

**My Summer Internship Experiences at the  
International Livestock Research Institute (ILRI),**

**Addis Ababa, Ethiopia**

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## Introduction

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I have lived on my family's farm about 5 miles south of Albert City, Iowa, my whole life. My dad, uncle, and grandpa operate a farm together. The farming operation consists of raising corn, soybeans, cattle, and hogs. As long as I can remember, cattle have been my favorite species of animal to raise. My experiences have led me to my interest in becoming a veterinarian. I will be going to Iowa State University this fall, majoring in Animal Science - Pre Vet and hope to continue on to veterinary school after that.

Along with my farming background, I have been actively involved in 4-H and FFA. I have raised and shown cattle, hogs, sheep, and goats for projects at our county fair. Through raising livestock, I have learned a lot about responsibility, which started in the 4<sup>th</sup> grade with bucket bottle calves and grew into junior feeders, lead calves, sheep, goats, and also leading an

FFA cooperative called Corduroy Pork, where a group of six FFA members raised hogs to show at local fairs. I have also learned much through livestock judging. I have been on our county livestock judging team for 8 years, and it has taught me much about what characteristics to look for in any species. This January, I had the opportunity to judge at the National Western Stock Show in Denver, Colorado. I have also learned many leadership skills through these programs and have served as president and treasurer of my school's FFA, and secretary, treasurer, and president of my 4H club. 4H and FFA were two of the key organizations that started my travels with trips to Washington, D.C., Indianapolis, Indiana, Southeastern Kansas, Denver, CO, and various trips to Ames and Des Moines.

In high school, I have always tried to take challenging classes and strive to do my best in everything. I took many college credit classes, such as Pre Calculus, Calculus, Animal Science, and Crop Production. I was in a variety of activities, such as football, wrestling, 4H and FFA, band, speech, and other various groups.

I attended the World Food Prize Symposium in 2007, which is when I really became interested in applying for an internship. With the topic that year of food vs. fuel, and living near an ethanol plant, I chose to write about the country of Brazil, as they were the big talk at the time regarding ethanol production. After sharing my own paper, I listened to the interns from that year and their presentations. I was really impressed by these presentations, and an internship sounded like a very good way to spend a summer. I applied in 2008 and was granted an interview. After the interview, I came to realize that this was not the summer for me to embark on this adventure, with 4H trips to Washington D.C. and Kansas already planned, and several family events taking place. This is why two days after my interview I withdrew my name from consideration, to be sure that someone else could have the great experience that summer. I then

reapplied this year and was very glad to be granted an interview again. When asked which place I would most like to go, I said that ILRI would be the place for me. I have had a passion for working with livestock my whole life, and ILRI fit right into this. This time I knew what to expect during the interview, and I was much more poised and lacked the nerves from the year before. When I got the acceptance letter in the mail, I was with my calculus class on a trip to Houston, Texas to visit NASA, and I had to tell my sister to open the letter. I couldn't wait for the news until I got home!

Time after that seemed to fly, with graduation and other activities keeping me very busy and before I knew it, it was time to leave. I really did not know what to expect but nevertheless was ready to depart on my adventure, which has turned into a life changing experience.

## About ILRI

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The International Livestock Research Institute is a world of its own in the large city of Addis Ababa. Here the chaos of the city is replaced by trees, flowers, modern style buildings, and everything else that makes it feel almost like home. ILRI is composed of many organizations around the world that work here and perform research in a relaxing and safe environment. The sight in Addis Ababa, Ethiopia is one of the many branches of ILRI located throughout Africa and Asia, with the headquarters in Nairobi, Kenya. ILRI employs over 700 staff from 40 countries, with over 600 of them being nationally recruited, with the majority from Ethiopia and Kenya. ILRI's mission is "To work at the crossroads of livestock and poverty, bringing high-quality science and capacity-building to bear on poverty reduction and sustainable development for poor livestock keepers and their communities." The strategy implemented has three main focuses: "(1) securing the assets of the poor, (2) improving the productivity of their livestock systems and (3) improving their market opportunities." ILRI is funded from a variety



of government agencies, development banks, private foundations and regional and international organizations. ILRI is also supported by Consultative Group on International Agricultural Research (CGIAR). CGIAR is watching over 15 future harvest centers (including ILRI) whose mission is “to contribute to food security and poverty eradication in developing countries through research, partnership, capacity building and policy support.”

