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Belarus, Factor 6: Sustainable Agriculture

Belarus: Implementing community hydroponic systems for recovery from Chernobyl

On April 26th, 1986, at 1:23am, the nuclear power plant “Chernobyl” in northern Ukraine exploded. The explosion released more than one hundred times the radiation than the bombs dropped during World War II on Hiroshima and Nagasaki. To date, the effects of the explosion has forced 350,000 people to relocate to a safer environment. The radiation from the explosion contaminated much of the surrounding land (Rosenberg, 2012). Due to its contamination, the land is no longer usable for safe agricultural purposes. Habitants of the area surrounding the Ukrainian explosion must have their food imported, and are unable to provide their own produce in a safe, and healthy way. Unfortunately, 4.5 million people are still living on the contaminated land, and using it for agricultural purposes. The food grown by these 4.5 million people is consumed, and endangering the lives of millions of people. These people have suffered from numerous health challenges. Some include an increase in cancer, birth defects, and the deaths of over 4,000 people from excessive radiation. It is expected that thousands of people will continue to become ill, or die from the long-term effects of strong radiation. Countries affected by the explosion include Ukraine, Poland, Russia, and Belarus. Twenty-two percent of all Belarusian land is contaminated. Sixty percent of southern Belarus is fully contaminated and should not be used for any type of agricultural purpose (Friends of Chernobyl Centers, U.S.).

Belarus, a country once a part of the former Union of Soviet Socialist Republic (USSR), gained its independence on August 25, 1991 (CIA, 2014). This country is labeled as a republic but is in fact governed as a dictatorship. Belarus is currently governed by Alexandr Lukashenko, who has served as president of Belarus since 1994. Following a visit with the president of Belarus in 2011, Senator John McCain labeled Lukashenko as "ruthless and brutal tyrant" when referring to his methods and styles of governing the country of Belarus (Yahoo, 2011). In his first two years of presidency, Lukashenko changed the constitution to allow a longer presidential term. He would have been limited to a five year term, but changed those limits to remain president. The urban population of Belarus is around 7.1 million people, and a rural population of 2.4 million people. The total population of Belarus is approximately 9.5 million people, with an annual growth rate of -0.18 percent (Belarus.by). The Belarus government has strict restrictions on freedom of speech, press, peaceful assembly, and religion. Much like the state of Minnesota, Belarus contains more than eleven thousand lakes. The Belarusian water supply is exceptional, and is 99.8 percent usable (Odysen, 2014).

The average size of a Belarusian family is 3.1 people. Typically, families consist of married parents, with 1-3 children. Quoted from Belarusian student Anastasia Korotchikova, “families in Belarus can not exist without married parents” (Korotchikova, 2014). Due to a decreasing population, if a family has more than four children, the family receives special benefits. The state will pay for school lunch for the children, and they receive reduced fares for apartment costs (Gvozdeva, 2014). In addition, grocery prices are reduced for larger families. A typical apartment in Belarus rents for the equivalent of approximately \$300-\$700 depending on location, number of rooms, and living conditions to rent per month. The cost of purchasing an apartment ranges from \$1300-\$2000 per square meter of apartment space. Based on a study from Washington State University, an average of 44 percent of income is spent on groceries to provide for families (WSU, 2012.). The combination of costs for an apartment, groceries, and utilities alone outstrips the average salary making it nearly impossible to provide or an average family.

The Belarusian diet is very similar to other parts of eastern Europe. In fact, neighboring countries such as Russia, Lithuania, Ukraine, and Poland influence the diet of the Belarusians. However, potatoes are a

large part of their diet. A popular dish, for which Belarus is famous is Borscht. Originally a Russian soup, borscht can be served hot or cold. It consists of potatoes, beetroots, cabbage, carrots, and onions (Culture of Belarus, 2013).

Education is a prized, and prioritized part of the Belarusian culture. Children at the age of six begin their schooling which is paid for by the state as education in Belarus is free, and mandatory. When a child becomes ill, mothers have the ability to take a paid sick day to attend to their ill child. By taking this day off, mothers can help children heal, and return to school at the earliest possible time. On average, the length of education for students is fifteen years. Ninety-eight percent of the Belarusian population can read and write. Ten percent of the population continues education after the fifteen year program, earning higher degrees such as bachelor and masters (Education, Belarus, 2014). Many colleges and universities are located throughout Belarus, but most can be found in its capital, Minsk.

In addition to education, the government provides access to medical and dental health care. There are an average of 3.76 physicians per 1000 population (Central Intelligence Agency, 2014). The life expectancy for men is 62, while the life expectancy for women is 74 years. Unlike many other European countries, employees are not required to contribute a medical care budget. Health care, which includes medical, dental, visual, and hearing is provided by the government. The only expenses people are responsible, are those of prescriptions. That said, many healthcare facilities are not as hygienic as they should be (Europe-cities, 2013). With the explosion of Chernobyl, the health care system has been flooded by ill inhabitants of the affected areas.

