



John Ogonowski and Doug Bereuter *Farmer to Farmer Program*
Volunteer Trip Report Cover Sheet

Name of Volunteer: _____ Josh Peissig _____

Country of Service: _____ Nicaragua _____ Dates of Trip: _____ October 12-26, 2009 _____

Persons Assisted Directly ¹ (male):	11		Persons Trained ² (male):	22
Persons Assisted Directly (female):	2		Persons Trained (female):	9
Persons Assisted Directly (total):	13		Persons Trained (total):	31

Recommendations Made by the Volunteer

Please summarize the recommendations you made to the groups/organization(s) you assisted. Details of the recommendations should be included in the trip report – this is a summary table only.

Recommendation	Host
Refrigeration preventive maintenance procedures	Masguito Coop
Milk measurement, plate cooler size, and refrigeration preventive maintenance procedures	San Francisco De Asis
Refrigeration preventive maintenance procedures	San Jose de los Remates
Refrigeration preventive maintenance procedures	San Francisco collection center
Refrigeration preventive maintenance procedures	San Martin collection center
Processing equipment, Refrigeration compressor sizing / maintenance	Nicarao Coop
Refrigeration preventive maintenance procedures	Alianza Nova S.A.
Completing operational milking barn	UNA Farm

¹ **Persons Directly Assisted** receive face-to-face or hands-on technical assistance, training or advice from the FTF volunteer.

² **Persons Trained** are the number of individuals to whom you have provided technical/instructional training *in a more "formal" setting:* classroom, workshop, institute/university or on-the-job setting)

Final Report To Partners of the Americas Farmer to Farmer Program

Volunteer: Josh Peissig

Country: Nicaragua

Dates: October 12 – October 26, 2009

Primary Purpose: To provide technical aid and teach skills about preventive maintenance and periodic repair of industrial equipment for the collection and the processing of milk and cheese.

Additional activities: Instruct students on the process of properly milking a cow, processing of cheese, and the types of technology used to accomplish these tasks.

Executive Summary:

Milk collection and processing centers, which provide dairy products to many local people, are generally low-tech. Meaning, the processes at which are carried out to produce various dairy goods are completed by the most basic means necessary. From my observations I was able to pinpoint a few areas which were commonly lacking throughout the cooperatives from which I had visited.

These areas include:

- Milk transportation from the farm to the collection center or processing center was mainly done by means of horse back or by non-refrigerated truck.
- Cheese processing was sometimes carried out without the means of refrigeration before processing. This was commonly due to the lack of milk storage space, and/or lack of refrigeration necessary to hold the milk for an extended period of time.
- Cooling of milk often took many hours to accomplish once it had arrived at the collection or processing center. This was commonly due to inefficient refrigeration units caused by poor maintenance or under sized cooling units.

Once these areas of poor performance were identified I was able to diagnose the root cause to each specific problem and provide the necessary actions to be taken in order to resolve the situation. A few things I had provided the technicians with include:

- Proper maintenance of refrigeration equipment including condensing units, bulk storage tanks and plate coolers.
- Educated technicians about the basic operations of how individual items completed their part of the process. These items include how a compressor actually cools the milk in conjunction with the bulk tank, and how a plate cooler operates through thermal transfer of heat to cool milk.
- Provided information on areas in which they would be able to save energy by using their equipment more effectively and how this was possible.

Overall, the key need for quality milk production in Nicaragua lies in the cooling, handling and storage of milk from the local farmers. In general, the cooperatives had the basic equipment necessary to produce quality milk at relatively high production rates. However, they were unable to do so because there was a lack of knowledge on how to complete this task, as well as a lack of knowledge on how processing equipment operated and how to properly maintain and repair it.

Background:

The purpose of my visit was to assess the milk collection and processing systems that were set in place at each cooperative. In order to determine the crucial points in the processing and cooling of the milk, and recommend preventive maintenance procedures for the various types of equipment. Traditionally dairy farmers in Nicaragua often lack the equipment to cool milk on the farm, resulting in farmers having to rely on collection and processing centers to store and cool their milk.

The process at which milk is delivered and processed begins in the very early parts of the morning. This is when many farmers milk their cows by hand and place the milk in cans to be transported to the collection or processing center closest to them. Depending on where the farmer lives they are able to have their milk picked up by the processing center at a small fee. This is a good way to get the milk to the processing center and have it cooled in the shortest amount of time, resulting in higher quality milk. In some instances farmers are unable to have access to this convenient service, so they are required to take the milk by any means necessary to the center. This is usually done through the use of horseback, or if the farmer has access to it, a pickup truck may be used. Once the milk has arrived at the processing center, it is measured usually by means of quantity, not by weight, which is how it is traditionally measured. The processing center takes the incoming milk and pours it into a large barrel where the quantity is measured. After the milk has been measured it is poured through strainer into a vat of some sort. From here it is either pumped into a storage tank to be cooled, or it is pumped directly into the pasteurizer to be processed (usually do to not having the ability to cool the milk). Once the milk is pasteurized it is immediately processed into cheese, yogurt, milk, or butter. From here it is sold to various vendors who disperse the product among the people of Nicaragua.

