Playing Multiple Roles from Harvesting to Round Baling

Combination Baler JCB1800
New harvester corresponding to increasingly diverse forage harvesting situations in Japan and its neighboring Asian nations

Recently, farmers are being encouraged to utilize idle fields for the planting of feed rice as domestic livestock feed. In response to this situation, a new all-in-one combination baler has been released. The Combination Baler can harvest feed rice as well as traditional feed crops, and form these into round bales as part of the same operation. With its compact and lightweight frame, this can operate stably even in small fields.

Combination Baler JCB1800

Challenges in the dairy and livestock industries

The biggest challenge for the Japanese dairy and livestock industries is the declining and aging agricultural population. In addition, because the demand for edible rice is decreasing and imported feed prices are soaring, the government is promoting a shift to feed rice resulting in diversification of feed crops. Against this background, IHI Agri-Tech Corporation (IAT) has developed Combination Baler JCB1800, which enables efficient forage harvesting even by a small number of farmers.

A combination baler is a self-propelled machine that can harvest crops, form round bales, and eject those bales on the field after wrapping them in nets. The JCB1800 can travel at a speed of approximately 1.0 to 1.6 m/s and form a round bale having a mass of 300 to 500 kg around every two minutes. The baler consists of a combination of a traveling

unit used in existing rice harvesters with our own specially developed harvesting unit, shredding unit, hopper conveyor which temporarily stores feed crops, round baling unit, and net wrapping unit. It has a total length of 6.2 m and cutting width of 1.85 m. On the mainland and Kyushu island in Japan, many feed crop production areas are located in hilly and mountainous regions where the fields tend to be small. The JCB1800 is designed to be compact so that high harvesting efficiency can be achieved in any region.

Versatile, lightweight rotary header-type harvesting unit

The greatest feature is that a rotary header-type harvesting unit has been adopted, with reduction in weight. The rotary header-type harvesting unit is a standard specification for forage harvesters used in Europe and America, because it is robust and easy to maintain, and can harvest a wide variety of crops. However, it is large and heavy, and therefore requires a large amount of power and is expensive; for these reasons, it has not been widely used in Japan. Nevertheless, it was anticipated that the rotary header type would once again draw attention due to its versatility with respect to the relevant crops, and we decided to develop it for the domestic market.

A challenge in developing the rotary header type was weight reduction. If the harvesting unit located at the front of the machine is heavy, then the round baling unit at the rear must be moved further backwards in order to keep the center of gravity around the center of the machine, and as a result, the total length becomes larger. In this case, this would hinder us from achieving the goal of a compact, maneuverable machine. In addition, the machine should be as light as possible for use on soft ground, such as rice paddies. This issue was solved by incorporating a planetary gear mechanism into the drum. High-precision processing technology was required to ensure that load is applied evenly

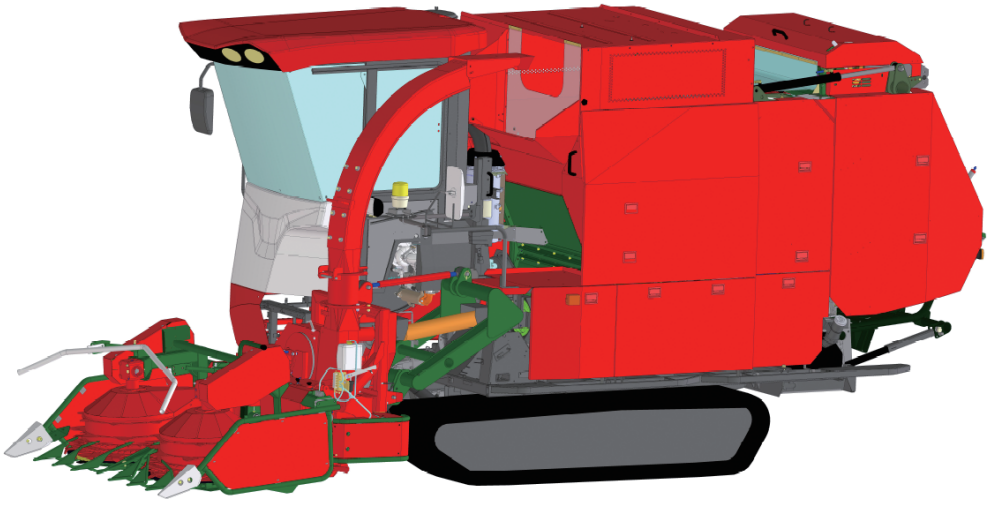
Rotary header-type harvesting unit

to three planetary gears. We developed this mechanism jointly with IHI Corporation, and thereby achieved compact, lightweight gears and gear case.

Completeness proven through over 500 hours of actual operation test

The Combination Baler is an integrated machine with many functions, and it is important that each element has a high degree of completeness. To ensure this, IAT achieved improved completeness by conducting a harvesting test for over 500 hours.

