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Japan: A Nation Ready for Ag Technologies

Japan. A nation of contradictions. From rocky farmland to thriving cities. From established tradition to modern struggles. They are a nation of humbleness wrapped in the honor of tradition.

Although Japan represents the fifth largest economy in the world, the disasters of 2011 have kept 16% of the population under the poverty line with the average income of urban Japanese families under 2,500,000 yen a year (CIA World Factbook.) Typical families are composed of four people. Most of the income usually comes from a father who works full-time and a mother who works part time. Although urban families do have unrestricted access to super markets and fresh produce, the access comes at high cost. Most Japanese families have inexpensive diets of vegetables, meats, and rice. Yet, over half of a family's income (Around 1,440,000 yen) currently go towards meeting the rising and unstable cost of food (Calculated on average required yen per person a day: www.numbeo.com). These high prices are partially attributed to Japan's import economy and infrastructure as well as the increasing costs required to own any of the low amount of available farmland. Currently, Japan is the highest importing country in the world (60%.) The meat industry comprises 20% of the imports. Soybeans, cooking oils (Canola, Corn, Vegetable and Olive) and maize products make up the remaining 80% (www.USDA.gov.)

Since the earthquake struck the coast of Tohoku in 2011, Japan has seen a multitude of economical and natural disasters including nuclear reactor meltdowns in Fukushima and a devastating tsunami with waves as high as 133 ft which claimed almost 16,000 lives. Due to this, the nation has seen a rise in food prices and a decrease in usable farmland. As much as 8% of the nation's rice fields, Japan's main source of food, have become unusable due to saltwater damage. With Japan already having over 400,000 hectares (1,000,000 acres) in abandoned farmland, the damage struck another blow to the struggling agricultural economy (Hiroshi.) On top of the immediate damage, Japan has also been crippled by the fear of radiation- a lasting effect from the damage to the Fukushima nuclear reactors. Three of the reactors melted down after damage to the cooling system caused radiation levels triple in the area around Fukushima. The main source of damage is from Caesium-137, an unstable isotope that was spread by the wind. This isotope takes up to 30 years to degrade ("Fukushima Accident".) Initially, the parameter instituted by the government and little to no radiation was detected in rice exports. However high levels detected in fields and the spreading cloud from the reactor inspired fear among the populace.

The irradiated land and new fears of crops with high radiation levels has caused Japan to drastically lower production throughout the area around Fukushima (which was a major agricultural area.) This loss has forced an increase in Japan's imports of food to over 60%, placating its fearful citizens. Their fears are not unwarranted. In 2011 a major spike in irradiated beef was detected, with levels exceeding the highest safety ratings allowed by the government. Although the cattle were raised outside of the radiation circle from Fukushima, it was discovered rice straw raised around Fukushima absorbed high levels of radiation and was unwittingly sold to cattle farmers around Japan. Unfortunately, due to the size of the area affected, much of the radiation detection was conducted by volunteers making it nearly impossible to determine the full extent of the damage (Bloomberg.com/Beef-contamination-spreads-in-japan-as-cattle-eat-irradiated-straw.)

From 2003-2013 the Japanese government restricted imports of beef from cattle aged over 20 months of age from countries with recorded incidents of Bovine Spongiform Encephalopathy or Mad Cow Disease

(www.nytimes.com/japan-to-ease-restrictions-on-US-beef.) This restricted Japanese meat imports to only a handful of countries with most cattle slaughtered at 25 months and heavy paperwork required to export beef to Japan, prices rose drastically. Even today, with the ban lifted, cuts of meat in stores can reach as much as \$12. per imported Angus sirloin steak. Prices on Japanese grown beef stand even higher. The same grade of meat can cost around \$20 per steak (Personal interview June, 2014.) Costs include an 8% consumption tax instituted by the government. The high tax rate is currently used to compensate government social welfare programs. Although widely panned by the public, the tax is projected to rise to 10% by October 2015 (www.bbc.com.)

Although lowering the cost of imports and improving its national import/export infrastructure would certainly ease the woes on Japanese families, the main problem lies in its own rural agricultural economy. Traditionally the majority of Japanese jobs and culture were based around some form of farming. Even the Samurai spent most of their time in the fields, only taking up arms on the command of their shogun (www.cityfarmer.com). The Ninja also find their roots in agriculture, with the discipline and tools of Ninjitsu based around the tools and skills learned in agriculture. However in recent times, the Japanese agriculture industry has seen severe losses in interest and pay, with only 1.5 million total farmers. Only 420,000 of them are considered full-time, the rest are mostly part-time rice farmers who are known for badly managing their farms and producing only small amounts of crops. Statistics say that the average Japanese farmer is about 70 years old and farms only around five acres of land. This is very worrying for Japan. If they plan on supporting the ever growing amount of families in urban areas something must change. The industry is in dire need of young willing farmers able to withstand the hardy lifestyle and properly care for crops. However the hard lifestyle and lack of support from the government keeps farming as an unattractive option to the younger generations of Japanese (www.economist.com).

