Fermentation can be a finicky business, depending on where you look. Large scale production of koji for the creation of miso, sake, and soy sauce has existed for centuries in countries such as China and Japan, who have vastly ramped up production due to technological improvemets over the past few decades. The opposite end of the fermentation spectrum, i.e. the small-scale production, is a wholely different story.

The ability to track and control small-batch fermentations has not been historically available at a scale useful for independent kitchens, nor have standardized guidelines been established about the various fermentation processes. A collaboration between the Basque Culinary Center and MIT Media Lab’s Open Agriculture Initiative, “The Fermentabot”, hopes to combine the worlds of food upcycling and fermentation with engineering, control systems, and data collection.

In basic terms, the Fermentabot minutely adjusts temperature and humidity levels, (as well as PH, oxygen and carbon dioxide in future iterations), monitors how ingredients react to specific environments, and adjusts the controls based on a pre-programmed recipe. Small variations in temperature and humidity can drastically affect enzyme levels during fermentation, and gathering data of the process proves incredibly useful to make food production more reliable, consistent, and resource-efficient without sacrificing flavor. Imagine re-using your kitchen’s food scraps to grow more food, at the touch of a button – this is one of the main intentions for the Fermentabot.

This project has been lightheartedly called a “very fancy sort of oven” by Diego Prado, an Associate Professor at Basque Culinary Center, and he isn’t too far off the mark. The Fermentabot was designed to utilize as many off-the-shelf components as possible, including heaters, fans, humidifiers, nuts and bolts, catering trays, all attached and integrated into an insulated food pan carrier. Mechanical, electrical, and software engineers designed the housings, fluidic systems, printed circuit boards, and wiring. The custom designed components were laser cut and assembled in Open Ag’s fabrication facility in Middleton, MA. While not everyone may have access to laser cutters or maker spaces, there are ample opportunities for the fermentation-loving communities to innovate and find easier and cheaper ways of building their own personalized Fermentabots.

The Fermentabot can potentially have a large impact on the way individuals make food. So far, small scale fermentation has been mostly manual process, with no documented engineering efforts involved in improving the efficiency, output, or factors that affect spore growth. The Fermentabot allows monitoring of the fermentation process, and has the potential to provide feedback to the chefs and educators, both professional and recreational.

One of Open Ag’s better known projects is the PFC\_EDU, a “Personal Food Computer.” Similar to the Fermentabot, it is a controlled environment agriculture technology platform that uses robotic systems to control and monitor climate, energy, and plant growth inside its specialized growing chamber. This project gave the lab the opportunity to collaborate with the OpenAg community, especially educators working in both informal and formal education settings (e.g. libraries, schools, museums), and to get rapid user feedback for future design improvements. It can be built, used, modified and hacked by the community for any number of applications. The Fermentabot projects hopes to follow in the PFC\_EDU’s footsteps to inspire current and new communities interested in technological development and culinary innovation.

Similar to the rest of the Open Agriculture Initiative’s projects, the Fermentabot design, build instructions, bill of materials, and collected data are all open source and available online for free. Instead of buying fermented products, people can make them at home, thus democratizing fermentation. Once the Fermentabot becomes a standardized and commonly used tool, the trickle-down effects poise to be impactful.

Down the road, transportaion costs can be reduced, since the ingredients can be sourced locally. Non-technical indivuduals can use climate recipes uploaded by other Fermentabot users and can create new recipes by using the web brower-based user interface. This way, identical koji batches can be grown and reproduced all over the world. And this is just the tip of the iceburg. There’s no telling what sort of innovations the Fermentabot and the world-wide fermentation-loving communities will think up.

[**https://techtrends.tech/tech-trends/how-hacking-can-be-delicious/**](https://techtrends.tech/tech-trends/how-hacking-can-be-delicious/)

[**https://forum.openag.media.mit.edu/t/fermentabot-2017/2222**](https://forum.openag.media.mit.edu/t/fermentabot-2017/2222)