HERgonomically Correct Tools: Cultivating a Paradigm Shift in the Marketplace

March 6, 2015

Liz Brensinger and Ann Adams pose with their Green Heron Tools HERShovel. *Photo courtesy Christine Adams*

Some people fear innovation, others dig right into the dirty, underbelly of entrepreneurship, searching for a way to grow their idea, cultivate their brand and, if lucky, mobilize a movement. The women behind Green Heron Tools, out of New Tripoli, Pa., do all of those things -- in spades. Pun *intended*. They applied public health, grant writing and farming backgrounds to a finicky problem plaguing many female gardeners – the lack of ergonomically correct tools.

Prior to Green Heron Tools, women were encouraged to fill in the gender gap with

pink-handled shovels, or spades made significantly smaller than ones peddled to men. Tools marketed toward women didn't fit their hands or the needs of their bodies.But why should one care? Is there really a difference between the reigning outlay of unisex products adorning hardware stores and the ones designed by Green Heron Tools' Ann Adams and Liz Brensinger?

Yes.

The basic utilitarian instruments pushed on the public for years have the ability to throw out backs, cause overexertion, and slowly and surely destroy bodies. *That goes for both genders, by the way*. Tools aren't held to overly high standards. There are no mandates, there are no guidelines. Tools are simply made and marketed to the masses without much oversight. And until Adams and Brensinger tried their hands at innovation, tools hadn't evolved much in the past century.

"It's not really spoken about," says Penn State University College of Agricultural Economics, Sociology and Education Program Associate Patty Neiner, referring to farm-related injury. "I have talked with some other people, I think with women – and probably with men too – but, with women they're already trying to do something that is generally considered a male job so they're not going to complain if their body is hurting, or because they don't want to be seen as, 'You can't do this.' The other thing is that they don't really value the health of their body. They put other people before their own health. If they have workers working for them, they're more concerned if those people get injured versus themselves. But the other part of it is – with tools, and this is for everybody, not just farmers – we've allowed people that make these things to tell us what they're supposed to be like. We've never even questioned whether a tool was designed for a female body compared to a male body. I never even considered it before I met Ann [Adams] and Liz [Brensinger]."

Essentially, Green Heron Tools blossomed from necessity. Prior to inventing, Adams and Brensinger started Green Heron Farms to supply organic and heirloom produce to restaurants and markets. They saw a need for better tools, carried over the Green Heron name, and in a

Female farmers, such as Erin McKinney, volunteered their time to test products with development team members like Penn State University engineering doctoral candidate Jesun Hwang. ***Photo courtesy Christine Adams***

serendipitous turn of events, learned green herons are some of the only birds capable of using tools. Brensinger says that synchronicity further fueled their desire to make good farming and farmed goods tangible to those who sought them.

“It was a synergy of lots of different things,” says Brensinger. “We saw something that, to us, was incredibly obvious, that had been missed by apparently all the other tool companies in the world. We had this fairly unusual combo of public health and nursing, and so we understood some of the connections between tools and health, and that made the situation
really obvious to us.”

Few people realize the impact tools have on their health. But the threat is there. In fact, conferences are built around musculoskeletal disorders that arise from improperly designed tools or inaccurate tool use. Still, most professional and amateur farmers are unaware of the risks until it’s too late.

“Clincally I saw so many injured people – I saw them after the fact and I’d have to fix them – so my interest in going back to get my PhD is to try to prevent those injuries by focusing on the job site,” says chiropractor, University of

Oregon Assistant Research Professor, and ergonomic consultant to Green Heron Tools Jennifer Hess.

As a five-foot-three, 113-pound gardener, Hess appreciates the difficulties women suffer through when trying to find tools that fit their body types. As an ergonomist, she identified with risk factors such as the demands of bending over all day while using a tiller, awkward postures and high forces that when completed day in and day out, lead to cumulative trauma damages. Essentially, a build-up of wear and tear on your body.

With so many data sets and so much proof that women suffer from poorly designed tools, why hasn't anyone done anything so far?

That's easy. *Man*ufacturers.

Ergonomist Jennifer Hess takes measurements while Green Heron Tools co-founder Ann Adams runs a tiller prototype. ***Photo courtesy of Liz Brensinger***

When starting out down the primrose path of patents, the Green Heron Girls decided

they needed to better understand the landscape of the situation, and searched out experts in the field. They were put in touch with a professor from a prominent unnamed western university. Adams says they rattled off the anthropometric data and explained why most tools did not work well for women.

