



Retrofit type automation system for agricultural equipment

Topcon Corporation

Turn your tractor into an automated tractor



Automatic steering system

■Challenges facing Japan's agriculture industry

Due to the extreme aging of the farming workforce in Japan, an increasing number of farmers are outsourcing the management of their fields to other farmers in the region. In order to handle the management of this increased area, they are incorporating, hiring workers, and treating it like a large-scale farming operation. However, it's not easy to manage a large field while dealing with an unskilled labor force at the same time. In particular, the operation of agricultural vehicles requires a lot of skill, as it is difficult to keep the vehicle moving in a straight line, and the driver needs to also operate the machinery hooked to the back (fertilizer, pesticide sprayers, etc.) In particular, ridging, sowing, and other operations require skilled driving with an accuracy of several centimeters.

■An automatic steering system that can be retrofitted

The automatic steering system uses a high-precision GPS receiver that registers position information, which is then used to automatically control the steering wheel of the agricultural vehicle to have it follow a pre-registered line of travel. The system is composed of three devices: **1. High-precision GPS receiver:** It has a built-in electronic compass and IMU (Inertial Measurement Unit), which measure the location, position, and bearing. **2. Console:** This processes the position and bearing information from the GPS receiver and also displays and sets the position and bearing information. It uses the location information to control the farm equipment. **3. Electronic steering wheel:** A high torque electronic motor is installed to automatically operate the steering wheel of the vehicle. These devices can be retrofitted to existing vehicles that are currently in use, enabling automation at a low cost. Since agriculture vehicles are used for a short time in each season, a single automatic steering system can be passed around to different vehicles for efficient operation.

■Making difficult work easier for unskilled workers

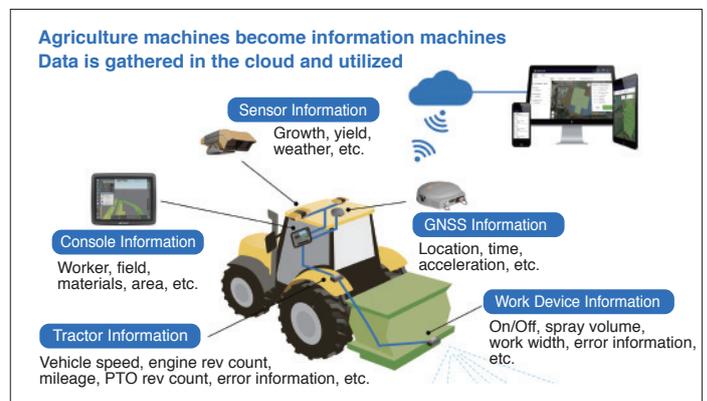
With the automatic steering system, even unskilled workers can perform highly accurate and efficient work similar to skilled workers. By delegating difficult tasks to unskilled workers, one of the obstacles to scale expansion can be resolved. For skilled operators

too, letting the system handle the steering wheel helps reduce fatigue and also lets them concentrate on checking the work equipment, allowing them to perform more accurate work. The system is particularly effective when operating at ultra-low speeds (0.1km/h) which is often the speed used in agriculture in Japan.

■Supporting DX (digital transformation) in agriculture

Automatic steering systems are rapidly gaining popularity in Japan, but they have already become common in advanced agriculture countries in Europe and the United States. Agricultural vehicles and work equipment are highly computerized and automatically controlled in conjunction with the position information of the automatic steering system. The automatic steering system collects data and sends it to the cloud and is managed by a system called FMIS (Farm Management Information System).

Meanwhile, in Japan today, automatic steering systems are only used to control the steering wheel and the recorded work data is not utilized. As Japan's work equipment becomes more electronic, it will be possible to obtain useful information. As agriculture machines become information devices, Japan will be able to utilize agricultural work data as is done in Europe and the United States. This will contribute to the transition from agriculture that relies on experience and intuition to one that is based on data.



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