FARMLIVING

SUMMER AT ITS BEST: BARBECUE ON THE COALS

What charcoal grillers lack in convenience, they make up for in flavour. Our TEAM expert presents tips and recipes for charcoal-grilled trout, seasonal fruit and more. | **Page 19**

Mechanical exoskeletons may one day reduce effort, injury risks for farmers

Abisola Omoniyi and Ornwipa Thamsuwan from the Canadian Centre for Health and Safety in Agriculture at the University of Saskatchewan hook an exoskeleton to Ron Swan of Glenside, Sask., who volunteered to test the unit on the farm.

GLENSIDE, Sask. — Farming is a real pain in the back. But a bolt-on solution is on the way.

Years of prolonged bending, lifting and shoveling contributes to back pain and is typical of many tasks in agriculture.

"We know that farmers get very high rates of back injury. Even higher than in some other areas of heavy industry and certainly higher than some kinds of desk-based professions," said Catherine Trask, Canada Research Chair in ergonomics and musculoskeletal health at the University of Saskatchewan.

According to the Canadian Census of Agriculture the rate of back-related injuries continues to rise as farmers age.

Trask is a lead researcher looking for a solution that uses existing technology and which is currently being used in manufacturing and heavy industry to facilitate manual work.

They are conducting an 18-month ergonomic evaluation of passive exoskeletons in agricultural tasks and the potential to improve the risk of back and joint pain among farmers.

Until now, she said farmers have largely been suffering in silence and little research has been done on the suitability of exoskeleton use in agriculture.

The researchers are determining how the exoskeletons can reduce postural and muscular load while performing manual farm tasks. Also, the user's experiences and perceptions, including potential barriers that might prevent some from using the exoskeleton.

It's a wearable device, which Trask calls a passive lifting structure.

"If there was a farmer who was looking to avoid back pain or to avoid a recurrence of back pain, this might be something that could come up on their radar. It's the kind of thing that could be useful," she said.

SEE IT WORK

Want to see the exoskeleton in action? See a similar model developed by Ekso Bionics put to the test at **bit.ly/31KjGw5.**

Several models are commercially available. Less complicated, less expensive units don't require a power source and sell for about $1,000. They provide a little bit of extra lift when someone is extending up out of a squatting position.

More expensive models have a built-in battery pack and motorized features, which cost up to $6,000.

"If you bend down to pick something off the ground it supports your back and your body a little bit more during the bend and then also as you lift and pick (up) that object, it provides a little more support," she said.

The researchers are inviting 18 volunteer farmers in the central Saskatchewan area to take part; men and women over the age of 18 years who have had no back issues for the past year.

"We're looking for all kinds of commodities and really trying to get a range of tasks. We're measuring throughout the 2019 growing season and we're looking for folks involved in grain production, oilseeds, pulses but also ranching. So far we've contacted folks that are involved with the sheep as well as beef, but we'd also love to hear from folks that work with poultry or dairy. Garden production is also on our list because there's a lot of bending, stooping, lifting, kind of tasks involved in cultivation," she said.

Researchers schedule a day with the producer to wear the exoskeleton depending on the tasks he or she is doing.

"If someone were driving a sprayer all day or operating combine all day, that would not be the kind of thing we're looking for or suitable for the exoskeleton," she said.

Shoveling grain or doing equipment repairs are the kind of movements that puts a lot of strain on the back.

Besides measuring heart rate to determine exertion during a task, each exoskeleton is equipped with wearable sensors that specifically monitor the activity of the muscles.

"We can tell for the muscles along the spine in particular how hard are these muscles working when people are using the exoskeleton compared to when they're not using it.

"We also have what's called a posture sensor. It's kind of like a Fitbit, but for different parts of the body. It tracks the movement of the ankles, the knees, the hips, the trunk. It shows us how fast people are moving, how far they're bending and how many bends they're making during a minute or during an hour. All of these three sources of data give us a quantified idea of the kind of biomechanics of the task," she said.

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Researchers are just as interested in what farmers have to say about wearing one on the farm.

"Much to my surprise, the experience with the exoskeleton was the ability to rep longer with more weight. I would say 25 percent more range without the fatigue," said Ron Swan who farms with John and Kent Harrington of Glenside, Sask., and who volunteered to wear one for a few hours Aug. 13.

Researchers Ornwipa Thamsuwan and Abisola Omoniyi hooked up sensors with the exoskeleton and gave Swan a variety of simulated tasks in a set amount of time that involved repetitive lifting, bending and twisting with different weights.

Swan said the exoskeleton proved its benefits while shoveling canola in the bin.

"I found that without the exoskeleton, I must pause fairly frequently to let the muscles relax in the centre of my back. I realized that my legs do a lot of that back support, but I didn't realize I was tensing those muscles up in order to support the back. The exoskeleton alleviated that effort and I could move more product faster and longer with the exoskeleton on. I pushed hard just to see what the exoskeleton would do for me and I came out quite a bit ahead of the game I think," he said.

Added Trask, "Farming is so varied that we can see lots of different tasks in lots of different environments and also different hazards as well. The numbers will say whatever they do, but if it turns out that the exoskeleton is only practical for certain types of tasks, that's a really valuable thing for us to know."

After their confidential exoskeleton trial, participants are asked to complete a survey and are interviewed about the experience.