A majority of the farmland is owned by the Belarus government. Indeed, approximately 85 percent of agricultural land is state owned which creates a barrier for Belarusians to own private land. Private ownership of land is restricted to plots of up to one hectare, which represents 15 percent of all agricultural land. Because of this, family farms are very small. The government hires workers to tend to the farming land to provide food for the population of Belarus (Agriculture in Belarus, 2010). An estimated 9.4 percent of the Belarusian population is employed in the agriculture industry. Popular crops grown include potatoes, grain, vegetables, sugar beets, flax, timber, and cattle used for milk and meat. Potatoes and vegetables take up more than 11 percent of the sown area, while 60 percent of the agricultural land is used for livestock (FAO, 2014).

An estimated one percent of the Belarusian population is unemployed. In addition, in 2003, 27 percent of the population lived below poverty. Industry is the largest employer with 46 percent employment, which is closely followed by employment in service jobs (doctors, teachers, etc.) with 44 percent. To date, the average monthly salary is \$484.90, or 4,687,918 BYR. One of the highest paying jobs is a web developer, receiving a monthly salary of 12,500,000 BYR (\$1280.00). In comparison, agriculture related jobs receive a monthly salary of 1,953,487.9 BYR (\$200)- 3,906,975.9BYR (\$400). Overall, wages throughout Belarus are low in comparison to other European countries. Surprisingly, doctors and physicians in Belarus do not receive a very high salary, compared to many other employment options.

Belarus faces significant challenges when referring to improving agricultural productivity. Due to the explosion of Chernobyl, 22 percent of Belarusian land is contaminated, and unsafe to use for agricultural practices. Because of this, many families must rely on the government providing fresh food. Another challenge faced by agriculturists, is the salary earned by those in the agriculture industry. As mentioned above, the average monthly salary for an agriculture related job is equivalent of \$200-\$400, compared to other jobs receiving \$2380 per month (Cost of living in Belarus, 2014).

The climate in Belarus is increasing in temperature, and increasing in number of annual droughts. The average temperature ranges from -4.5 degrees Celsius, to 18.5 degrees Celsius. The average rainfall is 600-700mm per year, with 70 percent of rainfalls occurring from April to October. In the winter months,

Belarus has an average of 15-30 cm of snow (Belarus.by. 2014). Belarus often faces sudden and premature seasonal changes from winter to spring, which lead to melting snow, river overflow and flooding of terrain. Heavy storms occur on occasion, causing damage to land, resulting financial losses. There is an abundance of water availability during the months of April through October, which can be beneficial to certain types of farming, such as hydroponic growing. By using the available resources, Belarus can thrive with hydroponic practices.

Many occupations in Belarus supply only a small income. With the average monthly income of \$480, often both parents in a family must work to afford a most basic quality of life. The average cost of a three bedroom apartment per month, is \$600 (Prices in Belarus, 2014). Other expenses such as groceries, utilities, and extra finances increase the need for a dual income. On average, women earn 25 percent less than men in working environments. Often, poor working conditions lead to poor health outcomes. As a result, healthy employment is difficult to come by. Few employment options are available for salaries at living wage.

Healthy food is lacking, particularly in the southern region of Belarus. As a result of the Chernobyl explosion, crops which are grown and consumed are leading to extensive health problems. In order for southern Belarusians to receive healthy, edible food, it must be imported from other countries or other parts of Belarus (CIA, 2014). Due to the need for imported food, the prices are expensive when compared to surrounding countries. New methods of producing produce are needed to improve health of Belarusians and reduce their dependence on expensive imported food.

The environmental effects of the Chernobyl incident negatively affected agricultural productivity in Belarus. Animals, produce, or materials grown on the contaminated land increases health risks immensely if consumed or used, so food availability in the southern region of Belarus is scarce. Many cities in Belarus are heavily polluted, especially in the industrial areas. The pollution is partially from lasting effects of World War II, partially from automobile exhaust, and partially from the lasting radiation effects of Chernobyl. Between the pollution and the contaminated land and other factors, more than 22 percent of Belarus is unusable for agricultural purposes (Hjem, 2008).

Immediately following the explosion, approximately 400 people died. 300,000 residents from local towns were evacuated in an attempt to avoid the negative effects of the explosion. Families were forced to change their way of living in attempt to remain healthy, continue to reproduce, and continue to provide. Families continue to be affected by the high levels of radiation from Chernobyl in many ways. To begin, health risks of living in the southern region of Belarus include; increased risk of cancer, birth defects, and an early end of life. Descendants of the first responders to the disaster will face effects of radiation for thousands of years, even as families reproduce (Harrell, 2011). Citizens are unable to provide food for themselves due to the contaminated land and high radiation levels. Unfortunately, the land may never be usable for agricultural purposes as the amount of radiation infused in the land has created perhaps everlasting unsafe, useless land. According to Ihor Gramotkin, whom serves as the director of the Chernobyl power plant, the effects of the explosion could last at least 20,000 years (Harrell, 2011).

