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Israel, Factor 1: Plant Science
Israel, the Key to Literal Food Security

Israel is a small country shrouded in rich cultural history and home to several religions, predominantly, Judaism. Despite being a small country (20,770 square kilometers)(CIA World Factbook), Israel has tremendous problems. Israel lies within the Middle East, a climate known for its hostile environment as well as its hostile countries. When founded in 1948, following World War two, Israel was immediately plunged into war by surrounding countries outraged by the removal of Palestine. This hate still harbors in Israel to this day; Palestinians constantly threaten the citizens of Israel and regularly commence clashes with the Israeli Armed forces. Israel is also situated in volatile region with relentless deserts and very little water to distribute between its population and crops. Yet, another threat looms overall. A threat nearly impossible to detect, yet impossible not to notice in the aftermath. That threat is agro-terrorism.

In Israel, cities spring out of the rocky desert into a dense metropolis oasis which provides a cramped city life. Most families in Israel live in cramped city apartments that average around four rooms. Because of the extreme prevalence of Judaism in Israel, family is the focus. Families are tightly bonded and are the symbol of union in Israel. The typical family in Israel consists of a mother, a father, and one to two children. The families are typically younger as well due to the said pressure on female civilians of Jewish faith to marry as quickly as possible. The mother typically is the 'house keeper' and does most chores and cooking around the house (Israeli Women's Role in Society). The Israeli diet strongly follows the kosher diet. The Israeli cuisine comprises several different blends of cultures and fuses them into one. Distinctive mixes are those of Jewish, Muslim, Arabic, and Mediterranean influences. Along with their meals, bread is a key culture food to the region. Bread is a staple to the region due to its starchy content; it is eaten with nearly every meal.

Education is the one of the main characteristics separating Israel from First World Countries. In Israel, the literacy rate is ninety-seven percent (CIA World Factbook), but while most citizens can read and write, only seventy-two percent of people graduate high school. Of that percentage, half have graduated college. Comparing that data to the United States, Israel is not very far off from being a proficient education system but there are very noticeable differences. One being that after schooling is determined complete, Israeli citizens are typically conscripted into the military this is due to the small population and a large number of surrounding enemies (Israel Military Service Age and Obligation).

Health care is also a very prevalent part of society. Under the Health Insurance Act of 1995 every Israeli citizen is entitled to health insurance and health care services. Israel has one of the highest doctor to patient ratios in the world. This is likely due to having five medical universities serving 7.5 million citizens. Also, through decades of foreign aid (primarily from the U.S.), Israel has a very technologically and intelligently advanced medical field and equipment. The one primary problem with the health care system in Israel is that there is a small, but very steady downfall of students going to school to obtain their M.D. and a larger amount of older retiring doctors (Times of Israel).

Agriculture in Israel is already a phenomenon in itself. Acres upon acres of hot and dry desert land, which were once the fertile grounds on the outskirts of the Babylonian Empire, are transformed once again through bioengineering. In Israel, agriculture is not a very popular job as it only employs five percent of the population. This is due to the new technology making farming and other various jobs in agriculture easier, thus requiring fewer and fewer people. The income based on agriculture in Israel is also small; it accounts for only six percent of Israel's income. Even with these facts, these farms are getting larger and larger. When Israel was first established as an independent state, the area under cultivation was only 408,000 acres (1,650 square kilometers). It has since increased to 1,070,000 acres (4,300 square

kilometers). The area of arable land has also increased due to the science behind bioengineering, making plants requiring less water. Also, through the Zionist movement, Jewish immigrants settled in semi-arid land destroyed by erosion, deforestation, and the harsh conditions of the Middle-East. These settlers put forth hard labor to clear rocks for fields, replaced water, planted trees, and counter acted soil erosion to make Israel able to, today have agriculture in its confines (Israel's Agriculture in the 21st Century).

In Israel, the average size of a farm measures about 13 hectares or about 32 acres. With the climate Israel has, farmers can grow just about anything possible, as long as they have the materials to achieve it, and even more important, water. The most common crops grown in Israel are: wheat, sorghum, and corn which account for 215,000 hectares of farm land of the 433,000 hectares of land under cultivation. The other crops grown are primarily cash crops which include dates, oranges, avocados, bananas, apples,(and various other fruits, primarily citrus), and vegetables. Israel also has ample flower fields mimicking Western European fields. Israel is also a large producer of beef and dairy. Due to the majority of the population following the kosher diet swine is undesirable and its bovine counterpart in livestock is more prized (Israel's Agriculture in the 21st Century).