"Once they've gone past the prototype into a developed apparatus that would be comfortable to wear and maybe not quite as bulky, I'm sure it would become a great assist for those that need their back. As the demographic of farmers becomes older, we're going to try and preserve those parts a lot longer so we can keep going," said Swan.

"Eventually in the future it could definitely become a tool on the farm."

Trask said wearing an exoskeleton may not be for everyone, but the people most motivated to overcome the learning curve probably already have experience with a musculoskeletal disorder, such as back pain or other types of joint pain.

"We hope to publish our findings and make some recommendations for farmers about what it's useful for, what type of differences you can expect from it and then producers themselves can weigh that against the cost of the device," she said.

Farmers interesting in participating should contact Trask at catherine.trask@usask.ca, at 306-966-5544 or ornwipa.thamsuwan@usask.ca, 306-966-6519.

Yuka Sudo grows about 60 varieties of mostly Asian vegetables. She examines a Japanese eggplant which is smaller and more tender than the traditional varieties.

Engineering success with Asian vegetables

B.C. family raise 60 varieties of vegetables delivered to communities in Vancouver area

SURREY, B.C. — There are more people who want to farm than there is farmland available in the Lower Mainland of British Columbia.

Yuka Sudo considers herself to be one of the lucky ones because she was able to secure a five year lease on a patch of land at Surrey.

Working with the Young Agrarian program, she was matched up with a landowner who wanted the property farmed and she wanted to grow Asian vegetables.

She worked as a civil engineer for 10 years but wanted a change.

"It happened when my kids were born. Your perspective changes and having to work a nine to five job and put the kids in daycare, you are wondering if you are doing any good for the world and them," she said. "I was just trying to figure out what was best for me and the kids."

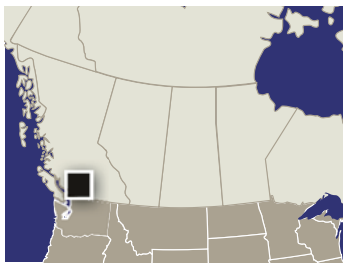
With moral support from her husband, a software developer, she has become a farmer from March to October and returns to her engineering job in the winter months.

"We have an agreement that we get to do one crazy career move and we just have to make sure it is staggered," she said.

She studied sustainable agriculture at the University of British Columbia. She is not organic but attempts to follow sustainable principles.

The young agrarian program is a compromise for her because she knows owning farmland in the Lower Mainland is out of reach.

ON THE FARM



YUKA SUDO
Surrey, B.C.

"It is frustrating. My husband and I work two well-paying jobs and we can't afford a farm, which is crazy I think."

She is in a slightly better situation at this point in her life because she had some cash and was already established with a career that can provide off-farm income.

"That is not true for most young farmers. They are farming in their 20s and they don't have any cash," she said.

"Unless the farm is in the family already it is nearly impossible to get a mortgage."

Ironically, Vancouverites want fresh, local food but the city and surrounding communities continue to convert land for urban development.

"I think it is a disconnect where they just don't realize," she said.

Her land is protected within the agricultural land reserve and with her farming it, her landlord receives a considerable tax benefit.

She starts plants like kale and tomatoes in her Port Moody home and work begins in March or April when the fields are ready. May is full production and she should complete harvest at the end of the October.

She has high intensity plantings of mixed vegetables on about three quarters of an acre. She is growing mostly Asian vegetables and for 16 weeks delivers produce for a community shared agriculture project in Chinatown in Vancouver. She has 30 customers and also supplies two Asian grocers.

Her delivery program is through the Choi project funded by the Hua Foundation to promote nutritious, local food for Chinatown.

"The focus is especially on younger generations that may have been born here and don't have ties to the Chinese culture," she said.

The foundation provides a coordinator funded by a Canada Works grant to help her with the CSA membership, sends email reminders and lends a hand bundling up the weekly shares of six to seven products with an emphasis on choi, that is Chinese leafy greens. For variety she adds onions, tomatoes, eggplant, garlic or whatever else is ripe that week.

She cleans and washes the vegetables and takes it to town in totes. She is trying to encourage people to go plastic free so they can bring their own bags or plastic containers.

This year she has 60 different varieties of vegetables and staggered plantings every two weeks to keep fresh produce available. A computer app tells her when to plant and keep track of rotations.

This year's crop includes popcorn, tomatoes, squash, Japanese eggplant and cucumbers, edible chrysanthemums, a variety of Chinese greens, beans, kale, peppers, onions, melons and squash.

She use drip irrigation and most is grown outdoors with plastic and fabric covers.

Weeds and wireworms are the bane of her existence as well as the unpredictability of weather. While this area has rainy winters, the summers are typically hot and dry. This year there has been more rain than normal and some of her crops are behind.

Her children are five and seven and like to help along with her husband and some friends who can occasionally lend a hand with the heavy lifting, but otherwise this is a one woman show. Her plan is to take on a business partner next year so she doesn't have to be there seven days a week and relieve her of some of the workload.

"Farming by yourself is really challenging because you have to be there every day," she said.

"There are just things that need to be done," she said.

"I knew that was always going to be an issue so that is why I started small," she said.

Next year she plans to expand by cultivating more land and stepping up production while she continues to learn about effective insect control, preventing coyotes from chewing her irrigation lines and figuring out which crops are most successful on her little patch of land.