“At the end of two hours he said, ‘I don’t really think I can help you because I really don’t see the point, I don’t see the need.’”

That stinging admission was enough to spur on the already frenzied movement of Green Heron Tools’ ergonomically correct tool design. But Adams and Brensinger had a variety of windmills to tilt at. They weren’t just fighting existing methodologies, the marketplace or gender indifference – they were fighting non-questioned acceptance. Although the majority of gardeners and farmers in North America are incorrectly using their tools, or using tools altogether wrong for their body type, no one knows the difference. Add to that the fact that like ‘organic’ once was, the word ‘ergonomic’ is not regulated. Manufacturers can slap the word upon their labels and hopeful buyers are none the wiser. And, in general, the point is moot anyway.

“Even when there are ergonomic tools, people don’t know anything about ergonomics,” says Hess. “I see this all the time and there are lots of office ergonomic fixes out there, and yet you’ll see even a medical office will remodel and put in poorly designed work stations. I don’t think the public knows enough about ergonomics to think about choosing ergonomic innovation. With farming, the tools just didn’t exist. And with that – women, Hispanics – tend to be smaller workers and there’s not tools for those at all.”

Grant a Wish, Fund a Movement

Properly designed tools have the ability to make not just healthy, but also sociological impacts. Hess points out that tools fitted for different body types enables more people to work in safer environments. Proper tools help shape the ability to work more efficiently, incur less bodily injury, which in turn means less time is devoted to healing injuries. More time in the field could mean more produce and more profit.The agricultural community could potentially allocate less time and money toward injury, as a result of using ergonomically designed tools.

“Ergonomics is about fitting the work to the worker, it’s that simple, develop tools that fit the worker,” says Hess. “We’re working longer, so it’s important to minimize the wear and tear [on our bodies] any way we can.”

Neiner has helplessly watched people work with unsafe tools for years. In addition to her work at Penn State University, she helps run the Pennsylvania Women's Agricultural Network. Neiner has professionally and personally witnessed her share of farm-related injuries. When moving 80-pound feed bags, she suffered a herniated disc. And her shorter-in-stature partner incurs leg problems due to stretching stressors that occur while running the tractor.

The safety element of Green Heron Tools' ergonomic designs is what pushed the duo's Small Business Innovation Research (SBIR) grant application to the top of the stack. Adams and Brensinger appealed to the forces who fulfill backing on behalf of the SBIR grant fronted by the United States Department of Agriculture (USDA) and the National Institute of Food and Agriculture (NIFA). The proposal for the HERShovel™ caught their attention and Phase I of the grant process was enacted.

"We're looking for innovative ideas, so the first thing is a project focused on an important problem – does it have good scientific technical merit," says SBIR National Program Leader, USDA/NIFA Charles Cleland. "So, in their case they were looking at the issue of farmer safety for women farmers -- and not just for women farmers -- but that was the stated purpose. They had good collaboration with folks from Penn State and it added sufficient merit to the proposal, as submitted, that it was of interest to us. Farm safety is an issue that's important, but we don't get many proposals that deal with farm safety, so it stood out in that sense."

Agricultural engineer Aaron Yoder, with Ann Adams and Liz Brensinger, was the only engineer involved in both Green Heron Tools grant projects.
Photo courtesy Christine Adams

According to Cleland, the USDA-specific program is a tech transfer program that supports innovative applied research and development projects that deal with some aspect of agriculture or rural development. The aim is to move technologies out of the laboratory and into the marketplace with applied R&D support. Green Heron Tools meshed with those ideals and requirements, and were one of few companies to commercialize while still in Phase I of a multiphase process.

“The fact that we commercialized a tool based on a Phase I grant is highly unusual,” says Brensinger. “Basically, Phase I grants just lay the ground for Phase II. What we learned is that apparently a lot of companies get a lot of grants and don’t necessarily commercialize. I think we are a success story, working on the needs of women farmers.”

Hess – who has her own HERShovel™ – celebrates their drive and touts their ability to work within the confines of public and private arenas. She cites the blend as a key ingredient for their success, noting that many would-be entrepreneurs don’t know about grants, and certainly don’t take advantage of them.

