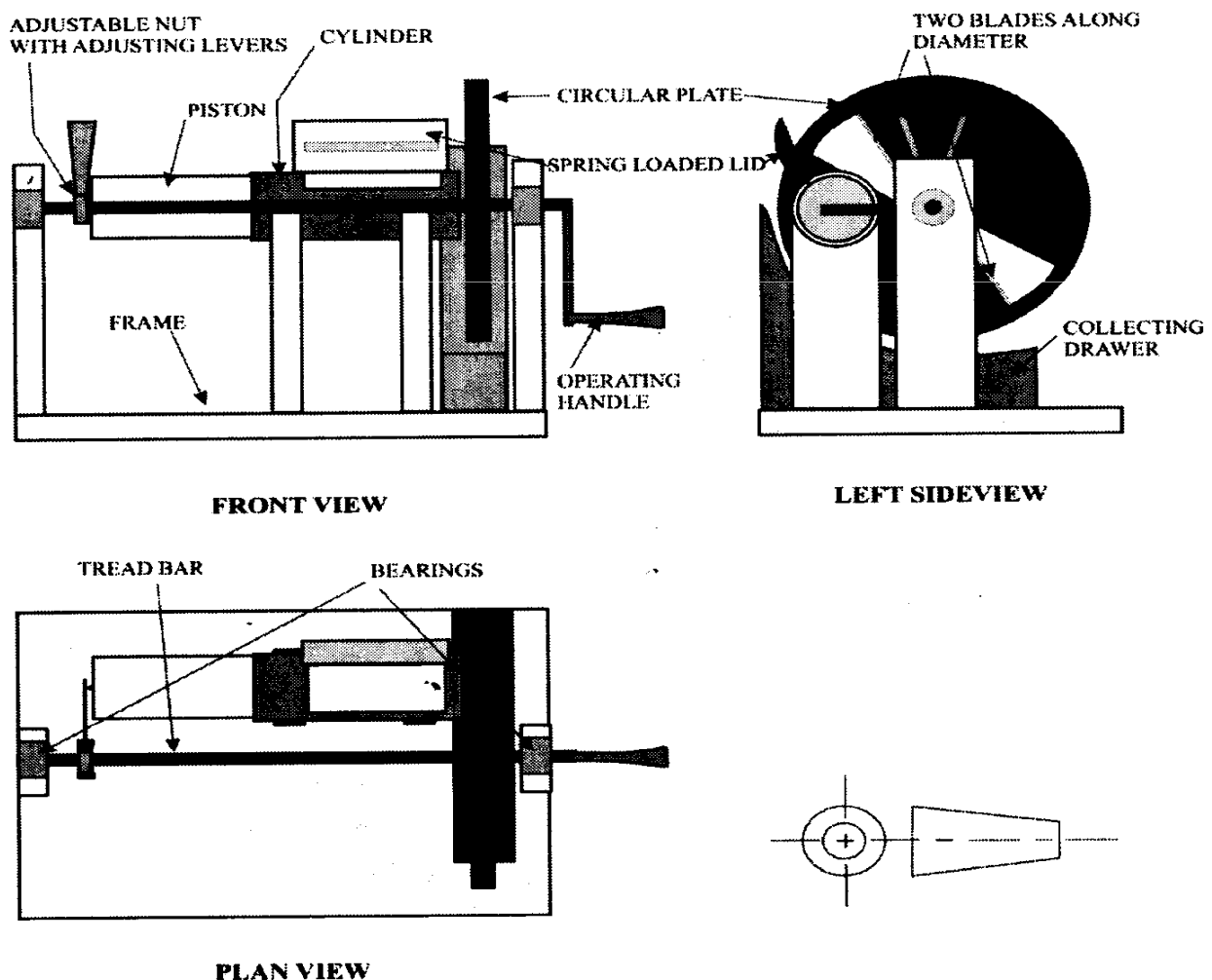
P.D. Kahandage<sup>1</sup>, R.H.G.R. Wathsala<sup>1</sup>, D.A.N. Dharmasena<sup>2</sup>