With interest in farming waning and more food needed to support growing families, the demand for groundbreaking agricultural technologies and ideas in Japan has never been higher. Companies have seen this need and are focusing their interests in one major area of the emerging Farm-to-Market infrastructure, known as Urban Agriculture. Urban Agriculture can be defined as the cultivation and processing of agriculture and livestock in urban areas such as towns and cities. Despite being relatively well-known around the world, Urban Agriculture has yet to take a serious hold in Japan. This is likely to change in the near future as fallout from Fukushima and the tsunami forces families to support themselves in unconventional ways. To bolster the appeal of farming to younger generations, a new tactic of supporting women in agriculture has taken root in the Japanese government. This idea has just recently begun to gain support as the majority of farming operations are controlled by men. However change is coming, in 2011 the government released data of showing that over three quarters of new agribusiness startups in Japan were by women. Such a staggering amount suggests a viable future in female agriculture (Kakuchi.) One of the more known businesses started by women is the Yamagata Girls Farm. Started in 2009, they rose in popularity due to the artful use of social media around the business. Customers can interact with the women through Facebook and Twitter, follow news on the farm blog and buy products through their website. The popularity of Yamagata Girls Farm and other startups has galvanized the government into supporting women in agriculture and given encouragement to families and businesses looking to raise crops and support themselves in a more modern 21st century style (Modernfarmer.com).

Although revolutionary ideas have popped up in isolated pockets around Japan, without connecting these pockets to the rest of Japanese farming industry, they will eventually fall into obscurity. To change this would begin with the creation of a government agency responsible for contacting and maintaining records of all farms in Japan. This will make it easier for both urban and rural farms to connect and allow better monitoring of farms that are currently too far removed from the government to provide details regarding their production capabilities. After this, the creation of an agriculture based online network would be instrumental in bolstering the production and transportation of goods from farms to market. Utilizing the internet to connect farms is well suited in Japan as over 85% of the country already utilizes it in some

capacity. Farms encouraged to connect with other will most likely have internet access and are already using it for recreational purposes. Connecting these farms will encourage them to work together in transporting goods and assist each other in times of need.

This notion of tech-savvy entrepreneurial farmers goes against anything ever seen in traditional Japan, as do ideas involving agricultural production done in cities or gardens as a major source of family food income. There are several reasons for this. This begins with the focus on tradition in Japanese agriculture as thousands of years have been spent on refining the techniques and traditions. This is especially prevalent among the rice farming community as they represent the largest most established section of agriculture and wield the most power in the political field. After World War II, farmers came to be represented by cooperatives intended to convey their needs to public official. Yet, the majority of farmers are now part-time and mostly farm rice the focus of cooperatives has involved supporting that demographic instead of encouraging others. The cooperatives have consistently removed opposition to their plans and engineered the removal of laws that would assist in helping agricultural startups and farms. Only recently have cooperatives noticed the danger of stifling new ideas and some have begun to institute programs to assist in new farms (Japantimes.co.com.)

It is regrettable for Japan to forget its roots as an agricultural community and focused on other industries for so long. Although many farming communities are still steeped in tradition, the rest of Japan has ignored their time-honored history in favor of business and technological gains. That is not to say no good came of Japan's shift in priorities. The focus on business elevated Japan to its high placing in the world economy today and constant increases in electronic capacity opens a door to technological integration into farming. With such an economic foundation, now is the time for Japan to support those in other industries while not forgetting to respect their roots. Connecting these facets of farming should begin with rural farms and urban citizens. After Fukushima, radiation fears were greatly magnified and the scope of paranoia spread to encompass genetically modified organisms or GMOs. This could actually help the rural community develop a larger presence in cities and urban communities. Farmers who would market their wares as GMO and radiation free are almost guaranteed to get eager customers and attention from citizens looking for safe foods. Rural farmers could also reach urban farms through marketing their seeds under the same banner. If this were to happen, farmers would need a drastic increase in field monitoring and control to ensure the best produce. To ensure this, companies should look to introducing drones to the rural market. With technological integration so high in Japan the switch to monitoring fields with Wi-Fi enabled drones should be easily accepted. The market on drones has led to many attachments ranging from thermal imaging to pesticide sprayers. With prices on drones lowering every year, the multiple application they can be used for will become more and more appealing.

