

On-the-go Urea Solution Spraying System for Straw Baler

The crop residues are produced in huge quantities every year in India. These are utilized very poorly by the livestock. Further, the problem of on-farm burning of crop residues is increasing day by day, due to mechanisation in harvesting of cereals crops, shortage of human labour, cost of conventional methods of crop residues management and sowing of the succeeding crop. These straws (rice and wheat) can be better utilized by treating with urea solution, which is generally done manually in conventional practice. But it requires lot of time, labour and storage area. To overcome these problems, a highly innovative urea solution spraying system on straw baler (rectangular type) has been developed.

In an Inter-Institutional project mode, the scientists of the ICAR-National Institute of Animal Nutrition and Physiology, Bengaluru (Dr S.B.N Rao and Dr M. Chandrasekharaiah) and the scientists of ICAR-Central Institute of Agricultural Engineering, Bhopal, Madhya Pradesh (Er. S.P. Kumar, Dr. Dilip Jat), were involved in developing this Urea Solution Spraying System to pre-treat paddy straw during the baling operation. This machine sprays urea solution during baling of the straw under field conditions. The developed system consists of a plastic tank, spray boom with flat fan nozzles, HTP pump, hose pipe, strainer, pressure relief valve and pressure gauge. The system has been used for on-the-go spraying of urea solution on loose straw during conveying to the compression chamber of baler. The discharge rate of urea solution is adjusted with the help of a pressure relief valve of the pump.

The developed system has been evaluated in paddy and wheat straw fields and also demonstrated at the farmer's field. The urea solution having concentration of 8% (8 kg of urea in 100 litres of water) was prepared. The average weight of paddy bales was found to be increased in the range of 45% to 50% after treatment. The working capacity of straw baler with urea spraying system was observed 109 bales/h for paddy at straw load of 8.3 t/ha. The Urea treated bales were wrapped in polyethylene sheet and kept for three weeks for curing. The nutritive value of the straw like crude protein, *in vitro* dry matter digestibility and metabolizable energy was found to be improved as compared to the untreated straw. The crude protein, metabolizable energy and *in vitro* dry matter digestibility in urea treated paddy straw was found to be increased to 85%, 3.4% and 6.3 %, respectively as compared to the untreated straw. The cost of retrofitted Urea Solution Spraying System is Rs. 30,000/-. The cost of urea treatment with a developed spraying system is Rs. 0.50/- per kg of straw. This machine can be a viable alternative to prevent stubble burning after harvesting there by reducing environmental pollution especially in northern parts of India apart from value addition in terms of improving the nutritive value of poor-quality straws for feeding of livestock.



Field evaluation of urea spraying system (courtesy: CIAE)



Wrapping and storing of urea treated bales of paddy straw (courtesy: CIAE)