



Balers – A boon for straw management

Syed Imran S¹, Senthilkumar T², Nataraj B³ G Manikandan⁴, Dinesh Pandi M⁵

¹Scientist, ²Principal Scientist, ³ Young professional, ^{4,5}SRF

ICAR - Central Institute of Agricultural Engineering, Regional Centre, Coimbatore - 641007, Tamil Nadu

Abstract

Straw management is an important aspect of modern agriculture. The use of balers has revolutionized the way farmers handle straw waste. Balers are machines that compress straw into tightly packed bales that are easy to handle and transport. This article discusses the advantages of balers in straw management and their impact on modern agriculture. The use of balers has several advantages, including faster and more efficient handling of straw waste, reduced storage space requirements, easier transportation, and increased income potential. Overall, balers have proven to be a boon for straw management in modern agriculture.

Introduction

Straw waste is a major byproduct of modern agriculture. It is generated in large quantities during harvest season and needs to be properly managed to prevent soil degradation and reduce the risk of fires. In the past, farmers used to handle straw waste manually, which was a labor-intensive and time-consuming process. However, the advent of balers has changed the way farmers handle straw waste. Balers are machines that compress straw into tightly packed bales that are easy to handle and transport. This article discusses the advantages of balers in straw management and their impact on modern agriculture.

Performance of tractor operated round baler

The average standing stubble height in the field, loose straw length, and loose straw moisture content was 137.4 mm, 881.0 mm and 17.80 % (w.b). The average size of round bale, volume and bale

density were recorded as 930 x 610 mm, 0.27 m⁻³ and 104 kg m⁻³. The number of bales output recorded as 64 bales/h and 197/ha with an average bale weight of 28.2 kg. The straw recovery efficiency of machine was observed as 95.25 %. The average field capacity, field efficiency and fuel consumption of round baler was found as 0.34 ha h⁻¹, 78.90 % and 3.05 l h⁻¹, respectively at the operating speed of 3.92 kmh⁻¹.

Performance of tractor operated rectangular baler

The average standing stubble height in the field, loose straw length, and loose straw moisture content was 141.2 mm, 894.0 mm and 18.5 % (w.b). The average size of bale, volume and bale density was recorded as 600 mm × 470 mm × 360 mm, 0.10 m⁻³ and 136.9 kg m⁻³. The number of bales output recorded as 125 bales/h and 416/ha with an average bale weight of 13.9 kg. The straw recovery efficiency of machine was observed as 93.25 %. The average field capacity, field efficiency and fuel consumption of rectangular was found as 0.30 ha h⁻¹, 79.51 % and 3.9 l h⁻¹, respectively at the operating speed of 3.20 kmh⁻¹.

Cost economics

The cost of operation for tractor operated round baler and rectangular baler (Cost of tractor plus baler taken as 12 lakhs for calculation) including all fixed and variable cost for 500 h/annual usage was estimated as Rs. 3307/ha and Rs. 3748/ha. The present market rate of round and rectangular bale at farmers field was reported as Rs. 40/ bale (Rs 7880 /ha) and Rs. 18/bale (Rs 7488/ha) respectively. The total cost of farmers earnings by using tractor operated round baler and rectangular baler was observed as 58 % and 49 %.

Environmental gains of alternate baling over field-burning

The average crop residue on-field was estimated as 5.5 ton/ha. GHGS emission from burning of 5.5 ton/ha was calculated (Gupta *et al.*, 2004) and it was found that the crop residues will emits 1.09 ton of fly ash, 8.03 ton of CO², 330 kg of CO, 11 kg of SO², and 16.5 kg of suspended particulate matters. It shows both economic and environmental gains on using of tractor operated baler on-field.

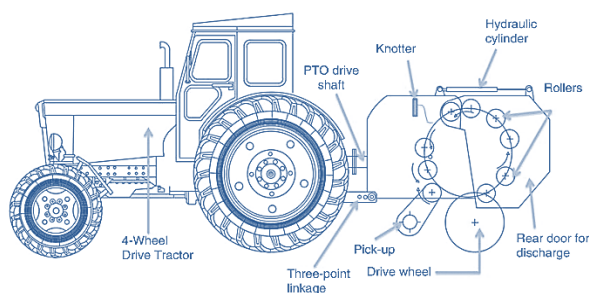


Fig. Parts of a roller-type baler (Balingbing *et al.*, 2020)

Advantages of Balers in Straw Management: The use of balers has several advantages in straw management. Firstly, they make it easier for farmers to handle large amounts of straw waste. Before the advent of balers, straw was handled manually, which was a labor-intensive and time-consuming process. Balers automate this process and make it much faster and easier. Secondly, balers help to reduce the amount of storage space required for straw. When straw is left loose, it takes up a lot of space. This can be a problem for farmers who have limited storage space. Baling the straw compresses it into a much smaller volume, making it easier to store. This means that farmers can store more straw in a smaller space, reducing storage costs and making better use of their land. Thirdly, baled straw is much easier to transport. The tightly packed bales are more stable and easier to stack, making them safer to transport. This is particularly important when transporting straw over long distances. It also makes it easier for farmers to sell their straw, as it can be transported more easily to markets and buyers. Finally, baled straw can be used for a variety of purposes. It can be used as animal feed, bedding for livestock, or as a source of renewable energy. Baled straw is also used in the construction industry as insulation and as a building material. This makes it a valuable resource that can generate additional income for farmers.

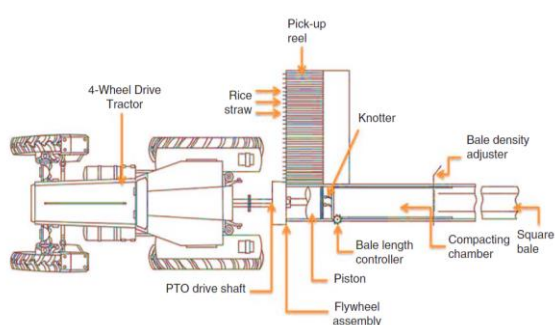


Fig. Schematic diagram of a square baler - Top view (Balingbing *et al.*, 2020)

Conclusion

In conclusion, balers have proven to be a boon for straw management in modern agriculture. They make the process of handling straw waste faster, more efficient, and cost-effective. Baled straw takes up less storage space, is easier to transport, and can be used for a variety of purposes. Balers have revolutionized the way farmers handle straw waste and have contributed to the sustainability of modern agriculture.

References



Kumar, S., Kumar, S., Kumar, V., & Bhat, S. A. (2019). Design and Development of Pneumatic Baler for Wheat Straw. *International Journal of Recent Technology and Engineering*, 8(4S), 599-602.

Muley, P., & Shrivastava, R. (2017). Design and Development of Low-Cost Straw Baler. *International Journal of Engineering Research and General Science*, 5(2), 429-433.

Ranasinghe, S. M., & Wickramasinghe, S. (2016). A study on the use of straw balers for paddy straw management in the north central province of Sri Lanka. *Tropical Agricultural Research*, 27(4), 382-391