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Drip Irrigation Case Study – Nelson Valley

Nelson Valle is a small farmer from the community of Jucuapa, Matagalpa, Matagalpa, Nicaragua. He lives with his wife, Johana, his 5 year old daughter, Ixil and his mother, Marina. Matagalpa is located in the northern mountainous region of Nicaragua and is known for its cooler climate, rivers and coffee production. Nelson grows squash, passion fruit, and tomatoes on 2 acres of land to sell at the local market but has had trouble earning a profit due to the high cost to irrigate his crops. When we met Nelson he was using a pump to water his crops that was powered by grid electricity at times and by a diesel generator at times. The diesel generator was used because the electric grid goes down often, preventing him from irrigating when needed, and the grid quality is not high enough to accommodate the voltage from the pump. When the water pump is turned on, the lights and appliances in the house do not work properly. In addition to problems with grid quality, some farmers in Nicaragua are charged commercial electric rates or a fixed electric rate, making the use of electricity too expensive to irrigate his small farm. Nelson was using his pump to water his crops three days a week, even though the crops needed watering daily. He was paying $130 a month for electricity and diesel fuel to irrigate his farm when we met him.

Nelson is a member of a national agricultural organization called UNAG, Unión Nacional de Agricultores y Ganaderos. UNAG is one of the largest agricultural groups in Nicaragua for small and medium sized farmers, with more than 72,000 members, offering them support, training, and opportunities to improve their businesses. GRID Alternatives approached UNAG to find small organic famers that would benefit from a solar-powered drip irrigation system. The UNAG Matagalpa chapter introduced us to Nelson because he met our requirements of having successful experience growing crops on 2.5 acres of land or less, having a clear need for a solar-powered

drip irrigation system, and having the willingness to pay for part of the irrigation system.

Over the course of nine months, GRID staff and local solar company Suni Solar worked with Nelson to determine his irrigation needs, design the irrigation system, establish ground rules for system use, and prepare for the installation. Nelson was required to pay $2,000, 20% of the system cost, up front before the project was installed. He borrowed funds from the UNAG Matagalpa chapter's revolving fund since small farmers do not typically have $2,000 on hand. GRID Alternatives paid the remaining $8,000 for the system for a total system cost of $10,000

In December of 2015, GRID Alternatives volunteers helped install a 370W solar-powered drip irrigation system along with Nelson, technicians from Suni Solar and community volunteers. The group spent three days installing a 370 Watt pole-mount system that pumps water from a nearby river into a cement storage tank, which then waters the plants drip by drip through gravity. Water pipes were buried in a ditch that ran from the river to Nelson's storage tank to prevent cows from stepping on them and breaking the PVC pipes. The PV system is a DC-direct stand-alone system with no batteries. The PV modules power the pump during the day to move water from the river to the storage tank, and the water moves to the crops as needed by gravity. A DC-direct system means no battery purchase, replacement or maintenance is necessary.

Ten months after the project was installed, GRID staff visited Nelson's farm to see how the system was working and to better understand the impacts the system had made so far. Nelson mentioned the following impacts on him and his family:

- Before he has the drip irrigation system, Nelson grew only squash, passion fruit and tomatoes because there was not enough water to irrigate other crops. Now he is able to grow squash, passion fruit, tomatoes, onions, pipian, pasturage, and raise Tilapia. He has improved the diversity of his crops and the quantity of each one.
- Before he had the drip irrigation system, his monthly earnings were $25 (income $103 - $77 costs). Now his monthly earnings are $546 (income $581 - $35 costs). He increased his monthly earnings by more than 20 times (or over 2,000%).
- Before Nelson and his family had to walk to the community well to get drinking water. Now that the pump has been installed they can get drinking water from the storage tank that runs directly to their house saving them time each day.
- Now that Nelson doesn't use electricity to run his pump, their monthly bill comes out to about $2.90 instead of $33. He also doesn't have to buy any diesel fuel and he is able to sell his diesel generator and old water pump to recoup some of his investment.
- Previously he had eight cows that had to eat in another field because he did not have enough to feed them. Now he has 12 cows that eat in his field. With the existence of irrigation system now he can keep their animals on his farm.
- The solar pump allows him to divert water from the river to create a pond on his property where he is now growing Tilapia, a fast growing fish that can be sold at the market. Tilapia fish eat mosquito larva, reducing mosquito born virus exposure near his home.
- Nelson is able to sell his crops to community members directly who take the produce to resell in markets in the capital city of Managua, providing his neighbors with a source of income.