When it comes to repairing the various types of equipment found in a processing center, there are a couple things to keep in mind. Many of the parts needed to repair refrigeration equipment and milk processing equipment are very hard to find, as well as it is difficult to find a technician capable of doing the job. Another aspect that makes the job of diagnosing equipment difficult, is that common tools such as wrenches, pliers, and voltage testing equipment are sparse. It is important when working to better the process of milk production, to keep in mind these few things and to try to make the improvements as simple, and as effective as possible.

Activities and Results:

Masiguito Cooperative

Date Visited: October 15, 2009

While upon my visit to Masiguito Cooperative I was approached with questions concerning their pasteurization equipment, as well as their cooling equipment. The question of concern for them was if their equipment was running properly or not. And if not, what can they do to better their situation. After my visit I was able to collect information such as equipment models and sizes, as well as the analysis for the equipment in question. I also had to provide them with the necessary information to be able to properly maintain their equipment.

Recommendations:

-Pasteurizer was under question because of the readings that had been recording on the temp recorder. The history-graph showed the milk was not being properly heated to the correct temperature. After I had taken a look at the various other manual gages located throughout the machine, I was able to come to a conclusion that it wasn't the pasteurizer that was working incorrectly; it was the temp recorder that had been the problem. In result, I had instructed them that they need to get the temp recorder re-calibrated and that the pasteurizer was working as it was suppose to.



-The compressors were under question due to the fact that they have recently had problems with them due to failure. After an analysis I was able to conclude that the compressors were running as they should, but that they need to keep an eye on a few of them that seemed to be getting low on gas and that it is recommended that they have them filled to avoid expensive repairs. Also, I had given instructions on proper maintenance of the compressor which can be found in the individual reports as well as a listing of specific equipment and the numbers associated with them.

San Francisco De Asis

Date Visited: October 16, 2009

Once I had arrived at the San Francisco De Asis Cooperative I was approached with many questions regarding their process and what improvements are achievable. Such questions involved included;

- Where to find a milk measurement scale
- How to improve the cooling efficiency of the compressors.
- Where to find a replacement pump for their pasteurizer.

Recommendations:

-Cooperative San Francisco De Asis is looking for a way in which they can better control the measurement of their current incoming milk in order to better pay the farmers. My suggestions were to purchase a scale in which they can weigh the milk and to make it easier to control the amount they pay to each farmer, as well as aid them in the documentation of who collects how much over a given period of time. These recommendations can be found in detail in the individual reports.

-A concern had come up with the operation of their cooling system and how they may better its' operation. After an investigation I was able to come up with two solutions. One in which involves increasing the size of their plate cooler, which aids in cooling all the incoming milk. I noticed that it was fairly undersized for the current flow rate that is received at the docks. Also, with the addition of a larger size plate cooler, the amount of energy used to cool the milk by the compressors would be decreased. Plate cooler size recommendations are found in the individual reports. The second problem that was causing poor milk cooling was that the condensing units on the compressors used to cool the milk were very dirty and poorly maintained. I was able to provide them with instructions on proper compressor maintenance found in the individual reports.

-Over the years of operation the pasteurizer has begun to weaken in its ability to pump milk. When first purchased their pasteurizer was able to process 8,000 liter/hr, now it is only capable of reaching amounts of 5,700 liters/hr. This decrease in flow is due to wear of the pump itself. I was able to easily recommend a solution to this problem, because the company from which the pump was purchased had a refurbishing program in which they would send the correct refurbished pump for your application, and you would send back the current poorly operating pump, which would result in no down time. Specifications can be found in the individual reports. As well as a current list of equipment and model numbers associated.

San Jose de los Remates (Collection Center)

Date Visited: October 17, 2009

San Jose de los Remates is a collection center which receives milk from 84 farmers at a total quantity of 2,500 gallons. Milk is delivered mainly in cans, and once received it is measured, strained and cooled to the appropriate temp, from which will be picked up later by the cheese factory. During my visit I was able to provide specific training on how to properly maintain the refrigeration equipment

that was found at the center, as well as collect information pertaining to the model numbers and sizes of the equipment that was used in the collection and cooling process. Specific details of this information can be found in the individual reports.