“It is still in the ether, it’s not just women, it’s people in general who don’t know

about these grants," says Hess. "Especially for entrepreneurs, you have to be a pretty innovative entrepreneur to get out there and find out about them. What's neat about Green Heron [Tools] – they're doing kind of a public-private grant innovation. Sometimes innovations don't get out into the public eye. To get that collaboration between public and private – get that tool to market – public research funds help it and that's key and pretty innovative. We've got to get more private companies involved. Just that they're [Green Heron Tools] thinking about ergonomic tools, not just smaller tools, they're so far ahead of the game."

Farming Ideas, Harvesting Feedback

The ability to locate experts, test hypotheses and tap others for insight helped pave the way for Green Heron Tools' success. As mentioned, many people apply for grants. That doesn't necessarily mean the public will ever see a finished product. Sometimes funding dwindles, other times momentum withers on the vine. It's generally a long process from inception to commercialization, but with the right people, Green Heron Tools was able to quickly develop a change-making tool that halted business as usual.

The seed of innovation quickly germinated when Adams and Brensinger met Rod Thompson at a farmers market. He stopped by their table. They learned he had a master's degree in mechanical engineering and quizzed him on the feasibility of crafting a tool designed for women. According to Adams, Thompson said it was extremely doable and his affirmation was the impetus they needed to believe they could achieve their goal. They raked up their courage and forged ahead, applying for the grant, cultivating contacts, and running data sets.

They sought advice from experts such as Penn State University Mechanical Engineering Professor Joe Sommer and Penn State University Department of Agricultural and Biological Engineering Instructor Aaron Yoder. Penn State University engineering doctoral candiate Jesun Hwang ran their analysis as part of his dissertation. They also approached Penn State University Industrial Engineering Professor Andris Freivalds to assist with development of a spade-and-shovel combination made for female produce farmers -- now known as HERShovel™. Freivalds had previous shovel design experience and accepted the challenge.

Adams says they conducted online surveys for female farmers, and videotaped women shoveling. Both helped them identify how to proceed with the design process. The diverse team of inventors, mechanical engineers and farmers was able to pore over results and design around wants and needs.

“The idea was to have one combination tool that could dig, penetrate turf and soil like a spade, and also move soil like a shovel,” says Freivalds. “Also, the length was anthropometrically determined to be optimized between short- and long-handled shovels and spades – long-handled being more efficient for leverage and short-handled being more efficient in close quarters [such as] bushes. The blade was given a wider step so that women, who typically have weaker upper body strength, could press more easily with the foot and the handle was wider than a typical D-handle, so that women could use
both hands on the handle, again to allow both shoulders to push down.”

Neiner participated in the testing group that sampled the shovel prototypes. Outfitted with a mask to measure oxygen and carbon dioxide exchange, she was amazed at how differently her body reacted to various shovels.

“There were three different shovels we were working with, with a few different handles,” says Neiner. “That, for me, was an education, because I just figured all tools were basically the same and it was interesting to feel the difference on my back and arms with using different styles of shovels.”

The in-field testing surprised the avid farmer. The mask ironically unveiled her workhorse habits. Neiner says she never realized how hard she breathed while shoveling until she heard her breath in the mask. She now focuses on correctly positioning herself so she’s not huffing and puffing. Stance and use are prime aspects to ergonomically correct gardening, and pertinent advice is offered free-of-charge on the Green Heron Tools website. The value-add advice comes courtesy of Adams and Brensinger, and their firm belief that a tool is only as effective as the person wielding it. Unlike other companies that churn out goods and let consumers fend for themselves, Green Heron Tools realizes it’s a holistic process.

Once the HERgonomic® shovel was on its way, the ladies carved out a new path – reimagining the tiller. With help from inventor Bobby Wrye, and another multitalented team, Adams and Brensinger were once again on the road toward success. Currently in Phase II, the battery-operated, lightweight tiller is undergoing more trials.

Ergonomic consultant Jennifer Hess, inventor Bob Wrye and mechanical engineer Joe Sommer visit The Tiller Testing Ground in Phillipsburg, Pa. ***Photo courtesy Liz Brensinger***

Hess lauds the tiller and its abilities to work for various types of people, although specifically tailored to women who are smaller and not as muscular as men. She obliged a request to test and hooked up a force gauge to measure pushing and pulling forces. She also took body measurements, looked at angles, and used a Rapid Entire Body Assessment (REBA) tool to measure, among a litany of things, body posture. Bodily effects are recorded, scores added up, and validated results show whether a tool is low, medium or high risk.

