PROJECT 02 SANDBOX

PROJECT TITLE | **Demonstration of AI/IoT Technology for Sloping Agriculture Land in Small Islands**

COMPANY NAME | **General Incorporated Association Tobishima Citrus Club**

AI and IoT Connect the Island to the Future

One of the major industries of Osaki-Shimojima island in Kure is growing lemons. However, people engaging in agriculture is decreasing and they are aging rapidly too. Opposite to the demand for domestic lemons according to growing popularity, this situation makes it harder to expand production. Tobishima Citrus Club cooperate with Energia Communications and other companies for the demonstration to accumulate detailed data for growing lemons through IoT devices and digitize the "intuition and experience" of the farmers. They also introduce camera drones and agricultural robots to challenge developing new method of cultivating lemons and in the end, forming the future of the island.

A Rising Problem Amongst the Popularity of Hiroshima's Lemons

Osaki-Shimojima, is a beautiful island nestled in the Seto Inland Sea with a population of just around three thousand people. As the first farming location for lemons in Japan, this area is famous for it's citrus, especially Ocho Mikan (which are a type of small orange). Now, this area produces about half of Hiroshima prefecture's overall citrus production, the most of any prefecture in Japan.

"Lemons were produced excessively about ten years ago here, and that caused a big problem for the farmers," explained Toshihiro Hata from Tobishima Citrus Club. Hata is a native of Toyoshima, a neighboring island to Osaki-Shimojima, and opened a pastry shop in the city of Kure when he was twenty nine years old. At the time he had access to a lot of the excess lemons that farmers couldn't sell in stores. Since the citrus fruits still tasted good, he thought it was a shame not to make more use of them. For this reason he decided to start Tobishima Kankitsu Kurabu, whose purpose it is to link the surrounding islands and share useful agricultural information. **"Thanks to this system, farmers were able to share more details about their crops and marketing strategies,"** continued Hata. Sueoka, a member of the project and a sixth generation fruit farmer, even opened his house to them. The group used this location to hold meetings to discuss issues such as the future of the islands and to share information on new lemon based products. **"However, the demand started to surpass the supply."**

According to experts, there are three main reasons for the sudden increase in demand. The first major point is that the island produces organic lemons, and does not coat the fruit in any kind of wax. Due to successful branding of this fact, consumers started to turn to local produce instead of cheaper, imported ones. The second main reason is the aging population, not only in Japan, but on the island itself. Lemons farms have decreased to a third of their number in recent years. Third, the method of production and farming has not changed for over fifty years in the area. The aging population not only affects the number of farms, but the willingness of farmers to embrace new technology and knowhow. Despite this, lemons still have a major impact on the economy, and the future of these farms is an important one. **"I was born on this island, and I knew I had to do something to help,"** remarked Hata. His first course of action was to establish a crowdfunding page for planting seedlings at abandoned farms.

Overcoming Tradition: The Benefits of AI and IoT Technology

Ideal growing conditions for lemon trees is on slopes, where it is sunny and well drained. To successfully raise good lemons, the amount of sunlight, moisture, and pruning must be taken into consideration. While experienced farmers can recognize when their plants need something intuitively, most younger people cannot. As the appeal of big cities continues to rise, more and more people leave suburban areas and move to urban settings. This is one of the biggest challenges facing farmers in smaller cities. Currently, the average age for most farmers is seventy five years old, but due to the decrease in younger populations, farmers have no one to pass on their knowledge to. In addition to that, the physical labor of maintaining the farms is starting to take its toll on the aging. Since most farms are located on slopping hills, the use of machines to aid in picking processes is extremely difficult. With all of this combined, Hata and his team applied to Hiroshima Sandbox, hoping that the use of AI and ICT could help with the situation. Shortly after applying, Energia Communications also joined.

Hiroyuki Takeda, a team manager of business development at Energia Communications said, **"When I met Mr. Hata and Mr. Sueoka, I could instantly feel their passion for lemon farming and wanting to fix the situation. Lemons are usually only successfully cultivated with ample experience and good intuition. If we can use technology to help others gain this knowhow, then we can help increase the number of farmers and overall production. Even beginners will be able to raise lemons and make a living off of their crop."**

Creating a Smart Lemon Farm with Drones

Currently, field tests at select farms are underway. During these tests researchers collect data in regards to temperature, humidity in the air and soil, pH, and sunlight using the newest solar panels. All of this data is collected using LPWA (Low Power Wide Area) technology. The air and ground sensors used in this project are the first of their kind in Japan, and came with a lot of trial and error on the part of the team. However, the situation has been fixed, and a steady stream of correct data is now being collected. In addition to these sensors, drones are being used to survey the farms.

Many new methods are also being tested in this project, the first of which is to try and create a robot to aid in the picking of fruit. This would be an invaluable asset to the already aging farmers. Additional methods include taking a leaf out of oyster farming's book by using bamboo tips in cultivation. Low ground temperatures can prevent lemons from growing properly, but areas using the bamboo seem to show that there was no major decreases in temperature.

On the other side of things, a major hurdle to overcome is having farmers get used to operating and using smartphones. Takeda commented that, **"We are developing applications and interfaces that are easy to use and understand, especially for the elderly. We have to start with the people side of the problem first."**

A Future Dependent on Lemons

"We are not only increasing the production of lemons, but creating a future for this island," says Hata. **"We have planted hundreds of lemon trees, but that's only the beginning. In oder to make this project a success we're going to need thousands, and to increase the number of farmers. Once we can solve these problems, others will follow I think. Our aim is to create an island where people are better off and can live comfortable and healthy lives. If by creating this project we can bring more attention to Osaki-Shimojima, then that is a plus too! I believe lemons have power!"**

●**Tobishima Citrus Club**／①Toshihiro Hata
●**Energia Communications, Inc.**／②Hiroyuki Takeda