Livestock is the main focus here at ILRI, as it seen as the way to bring the poor out of poverty. This is greatly justified as the rural poor rely so heavily on livestock for traction, fertilizer, meat, milk, income, other by-products, and the use of lands unable to be planted to crops through grazing. “Of the 1.3 billion people living in absolute poverty, 80% live in rural areas and of these, two-thirds—some 678 million poor—keep livestock.” So, as you can see, targeting livestock is targeting the largest portion of the poor throughout the world. With the demand for livestock products projected to greatly increase in developing countries, this can be a way to bring many rural poor out of poverty. The livestock in developing countries are eating grass, forages, and crop by products, and transforming this rather unused resource into protein, fat, and micronutrients. Livestock can also be seen as portable savings accounts for the rural poor because they can reproduce and provide them with anything they need. ILRI is a key player in making sure that livestock are properly managed without abusing the environment, and are being raised sustainably so they can live up to everything they are said to be. This is what I have observed in everything the Biotechnology team here at ILRI does while implementing projects and activities. ILRI sees the livestock revolution as the way to bring many of the rural poor out of poverty ([ilri.org](http://ilri.org)).

# Trypanosomiasis Background

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Trypanosomiasis in cattle is the leading cause of mortality and loss of production throughout the horn of Africa. Trypanosomiasis in Ethiopia is a major problem, particularly in South and Southwestern Ethiopia and other areas below 1700m elevation.(Epidemiology #1) Tryps in short is transmitted by a special fly by the name of tsetse. When the fly is prevalent in an area, so is tryps. The three species of tsetse in the Ghibe Valley area are *Glossia pallidipes*, *G. fuscipes*, and *G. morsitans submorsitans*.

Tryps is not a new problem by any means, going back many years. The disease was treated most often with diminazene, isometamidium, and homidium. This was very effective in curing the cattle until the late 1980's when the disease became resistant to all three of the drugs. This caused many people to leave tsetse infested areas and the death of many cattle.

ILRI, by then called ILCA, really became involved with many different ways to try and control the disease. This was both going after the vector (tsetse fly), and trying to treat the cattle differently. It was found that even though treating cattle for tryps infection with diminazene, isometamidium, or homidium did not cure the disease, it did keep the cattle at a higher productivity level and often close to that of normal East African Zebu cattle. Other methods implemented and still continued today are the use of deltamethrin pour-on and traps to kill the tsetse fly. The use of the pour-on at first showed great reduction in the overall number of the tsetse and still continues to help reduce tryps infection rates among cattle. It has allowed the cattle to go into areas that previously they couldn't because of being bothered by the fly. This led to more productive grazing. The traps are located at the edges of the Ghibe Valley to help



reduce the number of tsetse coming into the area. This has been a great help to the area and the fertile soil that had to be left because of the tsetse infestation can now again be farmed.

The main project that is ongoing now at the research station is comparing four indigenous breeds of cattle: horro, sheko, abigar, and graughe. The project is near its end and is wrapping up with the results that the sheko are trypanotolerant and also interesting enough, that the horro respond very well to the diminazene shots and are very productive and the most productive with the shot. The abigar and graughe are both very unproductive in the tsetse infected region.

### **The Four Breeds a Little Closer**

Looking at the four breeds a little closer, I will start with the Guraghe. This is the Ethiopian highland breed which lives in the Guraghe and Hadiya highland areas in close vicinity to tsetse infested areas in the Ghibe Valley. The Guraghe are smaller in size, are chestnut, red, or roan in color, and have shorter horns. Next is the Abigar, who are found near the White Nile area, are of the Sanga group. They are large in body size, have long horns, and small humps representing the true Sanga. The third breed at ILRI research station is the Horro which is classified into the Zenga group of breeds (Zebu and Senga cross). They are medium to large in size, have medium to large horns, and are uniformly brown in color. The last breed is the Sheko, who are found in southwestern Ethiopia and are one of two native *Bos Taurus* breeds to Ethiopia. The Sheko are short horned or polled, do not have humps, are smaller in size, and are brown or black and white in color.

The Sheko also have one very unique trait, they are trypanotolerant. This means they can live with tryps and still have good productivity rates. A worrisome thing about the Sheko is that there are few purebred Sheko left. They have been interbred with the Zebu cattle they are often

being grazed with. So the next plan for ILRI is to multiply the Sheko in number using reproductive technologies such as embryo transfer and Artificial Insemination to greatly increase the number of Sheko. This will also come with a more intensive management to increase reproductive rates. ILRI sees the Sheko breed as being very special and useful to many areas not only being trypanotolerant but being very good in milk production and traction power.