To date, efforts to reduce the radiation and return the land to a usable state are in effect. Fertilizers are being created in an effort to treat the contaminated land (Hjem, 2008). The efforts have continued for nearly 30 years, but are far from complete. Workers dressed in white suits and respirator masks work every day to construct a new concrete shield to replace the diminished pieces built before the explosion of Chernobyl's reactor 4. The previous shield, which still protects and contains the still-radioactive core, is starting to crumble and could collapse. A collapse of this shield could lead to another radioactive cloud in the air, and incredible pollution effects (Harrell, 2011).

The condition of the land is gradually improving. However, full recovery from the explosion could take a

minimum of 20,000 years. Some say recovery from the explosion will never happen, due to the tremendous amount of radioactivity. However, through the hard efforts of workers, the radioactivity of the area could produce a better quality of life for residents. By continuing to improve the condition of the land, the population of southern Belarus has the potential to increase, which in turn would help the Belarusian economy. Eventually, the land may be usable for agricultural purposes, which would help lower the cost of food, increase food production, and provide more agriculture related jobs for unemployed Belarusians.

Because of the poor land condition, and the time consuming process of returning the land to a usable condition, an alternative for providing fresh produce would be the use of hydroponic systems. Surprisingly, 99.8 percent of the water in Belarus is perfectly usable. Belarus has an abundance of water, as they are the land of eleven thousand lakes! The effectiveness and health benefits of growing hydroponically could improve the quality of life for many Belarusians by, not only providing healthy food, but also increasing food production, providing jobs, and reducing food importation.

An abundance of fresh produce can be grown through hydroponic growing systems. Some examples of foods which thrive in hydroponic systems include; lettuce, tomatoes, cucumbers, radishes, celery, onions, herbs, beans, and many more. In addition, aquaponics can be used to add natural nutrients and minerals from fish. Some plants grow better through hydroponic rather than aquaponic systems. These hydroponic systems could be provided to towns throughout southern Belarus. Greenhouses would be built to house these systems. Much like a community garden, members of the community would share in the responsibility of caring for the fresh produce, as well as to take what they need to provide for their family. Residents of Belarusian towns can determine what to grow for their community to provide for all their needs. In July of 2013, 40 students from across Belarus traveled to the United States through the WorldLink Youth Leadership Program to learn about community gardening. While on the program, students learned how to develop and maintain a community garden to help provide for their communities. As a result of their studies, these students have the ability to actively start the production of community greenhouse and hydroponic growing (Worldlink, 2013).

The cost of building a greenhouse and purchasing a hydroponic system vary, depending on the size of the building and equipment needed. The cost of constructing a 28-foot by 95-foot greenhouse would cost approximately \$20,000 or 195,598,604.84BYR. This cost includes the price of the frame, walls, heating system, floor, utilities, cooling and ventilation system. While this may seem expensive, the long term usage of a greenhouse could show great benefits and lasting usage for many years (West Virginia University Extension Service, 2013). The average cost of a 12-foot by 20-foot commercial size hydroponic system is \$10,000 or 9,779,9302.42BYR (greenhousemegastore, 2014). This size hydroponic system can grow 576 plants at one time, and can produce as many as 14,976 plants per year. This could easily supply a community of at least 200 people for one year. Many hydroponic and greenhouse supply companies are available throughout Belarus as well as surrounding European countries. Altogether, to provide a greenhouse and hydroponic system for a community would cost at a minimum, \$30,000 or 293,397,907.26BYR. This cost, although high, could be overruled by the positive outcomes. Citizens would have fresh, healthy, locally grown produce, which in turn could help the health of many Belarusians.

To care for and maintain these community produce growing centers, either community members could share responsibility of care for the system, or community members could be hired to run the system efficiently. Hydroponic nonprofits are available to provide financial support such as Rosewell Patch (rosewell.patch.com). The national government could use part of its budget to supply part of the cost for these hydroponic growing systems, which in turn would reduce the medical expenses which are normally covered by the government. On a smaller scale, families can build their own hydroponic systems to provide directly for their own families. However, the cost of this compared to a community greenhouse

would be much higher, and a typical Belarusian family would likely not have the funds to afford this.

In conclusion, the effects of the largest nuclear explosion in history were devastating. The explosion of the nuclear power plant, Chernobyl, located in northern Ukraine, affected the lives of millions of people. Thousands of square kilometers of land were contaminated, and will take an estimated 22,000 years to recover the land and restore it to usable soils. 22 percent of Belarus land is contaminated and unusable for safe agricultural procedures. Over 60 percent of southern Belarus is unsafe. Unfortunately, many people still farm on the contaminated land, and consume the food grown there. The food grown on radioactive land has led to high numbers of cancer, other illnesses, and death. By implementing a new way of providing fresh food for Belarusian citizens, food will no longer need to be imported to the contaminated areas which will reduce the cost of produce and the federal government expenses. Because less people will be growing crops on contaminated land, medical expenses will decrease, as well as severe illness. The average cost of building a community greenhouse as well as purchasing a commercial sized hydroponic system would be an estimated \$30,000 or 293,397,907.26BYR. This hydroponic system could grow 576 plants simultaneously, and produce nearly 15,000 plants annually. By building and maintaining a productive greenhouse and hydroponic system, citizens would have better access to fresh produce at a lower price, and suffer from fewer health challenges.

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