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Mezquital Factor 6 Demographics

Durango: Microtunelling in rural zones and families that live in the country.

Mezquital, in the state of Durango, Mexico, is one of the municipalities in the country that has a minimum use of agricultural technology and at the same time, a great potential to grow several types of edible plants for self-consumption, but moreover, a great potential to grow crops. It is located in the further South area of the state of Durango, which is in the Northwestern zone of Mexico.

Durango has eight different kinds of climates. It is also the area with more ethnic groups in Mexico, amongst them: Tepehuanes, Náhuatls, Huicholes and Tarahumaras, which compose 78 % of the state's population.

Mezquital has a total surface of 4,470.82 square miles with an enormous agrarian potential, but without the implementation and use of special modified seeds to grow crops, the field is totally wasted. This is one of the areas in the country that suffers from food scarcity and is a priority for the National Crusade against Hunger, a program sponsored by the Mexican government. Its main purpose is to significantly reduce poverty and hunger.

A typical family is composed of both parents and their children; the elderly die soon for they are constantly at risk due to the lack of medical services. Women usually have four to five children. The reason for them to have so many children living in poverty, is that mortality rate in newborns is 45%. Families do not and cannot get bigger because food is really limited. Their daily diet only contains the minimum they need to survive. It is based on three items: corn, beans and chili.

Mexico's national educational system provides school for everyone, but most of the times, the walking distance is too much for children to attend school. There are other basic needs that must be covered in order to survive first, which make it almost impossible for them to study beyond junior high school. Mexico's agency that collects census information, Instituto Nacional de Geografía y Estadística (INEGI), concludes that only 48.6% of the children have access to education and a vast majority of them still cannot read or write. This makes it nearly impossible for them to even get to know about the existence of modified seeds that they could use to better their lives. INEGI's 2012 research says that 61.6% of the population has no studies at all. Only 4.2% have studied up to elementary school, 28% has finished junior high school (9th grade) and only 0.9% has studied a technical career.

Health care in the region is really difficult to access and in case of an emergency the only hospital that is in the zone is not at an easy reach. The poorest zones that are in most need of medical service have no access to it at all. There is a common plague of lice and 92.5 % of the population suffer from this condition and have no effective way to eradicate it. Their skin is dry and squamous. They only get to shower once per week and sometimes they don't shower in a long time. Some of the common health problems are: cheilosis, an abnormal condition of the lips and formation of fissures in the corners of the mouth and glossitis, an inflammation of the tongue. This also affects the throat, mostly due to bad hygiene. They also have many health problems derived from the small amount of food intake.

Family farms are a very important part of their life because 95% of the food they eat is cultivated at

home. They only produce corn, chili and beans. The amount of wild herbs they consume is really high and they normally use them to flavor soups. The amount of square feet that they would be able to use to cultivate is quite vast, but the actual size of a family farm varies between 84 x 46 square feet (the largest ones) and 65 x 2 square feet, the smallest. Families divide the terrain into three to five different types of crops. They basically grow beans, corn, pumpkin, lentil and a few herbs. A typical meal includes corn tortillas with beans and chili.

The Instituto Nacional de Salud Pública de México (INSP), a government agency, tells us that 25% of their income is destined to feed their families, which is around \$0.34 to \$1.38 USD per person per week. This figure is calculated using market prices of other items that are not produced by them and have to be bought, except for pulque, (an alcoholic beverage made from the fermented sap of the maguey plant), and some herbs they use to make soup. Pulque is usually produced by some farmers and is sometimes sold to the rest of the community; nevertheless, many families have some agaves and produce small quantities for personal consumption. The trading price of corn, their main food, is 23 cents for 2 lb.

The agricultural practices that these groups use are traditional. Farmers let the foliage dry and after that, they burn it in order to be able to plant new seeds. This practice deteriorates the soil and its nutrients. The only means they use to water the fields is a gravity flood irrigation system that actually wastes water. Farmers and their families make no profit out of their farming; they grow only enough food to eat.

The difficulties that these farmers and natives face are basically economic. There are no commercial activities between the villagers. The people from Mezquital are totally unaware of the existence of new techniques developed by modern farming. Farmers keep on using traditional agricultural practices such as crop burning, which eventually damages the soil and field productivity. New techniques have been proved to be useful, unfortunately, the people of Mezquital live in a situation that does not allow communication with other communities and they are living in some sort of isolation. That is why we need to think about educating the farmers and teaching their leaders, so they can share their learning in zones that are in great need. Farmers do not make any extra money out of their labor, because the amount of food they produce isn't enough to hire help and expand their farms.

The main problem that Mezquital crops face is droughts and frosts. The small amount of food they are able to produce is only possible during certain months and once the productivity month is over, they are unable to plant even basic crops, which causes hunger in Mezquital. If they could only implement a more effective system, this would enable them to save some food for those months with no productivity at all, even better, keep on producing throughout the whole year.

A drought is a period of time when a certain area suffers from high temperature and deficiency in water supply. It has a substantial impact on the area's agriculture. Droughts can harm local economy; in Durango, they can last up to four months. They don't have enough water during these months and they cannot irrigate their fields. Over 60% of the states in Mexico have this problem. Durango is one of the top five places in Mexico with lack of natural water income (rivers, lakes etc). Droughts affect the fields because these dry out and the water supplement that they use for the agricultural purposes evaporates fast, leaving them with only enough water for farmers and their families to drink. Droughts, calculated by the Local Meteorological Observatory of the National Water Commission (CONAGUA) for this past summer, brought at least 118 days without rain, which made the season one of the driest in many years. CONAGUA said that it used to rain at least 47 millimeters, however, this year, only one millimeter of rain was accumulated. CONAGUA also

reported that temperatures are increasing throughout the state, up to 97 degrees Fahrenheit in the state capital where the temperature during this season ranges from 80.6 Fahrenheit.