### **Farmer Cooperatives**

To put a sustainable approach to the treatment of cattle for tryps in the Ghibe Valley, ILRI has helped to create farmer cooperatives. The cooperatives are in seven different areas located throughout the Ghibe Valley. Each cooperative has its own chairmen and leaders. The cooperatives are in charge of ordering the medication from private dealers and letting everyone know in their cooperative what date the ILRI technicians are coming for the pouring and treatment. ILRI's plan is to now train members of each cooperative to be able to treat and pour the cattle correctly so in the future the only job of ILRI is providing technical backstopping.

## **Problems Faced Once Research is Completed**

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ILRI has a common problem that is faced by many research organizations and other places like it, which is getting research and projects implemented and continued by the local community. The first problem that I have been able to witness through presentations put on by Dr. Tadelle and through talking with various people at ILRI, is that the different partners are very hard to work with. Ethiopia's government is a dictatorship, and it takes a lot of effort to get something that ILRI has worked so hard to begin to be continued by the government. For example, Dr. Tadelle's team created a comprehensive database outlining all of the major poultry

farms to help with disease outbreak, especially avian influenza. It is a database using a GIS system that has a map and is a very easy to use system to find all of the data. The plan is to put this map, which needs to be updated often, into the hands of the Ministry of Agriculture, so they can update it and use it for many purposes, including disease outbreaks. In order to do this, they must, in a sense, market the technology of the GIS system and their program to the political leaders through meetings and different opportunities just to keep the wonderful database they have created up and running. I have also been told that many wonderful programs created by ILRI and then handed over to the government have just kind of dissolved because of the lack of management and lack of care. This makes it very frustrating to go to all the work on a project, including securing someone to fund it, to end up with nothing.

It is also a very tough endeavor to get the farmers to accept/understand research outputs and use it. The farmers do not care about numbers or studies; they just care about things that are going to improve what they are doing. They also have a tough time understanding the concept of that more input can lead to more output. I talked with one man who says you have to show them that what you are doing is better. This may take many times of carefully demonstrating before you fully convince anyone. There is also the idea in the back of the farmers' minds that the government is using this to get more control over them or to make them pay more taxes. For instance, Dr. Woudyalew told me it was very difficult to get the farmer cooperatives started, as the farmers thought it was another way for the government to control them and to get more started it takes much convincing and showing them the coops that are already in place. So as you can see, it can be a very frustrating job working with research trying to help the rural poor when it takes so long for them to accept and use it. Like everyone says, you can find solutions to all of the problems, but the tough part is getting people to use what you have discovered.

One last thing that is very difficult for farmers in Ethiopia is the distribution of medicine in the private sector. When the farmers go to a privately owned veterinary office, they never know what they are getting. There is a trend for diluting things with water like the pour-on medicines, so they can make more profit on the product. Also, the prices in the private sector are very high for smallholder farmers. This is why ILRI and also the government have stepped in to help with the treatment of many animals throughout Ethiopia.

## My work

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The first day of work was one that which I would never expected. I was told my advisor Dr. Tadelle's office was in Research Building 2 on the second floor, and that is where everything would start. I met Dr. Tadelle just as he was arriving for the day, and the first activity of the day was taking me to the Zebu club for coffee. Right from the start, I could see Dr. Tadelle was very laid back and someone I could talk to about anything. After coffee and discussing briefly what I would be doing while here at ILRI, I spent the first day on the DAGRIS database learning about all the different breeds of cattle in Ethiopia. This was very interesting to me to see how diverse the breeds are and how they each seemed to have their own special qualities for the area they were raised in.

After the first day, I started reading research papers about trypanomiasis. I read about the history of tryps, the use of traps against the tsetse, the pouring of cattle to prevent tryps, the use of drugs and their effectiveness, and the trypanotolerant and suspected trypanotolerant breeds. I truly learned more than I could have ever imagined about tryps, and also the production of tropical cattle.

My first trip to the Ghibe Valley came very quickly, just over a week after I arrived. I was very excited but also a little nervous as I was not sure what to expect. I found out soon enough there was nothing to worry about and the Ghibe Valley was absolutely beautiful.

My first day of work began with a journey through the valley to ILRI's storehouse. This is where we collected the treatment and pouring medicine. After this, we drove up a rather rough road to an area where the farmers gather with their herds of cattle. The cattle were brought in groups of an average of fifteen, and kept just in their own little herds by their owners. I was amazed to see how the cattle owners knew exactly which animals were theirs and how content the cattle were to just stand and wait. Also, unlike what I was used to, there were no working chutes or corals. To my surprise the cattle were just grabbed by their horns or ears and hung on by one or two of their owners. If there was an aggressive animal, it would be tied to a tree or a wooden post would be held by two people in front of its rear legs.