*<sup>1</sup>Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka, <sup>2</sup>Department of Agricultural Engineering, Faculty of Agriculture, University of Peradeniya*

Leafy vegetables are important protective foods, highly beneficial for the maintenance of health, prevention of disease and they contain valuable food ingredients which can be successfully utilized to build up and repair the body tissues. The difficulties in preparation, unreliability of the sources of origin and application of herbicides, prevent their consumption. In processing leafy vegetables as a food most of the time, slicing them into very thin fragments is required. Manual slicing of leafy vegetables with a knife is time consuming and requires great skills. Although, imported, power operated leafy vegetable slicing machines are available for large scale use in Sri Lanka, there is still no a suitable machine for domestic use. Introducing a suitable machine for domestic use could support to increase consumption of leafy vegetables and improve the health conditions of peoples.

The main objective of this study was to introduce an efficient mechanical solution for the difficulty of having very thin/small particles of leafy vegetables within short period of time. In the process of designing this machine, efficiency, safety, power consumption, affordability and easiness of operation, cleaning and maintenance were considered. This leafy vegetable slicing machine is manually operated and integrated feeding and cutting mechanism is the most outstanding feature of this machine. Main parts of this machine are operating handle with the tread bar, piston and cylinder, adjustable nut, circular plate with blades (cutter), collecting drawer and frame. Operating handle of the machine is tightly fitted to a tread bar with 2 mm screw pitch and circular plate, containing two blades along the diameter (Figure 01). A cylinder with an opening and a spring loaded lid is used as the hopper and the piston is used to gradually push the leafy vegetables towards the cutter, which is already in the cylinder, and is fitted to the tread bar using an adjustable nut (diameter of the hole of the nut can be adjusted). The frame of the machine is made with a hard wood and it carries all the components together. Before operating the machine, operator has to fill the leafy vegetables into the cylinder and tightly close the spring loaded lid and rotate the operating handle, counter clockwise. For each rotation of the operating handle, tread bar and circular plate rotates one revolution, counter clockwise (all are tightly connected) and adjustable nut moves a 2 mm distance along the tread bar, pushing the piston and leafy vegetables towards the cutter due to the screw pitch of the tread bar which is 2 mm. Thus, one rotation of the circular plate, the leafy vegetable is cut twice and 1 mm size particles can be obtained. 2 mm sized particles can be obtained by using only one blade of the circular plate. All the cut particles are collected by the collecting drawer. After finishing the slicing the content in the cylinder, the adjustable nut should be put on the initial position by adjusting the diameter of the hole.

Popular leafy vegetables in Sri Lanka such as *Mukunuwenna*, *Kankun*, *Gotukola* and *Kathurumurunga* were used to evaluate the performance of the machine. Five samples from each were collected from five different places of the market and mixed well and finally four, 200 g samples were prepared in four replicates with the machine and another four 200 g samples were prepared by manual slicing with a knife. Times taken to complete the operation and average particle sizes of both methods were measured. Capacity of the machine was calculated by the average value taken to slice 1 kg of each kind of leafy vegetable<sup>1</sup>. The capacity of the machine for *Mukunuwenna*, *Kankun*, *Gotukola* and *Kathurumurunga*, were 1.714 kg/hr, 1.523 kg/hr, 1.92 kg/hr and 1.714 kg/hr, respectively. The rates of slicing manually with a knife for *Mukunuwenna*, *Kankun*, *Gotukola* and *Kathurumurunga* were 1.152 kg/hr, 1.071 kg/hr, 1.132 kg/hr and 0.991 kg/hr respectively. The average particle size of the leafy vegetables cut by machine was between 1 2 mm, while it was 3 mm for manual slicing with knife. Based on the results it could be concluded that slicing of leafy vegetable can be effectively facilitated by the machine.



**Figure 01: Orthographic drawing of the machine**

#### REFERENCES

1. Larry K.B. and Richard B. (1997), the cost of owning and operating farm machinery Utah 1997, Utah state university cooperative extension. Pp 06. Retrieved September 20, 2012, 2:53:18