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**Mexico: Managing water scarcity and adapting farming practices to reduce water supplies with improved irrigation technologies and conservation practices.**

**Problematic:**

There are a lot of states in Mexico that even though their climate is not the best for their crops, they keep on planting and trying to make things work out. Life in the field is not easy and it is especially hard for farmers because their work depends on the quantity of food they are able to produce.

In a place like Fresnillo, Zacatecas, people can't depend on the weather. There are a lot of places in which farmers can rely on the climate to have a successful harvest but in a place that rains about 20.4 mm (0.8 inches) (Medina & Echavarría, 2007) per month rain is not an option. People are using an enormous quantity of water to water their yields due to the low precipitation rates and even in a country that has stable rain levels, climate is not a factor that people can count on. Eventually, water will be more valuable as a consequence of our needs because we have more needs than ways to produce it. Farmers shouldn't need to use rain as their first option to water the fields and a lot of things depend on something we can't trust. Society needs a new source of water that will not damage the ecosystem, in which we can rely and know for sure, that will be able to fulfill our needs in the fields.

Mexico is a country that has the territory, the people, and the resources to produce an enormous quantity of food. The Mexican government needs to see and analyze the needs of their people, and focusing on agriculture there are a lot of things that can be done. People need money so they can eat, and it is better for the country if they eat their own products instead of buying them.

People are becoming aware of the importance of water in our life, and that it might have a dead end. Society is making people responsible for the use of it due to the fact that there are not too many water sources. When cities start lacking water they use the lakes in nearby countryside territories.

People are not conscious about the importance of agriculture in our daily life and everything that is behind it. Agriculture affects the way people live. It has a great impact in society and in economy in many ways such as having more incomes. The more we produce the less money we use in importing food for the country.

**Objectives:**

- The promotion of Mexican agriculture in order to raise the productivity in our country.
- To create alternative water sources in order to preserve water supplies
- To transform Mexico into a self-sufficient country in agricultural terms.
- The promotion of air-water machines for positive further usage.

The main idea is to produce what the people need and not expending in products that can be raised in the same territory. If we achieve this, we could be even ready to think on exportations.

Creating alternative water sources is not just a need in agriculture but in everything else, basically everything depends on water. Starting to produce other water origins will help prevent a further crisis, if we sometime end up lacking water.

Mexico imports a lot of food; the reason of it is that our agricultural community is not strong enough to sustain their own needs. Last year Mexico bought 33% of the national corn consumption (Rodriguez, 2011) when the country is completely capable of covering their need and even produce some more for exportation.

**Location:**

This project is focused on Fresnillo, Zacatecas. The state was chosen by the criteria of climate and weather. Zacatecas has a semidry temperate climate. In a state such as Zacatecas that practices agriculture, water is a need, it is a vital resource. The community was chosen by its population, too. Fresnillo has 212 thousand inhabitants (INEGI, 2012). One of our objectives is to promote Mexican agriculture, so we can be a self-sufficient country. Having a place where a lot of people need a job, and a project that will create those jobs for them is the perfect match. And talking about a large scale, promoting a system that works will create an interest in a lot of people and focusing that interest on Fresnillo would help the community a lot.

In Zacatecas the minimal wage is $4,4 USD or $59,08 Mexican pesos each day (Rombiola, 2012). The money a farmer needs to produce one hectare of any product depends on the place he is in. To produce one hectare of wheat you need approximately $229 USD. And to plant one hectare of corn you need $382 USD (Carrillo, 2012). This is the cost of a good investment. With this kind of money you expect a good and profitable harvest.

Climate is an important factor in this project. The place must have a minimum humidity of 35% and Zacatecas showed an average of 70,4% (Medina & Echavarría, 2007) showing it is suitable.

Creating a hypothetical situation in which a farmer has to invest in his crops, he has to work 59 days in a row without spending any money to plant one hectare of corn and 99 days if he wants to plant one hectare of wheat. As a consequence farmers choose to use cheap seeds or seeds that they collected from the last crop rather than buying good ones.

**Proposal:**

The government must support the field, especially with subvention. The productivity of a farm depends on how much money you invest in it. As there are many factors that will ruin plantations, there are even more that will make them a success. When farmers start planting their crops, there are many kinds of seeds they are able to be used. Farmers can use seeds from their last harvest, which are seeds that have fallen from their last crops. Or they can buy good seeds. The type of seed that is used will determine the tons that will come from each hectare you plant. A harvest that has received an investment will produce bigger profit and better results than a cheap one. If harvests are successful and bring profit, there will be more money to invest and a bigger profit and result will be produced.

Extracting water from the air is possible, it's as a lot of new things are, unknown, rare, and surprising. A Mexican company called Pure Water America has machines that are able to produce even 10,000 *l* of water per day. Each machine has a life spawn of about 10 years (Flores, Catalogo Pure Water America 2012) and if we use water correctly we could use it for a lot of hectares.

My proposal is to use these air-water machines to water the fields. Watering fields seems simple but it's not. With 360 *l* of water you can water one *ha* for a day if you use a trickle irrigation system. Based on the productivity of the machines we have 10,000 *l* available per day, that means we can water 27 *ha* daily for 10 years (Schmetz, 2009). These machines work and take the water out of the humidity that is in the air and to function at its full capacity it requires a 35% of humidity in the air. If it's lower than the 35% the productivity will lower gradually, but the machine will keep on working, without expecting any breakdowns. A lot of things are involved in this, more than just economical and ecological. When society really gets to know this new product they will realize that there are still many ways to produce water that have not been discovered and that anyone could do it. Each machine costs $388,000 USD (Flores, 2012) but as its popularity grows it will become cheaper and it could be used to satisfy many more needs than just producing food.