After observing for a short while how the cattle were handled, I was able to help with pouring the cattle. For the first week, the application was 20ml per adult and 10ml per young of Biodelta. This is a pour on with the active ingredient of Deltamehrin, and has the main focus of protection against the tsetse fly, but also kills other external parasites like ticks. The product is applied starting from the neck, across the back line, and ending at the tail head. To have the pour on applied to the cattle the farmer must pay 5 Birr for a token for each animal to be poured from the farmers' cooperative, which I then collect when I have completed pouring the farmer's cattle. The pourings main focus is to kill the tsetse fly and keep them away from the cattle. However it also helps rid the animals of all external parasites and has really helped against tick infestation.

I was also able to assist in the treatment of the animals suspected to have tryps. The first question I asked was how they knew which ones had it, and I was told the farmers are very good about knowing when their cattle are sick and what it is. They said no tests were needed to test for diseases because the farmers knew the cattle that were sick. To treat the cattle first what had to happen was the mixing of the medicine. Depending on the area there were two treatments used, Veriben and Diminazen. The medicine came in packets and had to be mixed with water. For the Veriben each packet was mixed with 15 ml of water and for the Diminazen each packet was mixed with 12.5 ml of water. This was done carefully with safe water brought from Addis, and we used a graduated cylinder to measure the water into a big water bottle to mix with all of the medicine from the packets. We then took the mixed medicine and treated those cattle that the farmers also had paid 6 Birr for a token from the farmers' cooperative. The doses were adjusted to estimated body weight and were given at 1 ml per 15 to 20 kg. The needle was inserted first and then the syringe was attached and the treatment given. The toughest part of the process was getting the needle through the tough hide of the cattle, and it took a lot of force.

The only thing that changed was the use of ectopour instead of the biodelta that was used on the first trip. The application rate was the same as the biodelta being 20ml per adult and 10ml per calf. This came as a change only because of availability.

The work performed by ILRI is done over a period of a week, in what is up to 7 areas when it is dry enough to reach them all. The work is done for the farmers' coop in place who handles buying the medicine and the farmers paying for application. The main focus is helping the farmers have productive cattle in the tsetse infected areas. This is very helpful as it allows the farmers to farm very fertile ground that was never possible before because of the cattle becoming infected with tryps.

One thing that is very interesting to me is the difference in how many cattle are treated and poured. This varies largely from person to person and especially has a trend in each area. Some farmers choose to pour all of their cattle, others choose to pour just their oxen, some pour only cattle that are sick, and others pour none and just get the treatment. With the treatment I see that some farmers choose only those that are really sick while others treat a good portion of their herd every month.



## My Research

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### Sampling Method

I was able to assist on my two trips to Ghibe Valley the research on testing the cattle for tryps and their PCV levels. The data was collected from 23 cattle on the first trip and 23 on the second. The cattle were from the Gullele area.

The process both times started with the drawing of ear vein blood. This process was started by using a lancet to puncture the vein and then using two heparinized capillary tubes to collect the blood. The tubes were filled  $\frac{2}{3}$  to  $\frac{3}{4}$  full and then stuck into a tray of putty to seal



the end. This was done to all of the cattle selected for the month. Once the blood had all been taken the capillary tubes were put into a centrifuge. The centrifuge was run for 5 minutes at a speed of 12,000 resolutions per minute. The next step was taking the separated blood in the tubes and measuring the PCV levels. This was done using a haemocrit reader that measured by comparing the total amount of original blood in the capillary to the separated red blood cells that are in the bottom of the capillary. After the PCV level was recorded, the slide was made for observation under the microscope. The first step to make the slide was cutting the capillary tube with a diamond pencil slightly below the Buffy coat. The Buffy coat is between the plasma and the red blood cells and where any parasites in the blood would be located as they are lighter than red blood cells, but lighter than the plasma. The plasma end of the cut tube is then tapped lightly against the slide to put the Buffy coat on it and prepare the wet slide in this way. All of the capillaries were made into blood smears no matter the PCV level, to make sure there was no tryps. The blood was then observed for either kind of trypanomiasis *T. congolense* or *T. vivax*. I was only able to see the *T. congolense* strain, as I will further explain in my results. Tryps is identified by the shaking or vibrations of cells. For *T. congolense* this is in a tight bunch of cells and does not move very far compared to *T. vivax* that moves away more in a line form.