"I was looking at forces on the bodies, forces to actually hold the tiller, keep it from tipping over, pushing pull forces, and looking at body posture – wrist, shoulder, back and neck – to make sure designs looked at the interface
between the tiller and the operator," says Hess. "They really did their homework, it was really just a matter of tweaking."

When Neiner participated in field trials, she was excited about how little energy she exerted and how gentle it tilled. Other testers enjoy the fact that it runs off a battery, and still others like the fact that it's a fairly simple construct that is easy to maintain.

Sowing the Seeds of Change

Cleland marvels over the pair's shovel success, and looks forward to completion and commercialization of the tiller. He heralds the fact that, although they were not trained engineers or product designers, they found a chasm that needed filled and found the people who could help them close up the knowledge gaps. Equally heartening was their ability to inspire next-generation engineers, and their use of female farmers and engineering students who, throughout the process, advised and participated in trials.

"We need enhanced focus on STEM education with all young people, but particularly with girls because they tend not to go into those areas as much as boys do, and they're just as good at it," says Cleland. "The pipeline of entrepreneurs gets fed originally from our educational system in this country, and we're not doing nearly enough of a good job as we should in teaching young people the importance of engineering – that it can be rewarding and fun. And I worry about the general level of scientific illiteracy that we see in this country. There really is a strong current of opinion in this country
that is questioning the validity of scientific opinions and so on, and this is largely based on ignorance and prejudice. These are obviously the people not coming to this program. We need to start at an earlier age and help young people get excited about these disciplines, and they will get excited if it's properly presented to them."

Hess echoes his sentiments, and states women and girls interested in STEM need more mentors. They also need to see success stories that show women can do more than dream about making impacts.

Hess applauds their creations, and points out you don't have to be an engineer to have a good idea. But you do need creativity, determination, and the ability to locate inventors and engineers who can help transform that idea into a
reality. By having the audacity to design, they've cleared the path for future female inventors and might have inspired a burgeoning crop of STEM careerists.

"I think first and foremost we need role models, and that's what these guys are doing," says Hess. "We're better collaborators, better team workers, better at seeing the big picture. We listen better. I think we need to promote women,
and it needs to be done at all levels."

PA Women's Agricultural Network member and Green Heron Tools volunteer Patty Neiner utilizes a mask to measure the oxygen-carbon dioxide exchange during shovel use. ***Photo courtesy Christine Adams***

Adams and Brensinger are currently on their third project – rolling out the HERSpadingfork™ for HERgonomic®Spading fork, based off the same research used for the HERShovel™. While wrapping up the beta phase of tiller development, they applied for another grant that would enable them to research tool and equipment needs of female farmers who raise animals. They haven't yet heard if the grant has been awarded.

There is no such thing as down time for this duo. They run an online tool emporium, rife with their own products and the ergonomically correct tools of others. When they're not researching or testing or applying for grants, they monitor production of their wares. The HERShovel™ is made entirely in Pennsylvania. The majority of the digging fork is comprised of parts made in Ohio and Pennsylvania, however it's a little harder to check up on the tine manufacturing. That occurs in Austria.

Adams says they're proud to produce most of their tools in the United States, and acknowledges that as a small business, they rely on manufacturers, as it was not feasible to set up their own production facility. The same thought process was used for their online tool shop. With one tool in the marketplace and two waiting in the wings, they refused to let other female farmers twist in the wind. They did their

research, found formidable partners, and carry ergonomically correct tools distributed by CobraHead and GrowTech.

“Remaining open to unexpected opportunities is incredibly important,” says Brensinger. “I never would have expected that I would have a tool company, nowhere in my consciousness, even 15 years ago. I started out as a journalist, then got a masters in public health. I think people who have this very focused idea of how they’re going to ‘make it happen’ run the risk of missing out on these sorts of serendipitous opportunities. You can’t let other people tell you what you can’t do. We had worked for however many years in public health and nonprofits and most of the people we worked with were other
women, and we moved into this very man’s world. There are any number of points along our path where we said this is just ridiculous. But there was this passion, and that belief that the world needed what we were doing. That helps -- this motivation -- get past getting discouraged, because you’re working for a greater good.”