The cutting length of the shredding unit can be adjusted, so that each feed crop can be shred to the most appropriate size for cows to digest, from 9 mm (e.g., maize, which is used for animal feed) to 42 mm (e.g., rice). In addition, the machine is equipped with a mechanism for further shredding crops to help cows digest them. The densely packed shredded feed crops have good fermentation quality, and they were well received by farmers in various regions.



Three-dimensional model of Combination Baler

(a) Harvesting of lodged feed rice

(b) Feed rice shredded to the appropriate size

(c) Harvesting of lodged maize

(d) Maize shredded to the appropriate size

Harvesting of lodged feed crops and shredded feed crops

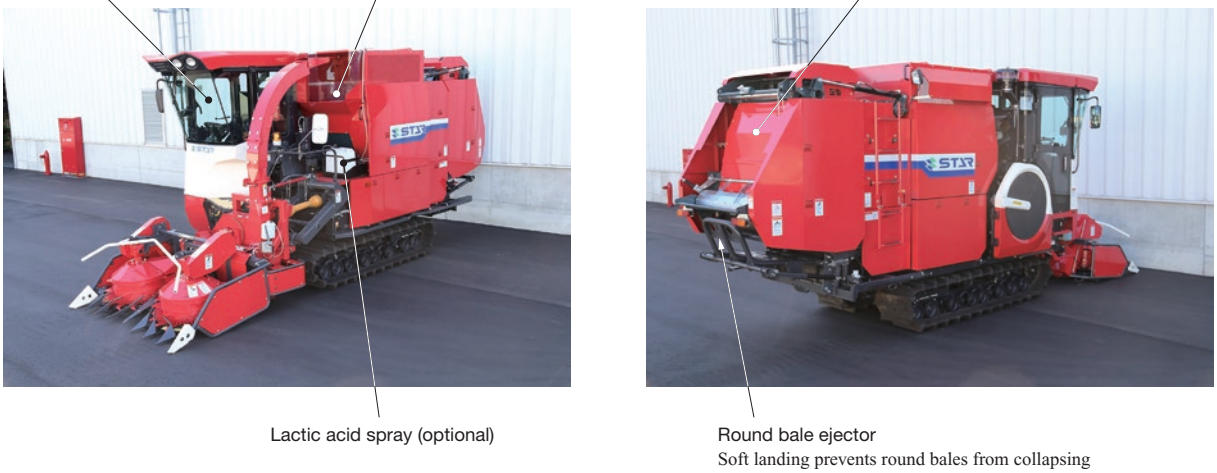
The machine is easy to operate, and regular harvesting work can be performed in a fully automated manner through single button operation. This takes the tendency for the older generation to operate into account. In addition, the machine automatically drops formed round bales in accordance with the timing determined by the operator. The dropping location of the bales can be determined so as to prevent them from rolling on a slope, etc.

Due consideration has also been given to safety. The harvesting unit can be rotated in the reverse direction. If feed crop becomes jammed during harvesting operation, rotation can be performed in the reverse direction, thereby allowing the operator to remove the jammed material without getting off the machine. We strongly urge the operator to stop the engine before removing jammed material, but some cases that operators inadvertently put their hand into the harvester and sustained injury have been reported on similar baler models. The reverse rotation function helps prevent such accidents.

Neat swaths that satisfy farmers

It is important to cut the crop to a constant height leaving neat swaths. In many cases, feed crops are harvested by contractors, but the finer the rice is cut, the more the farmer is satisfied. However, if feed crops cut too low, soil is mixed into them and causes a deterioration in fermentation quality, adversely affecting the health of the cows. In order to fulfill these demands, IAT has pursued an optimal layout by adopting the above-mentioned planetary gear mechanism, etc. A feature of this Combination Baler is that the crop can be cut low to a constant height without soil becoming mixed into it.

Ejection of round bales



High-performance/high-functionality specifications

Expanding the target market of the Combination Baler to Asian nations

This Combination Baler has advantages to many dairy and livestock areas where there is concern over shortage of labor and lack of successors to continue the business. For example, it can harvest not only maize but also a wide variety of crops, operate stably even in small rice paddies with soft ground, and do all processes from harvesting to round baling. For the time being, we aim to sell our Combination Baler in Japan, but, going forward, intend to expand our sales network to China and other Asian nations where there are dairy and livestock farmers who grow crops in small and medium-sized fields.

One technical challenge is the smooth harvesting of any lodged feed crop. In tests, feed crops that had been lodged in a certain direction could be harvested smoothly, but this could not be done for those that had been lodged randomly, e.g., after a typhoon. Going forward, we will continue our research, with the aim of being able to handle all conditions.

Combination Baler JCB1800 is a carefully designed and extremely helpful agricultural machine. We hope that this product will help meet the needs of the dairy and livestock industries, thereby supporting those industries and contributing to their invigoration.

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