Robot suits to aid elderly Japanese farmers with toiling in the fields

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Manual labor is becoming more and more difficult for Japan's aging farmers, prompting a Tokyo professor to devise a high-tech solution: mechanize the bodies of the farmers themselves.

Prof. Shigeki Toyama of Tokyo University of Agriculture and Technology's Graduate School of Engineering is close to perfecting a robot suit that could considerably reduce the physical burden of farmwork on elderly farmers.

People aged 65 and older are a key pillar of the agricultural work force, accounting for about 60 percent of the agricultural population in Japan. Development of the robot suit may come as welcome news to such elderly farmers.

While agricultural machines such as tractors and rice planters have reduced farmers' physical burdens, many kinds of work still depend on manual labor, such as harvesting fruits and vegetables or pruning the branches of fruit-bearing trees.

For elderly farmers, it is difficult to work in a kneeling position for hours on end or to lift heavy bundles of crops. Many suffer chronic pain in their lower backs, knees and elbows.

During a conference at his university, Toyama heard of the hardships in the nation's agricultural sector from Prof. Isao Ogiwara, a horticultural researcher. Toyama subsequently began developing the robot suits for

farmers, which he named "Power Assist."

Toyama, who had studied robot suits for nursing care workers, wished to develop robot suits for elderly farmers.

The robot suit can be easily worn with straps that fasten it to the user's body. Four ultrasonic wave motors, which generate electric power from ultrasonic vibrations, are situated at the knees and both sides of the lower back.

Users can set the arms of the suit to a number of positions.

With the robot suit, work such as harvesting grapes, which requires farmers to keep their arms raised, will be less physically difficult.

When users must work in kneeling or crouched positions, they feel as if they are sitting on a chair as the motors support their bodies.

The professors said that pulling a daikon radish out of the ground usually requires muscle power equivalent to that needed to lift a 30-kilogram (66-pound) object, but using the robot suit reduces the figure to less than half.

The robot suit's movements can be controlled by methods including commands spoken into a microphone.

In January, the professors had the suits field-tested by grape farmers in Kofu, Yamanashi Prefecture, during their harvest. The farmers praised the equipment, saying that using it made them less tired.

A robot suit weighs about 18 kilograms (39.6 pounds). The professors aim to reduce the weight to about 6 kilograms (13.2 pounds) by using lighter ultrasonic wave motors. They hope to begin selling the suits two

years from now for about 500,000 yen (about US$5,830) each.

Toyama said the robot suits are not just for the elderly. "By incorporating information technology, work efficiency can be raised and it is not a dream to say it could increase farmers' profits," he said.

Toyama also began developing goggles with augmented-reality technology, which displays digital information over real fields of sight.

The goggles will display such information as shipments from each field, records of past work and weather forecasts.

"Through the robot suits, I want to demonstrate what agriculture in the next generation should be like," Toyama said.