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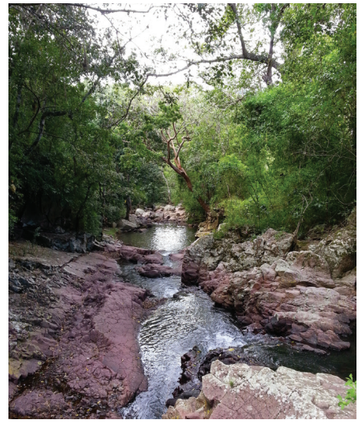

In summary, impacts from the solar-powered drip irrigation system include higher earnings, more diverse crops, less time collecting drinking water, more reliable electricity for home appliances, no more trips to buy diesel fuel, more income for neighbors, more locally grown food available all year round.

Due to the increased income from more and different crops, Nelson will be able to pay back the $2,000 loan in one year. Now that he is earning more income, he is thinking of opening a bank account for the first time to have emergency funds in case the new pump needs to be fixed. He will also use the funds to provide for his family, paying for food and clothing. One day Nelson hopes to buy a motorcycle so he has more transportation independence and possibly more land to grow more crops.

Normally, Nelson would only need to use the drip irrigation system during the dry season since there should be plenty of rain in the rainy season and the holes in the drip irrigation tubes can get clogged with mud when it rains hard. But in the last two years Nicaragua has experienced extreme droughts which requires farmers to water their crops all year round or lose their crop entirely. Since it's been dry Nelson has used his drip irrigation all but one month since it was installed last December. When it does rain heavily, Nelson rolls up the irrigation tubes and removes the pump from the river and locks it up so it won't get stolen and so the river doesn't cover the surface pump.

Although the project was installed successfully and the system is working well, GRID will continue to visit Nelson twice a year to maintain a relationship with him and ensure he is part of our solar network in Nicaragua. Our staff will work with him to ensure his system is working well and to continue to gather feedback about the project for the years to come. Nelson will continue to be invited to our annual solar conference in Nicaragua where he will meet up with representatives from other communities where GRID has installed solar projects, to learn more about solar energy and to share experiences with others.

Nelson has become a role model for the surrounding farm-

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ers who were skeptical at first about the reliability of solar energy and the system's return on investment. Many of the neighboring farmers now express strong interest in having a solar-powered irrigation system themselves. Nelson expressed that even he had doubts at first: "When GRID told us about the drip-irrigation project, I wasn't sure it would really work. Plus I knew these types of systems are expensive so I didn't think I would have the capacity to pay for one. But now we're happy to see how much progress we've made. I now have more varieties of food to feed my family and sell. Not only am I producing more, but there are also fewer costs both economically and environmentally."

SYSTEM SPECS:

Modules: Two 185W UD-185MF5 Mitsubishi Electric PV Modules

Motor controller: One NOV MONO Solar Motor Controller

Pump: One Surface Pump, SunRay SRX Drive Pack CP800

Combiner Box: 1 Midnite Solar Combiner Box MNPV3

Surge Protector: One Midnite MNSPD115

DC breaker: One Midnite 20 amp

Land Size: 2 acres

Water flow: 44 liters per minute (on a sunny day)

Total project cost: $10,000 USD

TO SEE ADDITIONAL PHOTOS FROM THIS PROJECT GO TO:	www.flickr.com/photos/gridalternatives/sets/72157650019531706/
TO MAKE A DONATION TO SUPPORT OUR WORK IN NICARAGUA GO TO:	https://donatenow.networkforgood.org/1441127