San Francisco (Collection Center)

Date Visited: October 19, 2009

The San Francisco Collection Center currently receives approximately 6,000 liters or 1,600 gallons per day. This is an increase from the last volunteer visit, in which they were receiving 1,800 liters per day. The current amount of milk is received from a total of 46 farmers. From my visit I was able to notice that this collection center was run very well. Equipment was in very good condition and no problems were of question. Also from my visit I was able to record the types of equipment, as well as sizes and model numbers that correspond. Finally, upon my departure I was able to instruct the technician on proper preventive maintenance for the cooling equipment that was being used. These detailed instructions can be found in the individual reports.



San Martin (Collection Center)

Date Visited: October 19, 2009

Currently San Martin collects approximately 4,200 liters or 1,100 gallons per day, which is received from 30 local farmers. This collection center was one of the smallest that had visited while in Nicaragua. This was based on their storage capacity which is currently 8,000 liters or 2,100 gallons. During my visit I was able to record the various types of equipment as well as the corresponding make and model numbers. Also I was able to instruct the technician on proper compressor maintenance which he told to me he was unaware of. This to me came as a surprise considering the good condition in which his compressors were in. The specific information that was recorded and the maintenance instructions can be found in the individual reports.

Nicarao

Date Visited: October 20, 2009

Nicarao currently manufactures a variety of cheese products that include Yellow Cheese, Marmite (mozzarella), Chiwawa and Crollo. These different types of cheese are pasteurized with the use of hot water that has been heated with the use of solar panels. On an average day Nicarao uses approximately 1,000 liters per day of hot water to pasteurize their cheese and clean the factory. Currently Nicarao is limited to the batch size of Marmite that can be produced due to a lack of proper equipment. Presently they are able to produce batch sizes of 50 gallons for Marmite. Upon my visit to Nicarao I was approached with many questions which required the time to research the answers to equipment sizes appropriate for their application. These questions asked include;

- Walk in cooler performance and how it can be improved.
- Find and spec out a machine that can package milk and cream in bags.
- Research a homogenizer that will work in conjunction with their current operations.
- Locate cooling tanks with new refrigeration units and provide them with a price.
- Evaluate the current cooling operations used and offer information on equipment improvements

Recommendations:

-Currently Nicarao has in operation a walk-in cooler that has recently not been able to keep to its set temperature. After some investigation I was able to conclude what was wrong that would cause the cooler to not be able to keep up. First off, the compressor that is running the system is under sized for the area that it is expected to cool, so I have recommended the appropriate size compressor in the individual reports. Also another reason as to why the compressor was not keeping up was due to it being in very poor condition. The picture below will illustrate the current shape of the compressor.



-When asked to find a machine that will be able to package milk and cream in bags at an affordable rate I visited the website of the International Machinery Exchange. I was able to find a variety of packaging equipment, for which I had chosen the best machine for their situation. To see the specific information please see the individual report.

-In order to produce good quality packaged milk a homogenizer must be used before the packaging occurs. The homogenizer is used to eliminate the skin which forms on milk if it is left to sit awhile and improve the shelf life of the product. A homogenizer works by mixing the milk at a microscopic level preventing it from forming skin, which many people see as a poor quality product. This however is not true, the skin that is formed is sanitary from the pasteurization process, but astatically it is unappealing to the consumer. The homogenizer that I had selected also comes from the International Machinery Exchange. Specifics pertaining to this equipment can be found in the individual report.

-Nicarao is currently looking for a pair of tanks to install at their, soon to be complete, collection center. They are looking for a combination of two tanks ranging in sizes of 400, 500, or 600 gallons. I was able to provide them with the prices for these tanks as well as new refrigeration units to power the tanks. The prices that I had received were provided by Bob's Dairy Supply, a company located in Dorchester, Wisconsin. To purchase a tank ranging in size from 400-600 gallons with a new refrigeration unit comes to a total of approximately 6,000 dollars each. This price includes all materials needed for installation, including gas to charge the system.

-While looking over the cooling system currently in place, I was able to spot a few areas in which improvements were possible. In order to cool the milk faster, the addition of a plate cooler installed on the incoming line would greatly improve cooling efficiency. Currently their 500 gallon tank is able to cool incoming milk from ambient air temp to 40 degrees Fahrenheit at a rate of four hours. This is normal operation, considering they fill the tank full of warm milk and then begin to cool it. The addition of a plate cooler would result in a cooler starting product, resulting in less work needed by the compressor to achieve the proper temperature. In addition, I was able to provide the technician with proper training regarding the preventive maintenance of the cooling equipment. Detailed instructions can be found in the individual report.