Proving if it is profitable is one of the most important things because if it produces a loss, the project won't be authorized and would not be taken in consideration. To prove it is profitable, a system will be created based on the products people harvest in Fresnillo, the price they have in the market and the average statistics. The government will subvent $388 thousand dollars for an air-water creator machine and give 27 *ha* for 10 years to some farmers so they can work the fields. The idea is to plant twice a year.

**Justification:**

Knowing that the machine will last for 10 years, having 27 *ha* of field ready for harvesting is the beginning of our project. Each *ha* of corn can produce an average of 2.2 tons, when it is used for fodder each *ha* can produce 25 tons. Each *ha* of wheat can produce 3 tons of products. Each ton of wheat is $345 USD; meanwhile each ton of corn is $320 USD (SAGARPA, 2012).

All this numbers are based on a national average, which means all those farmers used a cheaper method of seeding due to the lack of money. If the farmers had money to invest in their crops there would have been better results, with more profits because there would have been more products.

The chart below shows specifications about the products that are going to be used in the project.

| *Product* | *Prize per ton* | *Tons per ha* | *Total tons (x27ha)* | **Total prize** |
|---|---|---|---|---|
| White Corn | 320USD | 2.2 (Summer) | 59,4tons | 19,008USD |
| Fodder corn | 320USD | 25 (Summer) | 675tons | 216,000USD |
| Wheat | 345USD | 3 (Winter) | 81tons | 27,945USD |

There will be 2 harvesting seasons summer and winter each year so in our 10 years there will be 20 harvests.

The chart below demonstrates the earnings the project will show.

| *Year* | *Season* | *Product* | *Gain* | ***Gain per year*** | ***Total Gain*** |
|---|---|---|---|---|---|
| First | Summer | Fodder Corn | 216,000USD | 243,945USD | 863,514USD |
| First | Winter | Wheat | 27,945USD | | |
| Second | Summer | White Corn | 19,008USD | 46,953USD | |
| Second | Winter | Wheat | 27,945USD | | |
| Third | Summer | White Corn | 19,008USD | 46,953USD | |
| Third | Winter | Wheat | 27,945USD | | |
| Fourth | Summer | White Corn | 19,008USD | 46,953USD | |

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|---|---|---|---|---|
| Fourth | Winter | Wheat | 27,945USD | |
| Fifth | Summer | Fodder Corn | 216,000USD | 243,945USD |
| Fifth | Winter | Wheat | 27,945USD | |
| Sixth | Summer | White Corn | 19,008USD | 46,953USD |
| Sixth | Winter | Wheat | 27,945USD | |
| Seventh | Summer | White Corn | 19,008USD | 46,953USD |
| Seventh | Winter | Wheat | 27,945USD | |
| Eight | Summer | White Corn | 19,008USD | 46,953USD |
| Eight | Winter | Wheat | 27,945USD | |
| Ninth | Summer | White Corn | 19,008USD | 46,953USD |
| Ninth | Winter | Wheat | 27,945USD | |
| Tenth | Summer | White Corn | 19,008USD | 46,953USD |
| Tenth | Winter | Wheat | 27,945USD | |

The chart above shows the project is profitable, and how the sales of the products makes the investments come back, in how many years and that is really simple.

The price of planting one *ha* changes a lot due to the place where you harvest and the products used. The chart above has not taken into account the price of seeding. As those harvests were result of cheap crops the actual difference will not be big. Taking into account that a cheap production has the cost of an expensive one with the results of a not well-invested one, the total gain in the 10 year lapse would be of 698,377 USD, which is still almost twice the investment.

If farmers received all the support they need with subvention, they could multiply the numbers showed above by one hundred or thousand and agriculture would be as attractive as it deserves to be. As a result of the project harvests will show incredibly positive consequences, in further seasons, due to the new conscience obtained in investment (SAGARPA, 2011). The money that the government was using to buy tons of food from foreign countries is now available for something else. The money could go to the fields generating more jobs and giving farmers a better life.

**Conclusions:**

Investing in the fields is a factor of great importance, that is sometimes ignored, making people aware of the influence agriculture has on our daily life will produce a positive effect in the society. Even thought water is a renewable resource, we are polluting it and finding alternate sources is vital for our well being. People will be more aware of the needs the farmers have and the government will start acting in a more empathic way.

If air-water machines were more popular they would attract a lot of attention, which would have as a result that lots of companies would be competing to produce and sell their machines. As the time passes by they would upgrade them and make them cheaper, transforming them into a water supply available for everyone.

This project will have positive effects in the way we live our life because it supports agriculture, in an enormous way. It will provide society with a not used water source that will be available for domestic needs such as drinking or bathing. Once this method becomes popular, a lot of people will be inspired on creating more water sources that will give a more conscious society.

In my own experience I've seen what the consequences of the lack of water are. There is a place called Valle de Bravo. It is a lake that is two hours away from Mexico City, it is a beautiful place filled with tourists. People who own weekend-houses invest and make a lot of money flow in, which helps the community a lot. By trying to fulfill the need of water the government is taking water from the lake to bring it to the city, and its getting empty which produces a negative effect in the tourists because people no longer want to go there.

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