Ironically, another radical idea to restructure Japan's agricultural foundations actually began in Japanese rice fields thousands of years ago. Japanese rice fields are largely composed of water due to rice being semi-aquatic. Although not based solely upon rice fields, the highly intriguing field of hydroponics is based upon the same principles. Hydroponics is defined as a method of growing plants without soil. This is done by dissolving mineral nutrient solutions into water and suspending seeds in mineral wool, pebbles, or clay pellets (www.wikipedia.org.) Produce grown in hydroponic systems is often superior to that grown in the ground due to the controlled environment and nutrients. With water as the main component of the system, it becomes much easier to transport and monitor than soil based alternatives. Implementing hydroponics in urban environments is actually easier than would be believed. All you need for a simple hydroponic system is a container of water, the supplements and seeds. While there is currently little interest in hydroponics in Japan, encouraging kitchen hydroponic gardens using pop cans, water bottles and other recycled materials may help raise interest. This would not only help the environment but also provide more food in families. Another idea encouraging the use of these systems could revolve around a container system that could connect to the internet for monitoring water and supplement levels. This has become more possible with cheap computer systems and new sensors that can connect with mobile

devices. The allure of technology such as this would pique the interest of busy families who work outside of the house and of young generations used to connecting to everything with their phones or tablets.

The Japanese government has seen the potential of hydroponics and other agricultural technologies. They have also seen the need to encourage agriculture among urban communities and are instituting public programs to inspire potential urban farming families. In 2001, a law was implemented in Tokyo that stated any building over 1,000 square feet that is built in Tokyo must utilize at least 20% of its usable roof space specifically for gardens (www.greenroofs.com.) The design of the law is to provide many benefits in urban areas. One facet of this law has already been demonstrated to the general public through the development of Soradofarms, rentable rooftop gardens, in train stations owned by the East Japan Railway Company. Although currently considered a hobby by many, Soradofarms provide a unique opportunity for urban families as each location is staffed by an experienced gardener and all plots are supplied with seeds and fertilizer. Unfortunately the high cost and small size of a plot keep them out of reach of many families (cleantechnica.com.) If the government were to reduce the rates and increase the size of plots, Soradofarms would become a welcome option for lower income families as even small amounts of produce would provide relief.

The government has also encouraged large businesses and companies to retrofit their existing unused facilities into urban food factories. The electronics company Panasonic has begun major support of this project and is helping develop urban agriculture. They have begun to renovate underused electronics factories to support both traditional and hydroponic vegetable production. Factory employees who previously oversaw computer chip production are now being trained to raise and monitor large amounts of high quality crops such as lettuce and spinach. These factories are an amazing way to see how the stability of tradition meets the possibilities of modern agricultural technologies and brings new opportunities to families in need (wsj.com.) The factories have proven to be incredibly successful in production and helped to provide more food in the urban areas where they are located. The focus of these projects is to provide relief from the high import costs plaguing families across Japan and support green, healthy, and natural lifestyles through Zero Food Mileage. Simply defined, Zero Food Mileage means to keep agricultural production as close to the area it will be consumed as possible. Kono Designs, a New York based design company, has taken this to the next level in conjunction with the Japanese based recruitment firm Pasona. Kono was hired to retrofit the Pasona headquarters into the ultimate example of zero food mile age and urban agriculture. With almost 12,000 square feet of the building used for agriculture, almost every corner of the building now supports some form of food production. This includes rice field in the main hall, Tomatoes hanging in the meeting rooms and broccoli growing in the reception area (dezeen.com.)

If these kinds of ideas could be further implemented into the homes and lives of families in Japan, the results could be astounding. As businesses and families in Japan get access to new ideas and systems, the possibilities of an inexpensive, self-sufficient and green way of life have begun to challenge preconceived notions about agriculture and farming. It will be hard to convince those rooted in tradition that change will help, but if those traditions are used in conjunction with establishing a dedicated agricultural structure and integration of new technology, Japanese startups and farms will flourish like never before. In short term benefits, the development of urban agriculture like the Soradofarms will provide relief to low income families and bolster their revenue. It will also encourage younger generations to enter the agricultural field as knowledge of produce and the owning of gardens becomes a way of life. Eventually this hybrid lifestyle and high amounts of food produce will drastically lower Japans import needs and bolster its exports, thereby helping to balance the economy and lower the cost of food. As its agricultural foundation strengthens, Japan will become a role model and appear as a mentor to developing countries. This agricultural model will then be implemented in those countries and in turn teach them to bolster their communities and integrate all walks of life. When this happens Japan will act as a beacon to others and truly be the land of the rising sun.

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