

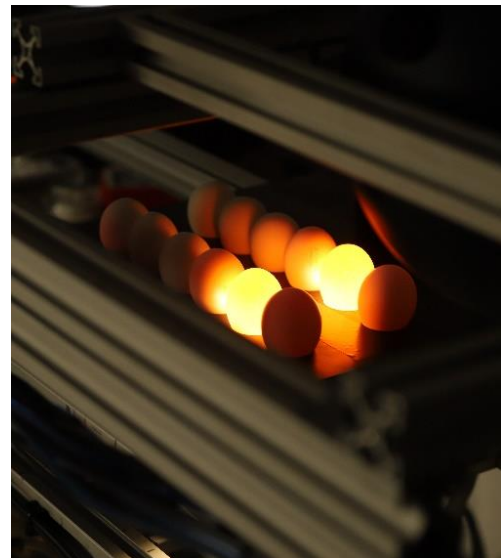
CAAIN 2020CORE006

Optimizing Hyper-Eye: An Integrated Solution for Assessment of Fertility and Gender of Pre-Incubated Eggs

Born and raised in Nigeria, Dr. Michael Ngadi, CEO of Montreal’s MatrixSpec Solutions Inc., came to this country in 1991 on a Government of Canada scholarship to pursue graduate degrees in engineering at the Technical University of Nova Scotia in Halifax. Upon graduation, he joined McGill University as an associate professor of food engineering. Twenty-five years later, he is a James McGill Professor (equivalent to a Tier 1 Canada Research Chair) with an impressive list of accomplishments, making him well suited to lead the CAAIN-supported, ground-breaking project, *Optimizing Hyper-Eye: Assessing the Fertility and Gender of Pre-Incubated Eggs*. “I have been very fortunate that my passion for food and desire to improve its quality and safety have been nurtured in an environment that has seen me surrounded by people I love, admire, and respect,” he says. “That has given me the freedom to engage in fascinating research such as the Hyper-Eye initiative.”

Dr. Ngadi explains that when he started this work in 2008, hyperspectral imaging was predominantly used for military applications and essentially unknown in the agri-food sector. The technology, which captures images from both the visible and invisible light spectrums, including different levels of infrared, is still little used for civilian purposes, making this work all the more exciting for him and his team.

“At the time, we had access to a hyperspectral camera and were using it to conduct non-destructive testing of vegetable quality. Out of sheer curiosity, I wondered if there was any way it could be used to assess the fertility of pre-incubated eggs. Now here we are 15 years later scaling up technology that allows us to assess both gender and fertility.”



He notes that things did not always go smoothly, including a period when the research was shelved before being resurrected with a small grant from the Egg Farmers of Ontario, who recognized its potential to impact the entire industry. Challenges tend to be difficulties that come out of the blue, and one such unexpected roadblock had to do with finding bulbs that provided optimal lighting for photographing the eggs. This is critical because the system involves illuminating the eggs from below, allowing a hyperspectral camera to take pictures from above. If the light is too weak, no images. Similarly, if it’s too strong then the eggs are overexposed, and the camera can’t record the appropriate wavelength. The team scoured the globe for a solution, experimenting unsuccessfully with a range of off-the-shelf options. Eventually they created their own light bulbs, proving yet again that necessity truly is the mother of invention—especially when you have really, really smart people working with you.

Dr. Ngadi smiles when asked what CAAIN’s support has meant. “I can tell you without hesitation that we would not be preparing to scale up testing from 6,000 eggs a day to 10,000. The money we’ve received

has allowed us to hire the exceptional professionals needed to adapt and advance the technology. This was never more important than during the pandemic. We're grateful our submission was chosen because we're on the verge of demonstrating commercial viability." He pauses before concluding, "People need to understand that our success will change the poultry industry globally. Because only female chicks are usable, millions of day-old males must be culled annually in Canada alone. Around the world the number climbs to roughly seven billion a year. The process, while necessary, is emotionally demanding of the workers involved, not to mention costly, wasteful, and bad for the environment. If hyperspectral imaging can be used to determine which eggs should be kept and which should be disposed of before they hatch, the impact will be extraordinary. The savings in time and money alone will be significant, as will the social and environmental improvements. We are very excited by the difference we will make when Hyper-Eye is eventually commercialized. This is a made-in-Canada solution to a global issue, and it wouldn't have been possible without CAAIN."

CAAIN Contribution

\$1,326,888

Total Project Value

\$3,311,152