All of this growing of crops and livestock in a desert would be impossible without widespread irrigation systems. Israel imports most of its water used for irrigation from the Sea of Galilee (Fao.org Aquastats). With that, it transports the water through various systems and goes to farms where it is introduced to the crops. Drip irrigation, an ancient form of irrigation dating back to first century China is used on Israeli farms. It consists of water arriving at a pump which is then sent to a filtration system. The water moves throughout a various grid of pipes to nozzle like joints in the hose where it then drips water down onto the plant. This saves innumerable gallons of water to direct evaporation to the hot desert sun, and also saves the plant from over watering. Greenhouses are also very prominently used in Israel. The greenhouses use the same drip irrigation as the fields, but it is better protected from the harsh conditions just outside its walls (Drip Irrigation for the Home Garden).

With all these innovations, farmers choose to spend more on technology rather than on work force. This coupled with a relatively small rural population (600,000 out of a total population of eight million), there is not much man power for agriculture in the first place (Tradingeconomic.com Rural Population Growth). This limited work force cannot achieve much so many farmers either live in agricultural villages where one town works as a whole known as Kibbutz. Otherwise Israeli farmers turn to modern technology. By having massive combines and tractors, farmers can significantly decrease the manpower needed. This technology is also very expensive and is rarely used on small farms like it is used in the United States. Another factor to a fault in Israel's agricultural productivity is, like stated previously, it makes very little income. Israel produces ninety-five percent of all its food for itself while exports remain low due to low demand of Israeli produce over the superior first world countries agricultural products.

Though Israel seems like a developed country due to the tremendous support from international powers, it still lacks quite a bit of traits attributed to developed countries. For instance, Israel struggles with poverty and annual income. In Israel, twenty percent of families are determined below the poverty line. The average annual income of Israeli families is only $45,000 USD for the Jewish majority. The annual income for the minority Arabs is significantly lower as Arab families make on average only $26,000 USD annually. These incomes make it greatly more challenging to live every day, especially for the Arab people in Israel. In comparison, the United States which averages $10,000 more than the average income of the Jewish majority in Israel. The population distribution is also centered more within the urban compounds of Israel which makes job competition difficult, but the unemployment rate plateaus at around 5.5%-6%, which means most Israeli citizens, are employed. This significantly helps with income and efficiency (CIA World Factbook).

In Israel, food is bought from an open air market, otherwise known as a shuk. These shuks have little resemblance to the modern grocery stores relative in most Western countries as they take from ancient traditions. These markets are in every town and also multiple spread through cities. They are easily accessible, but these are not as regulated as its Western counterparts. These shucks are more similar to a farmers market than a modern supermarket (Shuks).

Though Israel has strict import regulations, its domestic regulations are unperturbed. Because of this, a threat of untraditional terrorism looms over Israel, far more severe than a car bomb or any other explosive excluding a nuclear war; a domestic threat so severe that it could cause millions to starve and the Israeli government to go bankrupt trying to save its people. This threat is an introduction of a human produced pathogen to the food supply of Israel.

Agro-terrorism is a severe threat for Israel. It is near impossible to detect as it can be spread by an airplane over a field, but the effect would be devastating. Depending on how widespread the pathogen would be spread, it could affect a portion to the entire country. This would be devastating especially because Israel produces ninety-five percent of its own food, with the only imports being grain, oilseeds, meat, coffee, cocoa and sugar. If this pathogen were to be commenced within Israel, it would wipe out nearly all agricultural practices within the vicinity of the spore drop. The results would be much like the outcome of the Irish potato famine which resulted in mass starvation and emigration. It would cause the food availability to drop substantially while the prices of produce to skyrocket. The quality of the remaining food would be debatable on the matter of how affected it was by the pathogen.

This act of agro-terrorism would greatly impact the average family. If it was a family within a kibbutz, it would devastate their crops. As a family living within the cities it would dwindle the supplies within the shuks and significantly inflate the prices of produce. Being that the average family is only a little above the poverty line, all of the money a family earns would go straight to food. Most families would not be able to adapt to the scarcity of food and would eventually cause the family to starve or leave the country. By leaving the country, it presents a massive amount of problems for the Jewish majority in Israel as nearly every surrounding country holds a deep hatred for the Israeli state especially the Iranians and the Palestinians as well as whichever hostile country or terrorist organization was responsible for the production and distribution of the spore drop.

