

FarmBot – like a 3-D Printer for Your Garden that can Grow Vegetables in an Efficient Automated Way



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CEOCFO: *Mr. Aronson, what is FarmBot?*

Mr. Aronson: FarmBot is like a 3-D printer for your garden. Imagine a machine that goes on top of your typical raised garden bed - five ft. wide, ten ft. long, and this machine will move back-and-forth, left to right, up and down. It plants seed, waters, and takes photos to figure out where the weeds are. It has a built-in weed whacker to remove the weeds. It has a soil sensor to measure soil properties so it can grow your vegetables in an efficient and more automated way. All of this is controlled from your phone from anywhere in the world.

You can either login and just check on how your plants are doing or you can set it on autopilot and go out of town for the weekend, come back and you can rest assured that the garden is taken care of and the machine has everything under control. Fast-forward two months and the FarmBot will email you when the plants are ripe and then you can go out and enjoy the fresh food that was grown right in your backyard, under your control, and with few resources.

CEOCFO: *What were some of the challenges in creating this piece of equipment?*

Mr. Aronson: It is a brand-new technology. There are products on the market that are related, such as hydroponic setups, little greenhouses for the home, etc. Those are all related in that they help everyday people grow food at home, but those products do not do things the way we do. We have taken a lot from the 3-D printer world and the CNC (Computerized Numerical Control) equipment world and we have brought it out into the backyard. That required making these machines rainproof so they can be outside in the sun and the rain and the snow and still function reliably season after season.

We try to take your standard gardening tools like a weed whacker, a soil moisture sensor, and we have had to miniaturize them and put all that functionality into the tool head so that the FarmBot can move throughout the garden and do all the tasks needed to successfully grow the plants. It has been a combination of designing this equipment to be suitable for the outdoors and packing in as many features and functions as we can within a price range that makes sense for people.

CEOCFO: *Are there certain items that could be planted? Are there perhaps 20 kinds of seeds that would work in this situation? Or, is it almost limitless; what are the choices?*

Mr. Aronson: It is almost limitless in the sense that our users are free to do anything they want with the hardware and software. It is not just a carrot-growing machine, it is not just a broccoli-growing machine, it is a general purpose farming robot that can be configured to grow anything you want, in any way you want. We have customers that grow

mushrooms, who are growing coral reef, as well as - of course - your standard garden vegetables such as leafy greens and radishes. We have customers who grow flowers and fruit trees until they are up to 12 inches tall and then they remove them from the FarmBot to transplant them into the field.

The one limitation is that the FarmBot is only five ft. tall, so it cannot grow really tall plants unless you are going to transplant them. Sunflowers or corn are trickier to do with the FarmBot, but pretty much everything else as long as it is under five ft. tall, you can grow with the FarmBot - Tomatoes, Onions, Arugula, Bok Choy, all of the common garden vegetables that you will see seeds for in your local nursery or big box hardware store, all of that is compatible with the FarmBot. We let our customers decide what they want to grow and how they want to grow it.



CEOCFO: *Is the premise that enough people want the fresh vegetables or fresh flowers but do not want to put their hands in the dirt?*

Mr. Aronson: That is exactly the premise. One hundred years ago, over half of the nation was involved one way or another in agriculture, whether it was people who were full time farmers or a family just growing a victory garden. People were connected to the soil, to the weather patterns, and to the plants that were sustaining them and their families. These days, people have all sorts of other interests and they are busy. People go out of town and they come back and the garden has died. They get busy with work, with picking up the kids from soccer, and other hobbies and passions, and then the weeds take over.

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Many people have tried to grow gardens before and unless gardening is your passion and the way that you want to spend a lot of your free time, you are probably not going to be successful. If you look around, most people just do not have a garden. They do not grow food at home and they are very disconnected from the food production process because they are busy doing other things. They just do not find gardening to be a passion of theirs that they are willing to put their energy towards. We see FarmBot as a tool that can automate that process and allow them to have the benefit of fresh vegetables growing right in their backyard without having to make it a chore.

CEOCFO: *Is there more than one model of the FarmBot?*

Mr. Aronson: We have four different models. Two of them are in the FarmBot Genesis line, which are our top-of-the-line, more advanced FarmBot kits. They feature all the bells and whistles, the most amount of features and functions. Those machines are good for our prosumer customers - the type of people who want to go all-out with their home automation and have the best of the best technology. Those machines are a little more advanced and a little more expensive. We have two sizes, a small and an extra-large. The small one is 5x10 ft. wide and the larger one is four times the size, 10x20 ft. in area.

Then we have our FarmBot Express line, also with a small and extra-large sized kit. Those machines are for the user who is a little more conscious of their budget and wants a FarmBot that is a little more plug-and-play. You plug it in, hook up your hose, then connect it to our web app and it is pretty much ready to go. The FarmBot Express models come 95% preassembled in the box, so the setup just takes about one hour. The tradeoff there is that it has a smaller feature set, so it does not have the soil moisture sensor and the weeding capability is more limited. If you just want to get up and running on a budget, that is the machine for you.