Frosts are a climatic phenomenon that consists of a decrease of the temperature level lower than the freezing point of water. Black frosts take place where there is a higher air pressure, usually near mountains. Zones like Mezquital get their plants completely destroyed. Frosts affect the zones not only by killing the crops, but also by making the population less active and unable to keep enough energy and calories for their bodies to stay warm at night and survive cold temperatures. Frosts have become an increasing problem because since last year, specifically in December 2013, the temperature registered in some places reached minus 66.2 Fahrenheit. In the north of Durango the temperature was between minus 32 and 37.4 Fahrenheit, and in the Laguna region, the hottest part of the state, and the thermometer reached temperatures below zero.

It seems that Durango's weather isn't getting better and this will slowly continue until the productivity months are reduced to only four or five within the year. This will be getting worse as time goes by, which has been stated in a research conducted by INEGI in 2013.

If farmers in Mezquital were able to produce enough food for the months when they aren't able to plant by using modern seeds in their fields, they could then stock enough food in order to survive. Having implemented new technology and modern practices, the amount of food produced would be sufficient and give each family an extra income.

Urbanization will someday be possible in Mezquital, but since it has been taking place very slowly, the people are running out of time because of the effects of climate change in the world. In the next decades, these people will not have any chance of surviving hunger and this will actually happen if we do not do something about it and promote change.

Based on my research, I have realized that the problem is the demographics and economics. My first recommendation is to provide Mezquital farmers with special modified seeds that will enable them to produce more. GMOs (Genetically Modified Organisms), in this case, seeds, have been developed to better withstand harsh climatic conditions.

Genetic modification is performed through gene splicing techniques of biotechnology (also called genetic engineering or GE). Plant tissue culture methods result in genetic transformation, and this "improved trait" survives from one generation to another. This new technology has helped scientists to identify microRNAs and use them to develop prototype plants that will resist prolonged periods of severe drought, maintaining an increased yield. A crop yield (agricultural output) refers to both the measure of the yield of a crop per unit area of cultivation and the seed generation of the plant itself (e.g. if three grains are harvested for each grain seeded, the resulting yield is 1:3). The figure, 1:3 is considered by agronomists as the minimum required to sustaining human life. If the surplus is higher, the farmer and his family increase their well-being and economic situation.

This will also assure food quality, not only in Mezquital, but also in places with the same conditions. This is a lifesaver program that could help a lot of rural zones. Families will be having enough food for themselves and some fruits for sale or trade with other villagers. This isn't going to be easy because we need to give them seeds and they should get help from the government. The government has decided to solve this problem by giving them food in their social program called Crusade Against Hunger, but food doesn't last forever, which is why they need to learn to use modern technology and a new production farming model.

My second recommendation for Mezquital is based on micro tunnelling. Micro tunnels are easily made and the construction and placing is really easy and intuitive. The size of these tunnels isn't

limited by length but by height, that is why they can be implemented with small crops. The maximum height is 24 inches and 40 inches wide.



It is a different way to implement a greenhouse. This specific type of greenhouse is smaller and protects little amounts of crops during droughts and frosts. Micro tunnels are not expensive and are very practical to install. Other types of benefits are plague control and less waste of water during the drought period. This would enable a constant flow in the amount of food produced, and would not limit harvesting and planting time. The problems these communities have can be solved by just applying micro tunnels that the government could provide for these communities don't have any kind of income and are unable to pay for this kind of technology.

The types of crops they could plant are nopales, beans, and chili amongst other.

This technique isn't as popular as it should be in Mexico. I think that compared to other projects such as Cruzada Nacional Contra el Hambre , it is more realistic and feasible to give them the material needed to revolutionize their farming better than just giving them food that will eventually finish.

First the communities would have to accept the project and after that the government should see this as an opportunity to give resources to the communities in an efficient way. Organizations and Enterprises that can support this relief can be: LALA (One of the biggest Dairy Producers in the country) because they have a lot of producing centers in Durango and can benefit from its advertising and publicity and also they will be helping a poor community from their zone.

A typical family can be supported by micro tunnels that can give a constant amount of food, which can be harvested by them. The budget for this project is feasible. Most of the money they can make can be divided in 30% LALA, 30% Government, 10% donations 30% can be obtained from a bank loan in with a 5 year- return program.

In my opinion, the solution to this problem is surprisingly easy. Unfortunately, many times it is not just a matter of difficulty, but administration and organization. Many people, especially my age, live in a bubble that doesn't let us see the real problems in Mexico. Most of us don't really know the truth of the situation many people live in México.

I am happy to say that I now I know more about my country. I feel compelled to help in any way I can, for which I will have to do a lot of research and learn about everything I can, study and work harder so that one day I can actually be part of the people that make change possible. I keep on asking myself, why hasn't anybody thought of this before? I am sure that there are many other places with similar problems and GMOs and Micro tunneling can be the answer to eradicate hunger.

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Picture Source

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