Alianza Nova S.A.**Date Visited: October 21, 2009**

Alianza Nova S.A. produces a variety of dairy products such as Gouda, Cheddar, Mozzarella, sour cream, butter, Chitlion (frying cheese) and Morolique. They also pasteurize approximately 25,000 liters of milk per day. Upon my visit I was able speak with the owner of the company and discuss his current needs in the factory. His response was that he had everything necessary to complete his factory, however, the only thing that was missing was the money to install all the machines necessary. After a walk through the factory I was able to see that they indeed have all the equipment necessary to complete their factory. The only thing that was missing was the appropriate power source to operate the machines. Which they have already purchased the transformer needed to create the appropriate power, however, they are lacking in financing in order to go through with their project. Currently to solve their cash flow issue, they are applying for a government grant in order to receive the money to follow through with their plans. I was able to collect information pertaining to equipment models and sizes, as well as provide their technician with the appropriate directions on how to properly maintain the cooling equipment. These details can be found in the individual report.

UNA University**Date Visited: October 14 and 22, 2009**

During my visit to the UNA University on October 14, 2009, I was asked to give a presentation pertaining to the operations of milking equipment and cooling equipment. The presentation that I had conducted for the students of the university consisted of a power point presentation with descriptive pictures on the various types of milking equipment. From these photos I was able to explain the process of milking a cow, and how each machine works in conjunction with one another to complete the task of collecting the milk from the cow with little effort and in such a short time. This presentation was given to a group of 31 students, 9 female and 22 male. After I had spent a short time on explaining the milking process and answering any questions, I moved on to explain the process of making cheese. During this part of the presentation I went into detail as to how the milk gets transported from farm to the factory, processed and delivered to the customer. Also included in this part was information explaining how a refrigeration compressor works and what important factors are necessary to keeping a compressor running at peak performance. After the presentation I was impressed with the number of questions I had received following my lecture. I could easily see the great interest from the students pertaining to the milk production and processing.



On October 22, 2009 I had a chance to visit the university farm where students have the chance to work hands on with the Nicaraguan agriculture. During my visit I was able to uncover a few interesting things that had been previously donated to the university from the Farmer to Farmer program. These items include a vacuum pump, milk cooling tank, cooling compressor, three milk buckets with milking shells, and a step saver with pump. Currently they have a small milking parlor like setup, located in a building attached to the cattle pasture. This is where the vacuum pump and vacuum lines are located. In a room adjacent to the milking parlor is where the bulk tank and compressor are housed, making this their milk house.



Recommendations:

-After an investigation of the current equipment. I was able to identify model numbers and equipment sizes for the items that are currently located at the university farm. Also I was able to identify the missing and needed parts in order to complete the basic milking parlor setup. For the list

of specific items located at the farm, as well as the specific items needed to complete the milking parlor, please see the individual report.

-My recommendations for the university farm include acquiring the needed parts through donation or purchasing to complete their current milking barn. I feel this would be an excellent place to introduce modern day milking equipment, allowing for the university to teach their students hands on, the process of milking by machine. I also feel the university would be able to take on the task of teaching local farmers about milking equipment by the use of clinics that could be held at the farm and taught by professors. These clinics could be held to the public at a small fee allowing for the university to benefit, eventually using the money to purchase updated equipment for their farm.

Follow Up:

-The need for improved milk quality is a must in Nicaragua. Throughout my visit I was able to see that there is a strong lack in milk cooling practices. This is an area that needs to be addressed. Currently many coops are recognizing this downfall in their operation and are taking the affirmative action to fix it. Continuing support in this area will greatly improve milk quality, resulting in higher prices to be paid to farmers for their milk.

-A second area of future interest would be introducing milking equipment to farmers on a basic level to improve the amount of milk produced on a daily basis. This can be done by the use of the UNA University farm to teach local farmers about machine milking. This can also be done by the instruction of future volunteers with a background in milking equipment.

- During my research I had come across a piece of equipment that may be useful if purchased by the Farmer to Farmer program. This piece of equipment is a portable milking machine that is entirely contained on a three wheel cart. The milking machine consists of a gas powered motor that runs a small vacuum pump that is connected to a milk bucket also contained on the cart. From the milk bucket a pulsator attached to a milking unit is used to collect milk from the cow. I feel this cart would be a useful addition on a typical farm because it is able to be self sustainable, meaning it runs off of its own power. This would work very well when milking cows in a pasture setting with no power available. For a machine with this capability it would cost approximately \$2000 dollars. Information pertaining to where this type of equipment can be found is located at the following website: <http://www.portablemilkers.com/page/page/1573150.htm>

Comments:

-I was very honored to be chosen to take part in the Farmer to Farmer program, and to travel to Nicaragua to give my knowledge in order for them to better their situation. I can honestly say that this trip for me was a life changing experience. I hope that the knowledge I have brought back as well as taken there can be of some assistance to the Farmer to Farmer program.

-Overall I feel the Farmer to Farmer program is doing a great job. Also I feel that they are heading in the correct direction in order to complete their objective of improving milk production in Nicaragua.