

SRI/16/12

13th November 2017

The Chairman,
Lanka Sugar Company (Pvt) Ltd.
No. 27 Melbourne Avenue
Colombo 04.

Dear Sir,

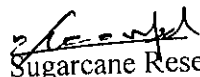
Recommendations on Sugarcane Harvesters

This refers to your recent telephone communication with me on the above matter.

Recommendations on sugarcane harvesters and field practices required for more efficient operation of harvesters are submitted herewith for your kind attention please.

I am sorry for the delay in replying to your request.

With kind regards,


Sugarcane Research Institute
Dr A P Keerthipala
Director/Chief Executive Officer

cc: 1 DD (R&TT)
2 ROIC-MT

Recommendations on Mechanical Sugarcane Harvesting in Sri Lanka

Based on the review of the harvesters available in the world and the evaluation of the sugarcane harvesters used by the Sugar Companies in the country by the Mechanisation Technology Division of the Sugarcane Research Institute, the following points with regard to the mechanical sugarcane harvesters for local conditions and crop management for mechanical harvesting have been highlighted:

According to the literature, the following are some important points:

- The fully mechanised harvesters are advantageous over the semi-mechanised harvesters in large farms.
- Among the fully mechanised harvesters, chopper harvester performs better for green cane harvesting. But most of the chopper harvesters have been designed suitable for large-scale farm especially farm layout which with row length more than 350m and appropriate headlands (space for turn the harvester).
- Among the chopper harvesters, there are harvesters of different sizes in terms of their power. In large scale-farm with higher yield (more than 100tonne/ ha), engine power more than 300hp perform better with a lesser operation cost.
- Small-scale chopper harvesters with less than 300hp are suitable for small lands and these harvesters perform better in farms with low yield (less than 100t/ha).
- In farms with high yield cane pour rate (cane delivery speed in harvester - t/hr) is high, and therefore, the machine needs to supply more energy to billeting (cut the cane into small parts) and cleaning resulting in need for increasing the size of the machine. But some manufacturers have designed sugarcane chopper harvesters with less billet size (less than 15cm, but most of the harvesters have billet size of 22-28cm). This has made possible increasing the pour rate and to perform better in high-yielding small-farms.
- According to the harvesting best practice manual (technical publication mn14001) published by Sugar Research Australia (SRA), reduction of billet size increases cane and sugar losses. Also, according to Norris, et al., (2013) reduction of billet size significantly increases non-visible losses of sugar, and hence, there is no any economic benefit by reducing the billet size. Therefore, the harvesters designed for very small short billet sizes are not recommended.

Some results of the evaluation of harvesters at Sevanagala are as follows:

During 2013-2015, the Sugarcane Research Institute investigated field performance of large chopper harvester (case 7000) and small chopper harvester (case 4000) at Sevanagala sugarcane fields. According to the results, the time waste (unproductive time used for turning and aligning the rows) when using large harvester was nearly 120% and that for the small harvester was 80% for average row length of 100 m farms. It was also observed that the farm lands had not been prepared suitable for machine harvesting. No any significant technical failures of the harvesters were recorded except the wearing of the base cutter. Therefore, these two harvesters are

technically sound. The higher rate of base cutter wearing is a result of inappropriate field conditions. This can be minimised by adopting best cultural practices when planting and managing the crop, especially by proper earthing-up.

According to the results of another trial conducted by the Mechanisation Technology Division of SRI, in Sevanagal sugarcane fields with average row length 135m, the time waste was 60%. Thus, increasing the row length significantly reduces the time-waste. In 2014/2015, total visible sugarcane losses during the above tails showed that 15.92t/ha for the large harvester and 5-8t/ha for the small harvester in Sevenagala. But for the same small harvester with the same brand, according to Manhães, et al. (2014) the total visible sugarcane loss in Brazil was 1.8t/ha in a field with well-prepared land layout and with skilled operator.

Therefore, the above-mentioned harvesters can be used in Sri Lankan fields by adopting the required practices for mechanical sugarcane harvesting in Sri Lanka.

Based on the above-mentioned findings, the following recommendations are made with regard to harvester and infielder and cultivation practices:

Harvester

- Capacity: Small chopper harvester with power around 200hp, but this harvester should facilitate adjusting the extractor fan speed. Before starting sugarcane harvesting, the operator should adjust the extractor fan speed to be suitable to crop condition (maturity level and dryness of the trash) to minimise visible cane losses and extraneous matter. The harvester billeting size should not be less than 15cm to minimise sugar losses.
- Base cutter: The automatically adjusted base cutter has advantages over fixed blade.
- Harvester turning radius: Should be minimum to minimise the waste of time.
- Centre of gravity: When selecting harvester, it is necessary to select harvester with the centre of gravity is located very close to the ground to keep harvester stable in irregular fields.
- Hydraulic system: Should be precise and reliable. Since the harvester is completely operated using hydraulic power, the manufacturing quality of the hydraulic system is very important to reduce the maintenance cost.
- Elevator: Should be flexible and adjustable. The farmlands in Sri Lanka are undulating, and therefore, it is very important to have a flexible and adjustable elevator to efficiently load the harvested cane into the infielder.
- Cabin: Should have a multifunctional cabin. A multifunctional cabin facilitates the operator to collect harvesting data and work data and to operate harvester efficiently.

In-fielder

- The wagon or infielder should have a shape to collect all the cane comes out from the elevator. The prime mover should have power and facility to comparable with that of the harvester to achieve maximum productivity.

Cultivation practices

Improving land layout: This is the most important essential requirement for improving the productivity of the machine harvesting in Sri Lanka. Improvement of sugarcane land layout for the requirements of mechanical harvesting significantly reduces the harvesting time and visible and non-visible losses (SRI is currently conducting a study at Sevanagala in collaboration with the Lanka sugar Company (Pvt) Ltd.-Sevanagala).

Training of the harvester operator: This is an essential requirement because correct operation and adjustments could reduce the sugarcane loss, increase the productivity, harvest clean cane and improve the lifetime of the harvester.

Earthing-up or hilling up: This should be consistent and matched with the height and angle of the base cutter of the harvester. Proper earthing up reduces stool damage, cane pick-up losses and soil in cane.

Sugarcane variety suitable for mechanical harvesting: Erect cane with self-trash removing varieties increase harvesting efficiency and supplying clean cane to the mill.

Consistency of row spacing: Preparation of cane row spacing according to the requirement of the harvester improves its field capacity.

Controlled traffic: Controlled traffic is required to reduce the field compaction by matching the row spacing to the width of the track of the machinery used in the field.

Maintaining a healthy crop: The crop should be maintained disease free and well-managed to increase the machine productivity.