CEOCFO: *How long has FarmBot been available?*

Mr. Aronson: We incorporated as a company in 2016 and we first launched our product with a crowd-funding campaign in July of that year. We made a cool video at the time showing the FarmBot growing plants with these amazing time-lapse video sections showing the growth over a two-month period, and the video just went totally viral. We had a lot of people talking about and sharing our video online. We actually did over a million dollars in sales in our first year in business so it was a smash hit success. It was just unlike anything anyone had seen before. We then started shipping our first kits to customers in early 2017.

CEOCFO: *What has changed since the first FarmBot; what have you learned from customer feedback?*

Mr. Aronson: So many things have become dramatically better. The first FarmBot that we shipped to customers were just one or two steps above a garage prototype. We were a brand-new company with a completely novel technology. We started literally in our garages making prototypes and when we were ready to launch the products, the version that we showed in our videos was that garage prototype. We pre-sold a bunch of kits and with that funding were able to manufacture the FarmBots at scale and that is when we started turning it into more of that consumer product, a product that is polished and streamlined and refined and something that you would expect when you open up a box from a company. The first version of the FarmBot that we shipped in 2017 was just a couple steps away from the prototype.

Fast-forward five or six years and we have gone so many more steps away from that prototype towards that consumer product. Now when you open up the box, we have custom electronics that are tailor-made for the FarmBot. All of the plastic parts are nice quality and have a great surface finish. All of the screws and nuts and bolts and small parts have been sourced and/or custom made exactly for the FarmBot, and so it is a much more refined, polished product, where everything fits cohesively into the end product - a farming robot for the outdoors. Early on, it was much closer to a prototype - cobbled together from things readily available, and now it is much more custom and made for its purpose.

CEOCFO: *What about maintenance and service if there is a problem; how is that handled?*

Mr. Aronson: The FarmBot does require a little bit of maintenance like anything you would put in your backyard. The biggest thing that we find is every once in a while, a plant will grow in an unexpected way and it might interfere with the machine. Most plants like onions, carrots, and leafy greens are going to grow in an expected, determinant way, and those are never a problem. It is the plants such as squash and some varieties of tomatoes that grow all over the place and if they grow into the machine, it can cause the machine to jam up. When that happens, the software is smart enough to recognize that the FarmBot is unable to move and it can send the user a notification telling them there is something

wrong with their FarmBot and that it is stopped for more than ten minutes, so they should check on it. That is the most common pitfall of the FarmBot.

Every once in a while a part may malfunction or need to be replaced and we just get in touch with the customer and send them a replacement part, which is often done free of charge.

CEOCFO: *Would you tell us about schools using FarmBot?*

Mr. Aronson: FarmBot in education has been a surprisingly large customer vertical for us, a large market. When we first started, we always thought this would be cool and fun in an educational setting, but we did not expect for 50% or 60% of our revenue to come from the education sector. That did not happen right away, it took a couple of years, but over the last five or six years of being in business, more and more of our revenue has come from the education sector.

At K-12 levels, FarmBot is an amazing teaching tool. Teachers all over the United States use it in over 500 educational institutions to teach robotics, agriculture, electronics, coding, soil science, nutrition, plant biology, climate science - you name it. What is cool is that the students love it too. It is one thing to hear about robotics, computer science, soil, nutrition and stuff like that in a theoretical sense, but it is another thing to have a robot in front of you that you can program, press a button, and have it do something that you can see in real-time. Then give it two months and it will grow something that you can eat. That is powerful.

Education these days has a huge focus on STEM (Science, Technology, Engineering and Math) learning, and the FarmBot is really great at synthesizing these different areas of study. So at the K-12 level, teachers love it and students love it and it is just an engaging teaching tool that touches on a huge variety of subjects. Many jobs these days require cross-disciplinary learning and knowledge to excel, and the FarmBot captures all of that learning into one fun engaging device.

At the university level, FarmBot is more of a research tool. Students who are studying bioengineering or agriculture or soil science can use the FarmBot to run an experiment. Running an experiment typically requires the operator to do a specific set of tasks over and over again in a precise way, and that is prone to human error. People get bored, they get lazy, they are forgetful, and if they are supposed to do the same thing over and over again a hundred times, they are going to make mistakes along the way. FarmBot does not make mistakes, it is computer controlled and once you set it up it will run your experiment exactly how you programmed it to run the experiment. You can go off and either set up another experiment, analyze the data, or do other parts of research that are not tedious, repetitive, and laborious tasks.

The FarmBot is useful for any experiment at the R&D stage in universities, anything from testing new fertilizers or new genetics, or hardware such as LED growing lights or equipment to create different growing conditions. Maybe you have the FarmBot inside an enclosed environment and you are running different climate simulations; it is really well suited for stuff like that.

CEOCFO: *What does 2023 look like for FarmBot?*

Mr. Aronson: A big focus this year will be on maintaining inventory levels. With the supply-chain crisis that affected the whole world the last year and a half or so, we learned that we have to be ahead of the curve when it comes to maintaining inventory. When we do not have our product in stock, that is a big dampener on sales. If you do not have something on the shelves and ready to ship, you are not going to sell it - that was the hard lesson we learned because we were not able to maintain inventory through the last year.

Other than that, 2023 will be about streamlining our business and our product so that it is easier to use, more reliable, and more capable than ever. From day 1 we have always been working towards a vision of FarmBot as a home appliance, and this year will be no different.

And finally, we want to continue striving to provide an awesome customer experience for everyone - from the moment somebody first learns about FarmBot to the moment they are eating their first salad.