Though the present status of this terroristic threat looms undefinable, it can happen at any given moment; in any lab anywhere a pathogen can be unleashed without mercy towards the Israeli people. This threat can be manufactured under any biological scientist with the know how to engineer the pathogen, transport it, and spread it. Given that Israel is surrounded by hostile countries which are filled with or occupied by terrorist organizations as well as a government hostile to Israel's own, this hazard is not fabled. If anything the threat of agro-terrorism is increasing due to new understanding of plants, cells, and also of how pathogens work. As long as fields are accessible by air, the pathogen can be delivered by spores dropped from the air. Though greenhouses can be protected from outside forces the water or soil supply can still be contaminated as long as the provocateur has access to it (Ehren Whigham)

By addressing this problem, Israel as well as multiple other countries can become protected from this diabolical form of terrorism, as well as imminent threats and natural events involving fungal pathogens. Having the knowledge of possible terror targets could protect millions of people from terrible conditions, starvation, and a total loss of a government.

These pathogens (specifically fungal pathogens) ironically work much like seeds in soil. Initially a pathogen attaches itself to a plant's cell and grows root like structure penetrating the cell wall. Once inside the cell the pathogen generates proteins, known as effectors, which are secreted and then infiltrate the cell. These effectors will modify the cell's activity as the pathogen spreads to surrounding cells. Much like the human body fighting a disease by finding an antibody the only way a plant can rid itself of

this pathogen is by finding a resistance gene or protein that can confer resistance to this specific pathogen. A resistance gene to specific fungal diseases plants can be genetically engineered into future seeds. By researching common pathogens scientists can find plants with resistance genes by looking for broadly conserved effectors. Those genes can then, as stated, be engineered for future plants which are resistant to the secreted proteins and the resulted fungus. (Ehren Whigham)

Addressing this concern may cause distraught thoughts and paranoia within the country, especially to the agricultural community, but by making this statement, the threat of bioterrorism can only be diminished. The first step in fighting this catastrophe is making it known that food sources are not completely safe and the agro terrorism does exist. Also by having governmental and privately hired biologists further research of how to protect these crops from the devastation of these acts the world can be safer. The typical family is Israel will not have to waver in fear by the threat of food scarcity of a biological terrorist, for that terrorist will not have a chance. This is literal food security. By genetically engineering these pathogen resistant crops, a significantly lowered risk will be enacted from both terrorists and also future natural events.

Within the country, local edicts could be issued requiring non organic farmers to have at least half of their crops protected with this broad spectrum resistance gene. Local kibbutz could strive to grow resistant crops, or if they operate under a greenhouse they could recognize the security level of the water and soil needs to be upgraded. The government could even get involved by issuing easier obtainable pathogen resistant engineered seeds to the farmers of Israel. Also there could be laws enacted to further protect farmlands and green houses such as routine checks of crops, soil, and water supply.

Everybody possible could help increase the use of these pathogen resistant crops. Agricultural communities could, as stated, boast their use of the resistant crops. Companies could promote the use of the engineered crops or use the crops within their products. Local health and safety organization could even organize events in which the planting of these crops would be in order. These organizations could even send out commercials or other advertisements showing what a widespread food shortage would look like in Israel. Even the average family of Israel can help simply just by buying the resistant crop products. The slightest acknowledgement that these crops can be used for the betterment of life is substantially worthwhile for the use of these pathogen resistant crops.

Though Israel is far from being a underdeveloped country, it is not as near to a developed country as it can be. Israel is also located in possibly the most volatile spot on Earth due to the harsh desert conditions and also the hostile countries and people surrounding it. Some extremists would stop at nothing to see the downfall of Israel. Terrorism shows no mercy, and in the instance of bioterrorism it takes no prejudice; plants, men, women, children, Jewish, Muslim, or Christian it does not matter to a terrorist as long as the person belongs to Israel. By addressing this less obvious form it can be easily reduced before it is ever implemented. The research that is done by biologists on this issue can save the lives of millions which is why it deserves to be addressed. This would only be the start to an array of new technological breakthroughs forever bettering the world.

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