Figure 0-1 Drawing Ear vein blood



Figure 0-2 Taking PCV level



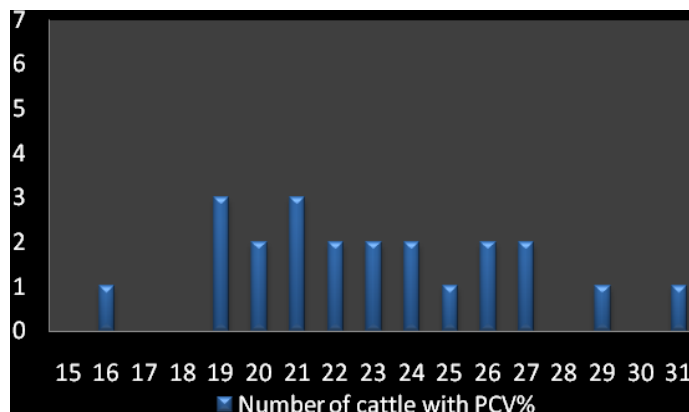
Figure 0-3 Cutting Capillary tube with diamond pencil



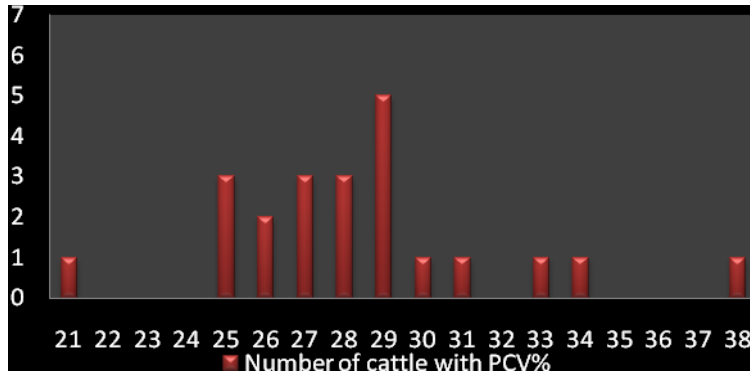
Figure 0-4 Preparing wet slide

## The Results

The results were very encouraging to see from both months. Out of both months of testing only one positive case of *T. congolense* was found. The average PCV level from the first month was 22.7%. The average PCV from the second month was 28.5%. The number of cattle for each PCV level is shown in the graphs below.



0-1 Month 1 PCV levels



### 0-2 Month 2 PCV levels

## Conclusions from Research

I felt that seeing this data even though it is a very small sample is encouraging to see that the program in place to help fight against tryps is working well. Only having one animal out of the twenty three from each month test positive is quite impressive.

The PCV levels rose dramatically from the first month to the second one. This comes as an obvious increase in feed availability for cattle. When we arrived in June the rainy season was late and it was just starting to rain. The landscape was full of green vegetation on our second trip as the rain had been coming since our first stay. This dramatically increased PCV values and just shows that the cattle rely on grazing for their main source of feed.

One strange thing that occurred was the positive tryps case came on our second visit. This was when PCV levels were much higher and the norm is for tryps to be less prevalent in this case. However, it is possible that this case was missed or in its very early stages and difficult to detect the month before.

Overall the research shows that the traps to catch the tsetse flies, the monthly pouring, and selective treatments are doing a good job to help the farmers cattle fight tryps. The cattle not having tryps is vital to the farmers so they are productive plowing the land and for reproducing. This kind of control can hopefully be developed by many areas of Ethiopia and greatly increase the productivity of all of the cattle here.

## Cultural Experiences and Other Things Learned from My Internship

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The internship has truly been a life changing experience for me. I have learned much more than the research, which is what I have come to realize that this internship is all about. I feel that, to start with, the people of Ethiopia are very friendly. Everyone at ILRI was very kind to me and really took good care of me while I was here. And the friendliness does not just stop inside ILRI, but everyone in Ethiopia is courteous and helpful in every way. It has been very interesting just meeting random people who just wanted to meet me and visit with a foreigner. While I was in the countryside helping to pour cattle, I met a man who was an English teacher in a primary school who had run for a long ways just to meet and converse with me because he saw me pass by in the pickup. It was very interesting to me that he asked my opinion of everything and what the next steps should be to make life better for Ethiopians.

One experience I had that I will never forget is being able to plow with oxen. This is the way almost all of the farmers in Ethiopia work the land, and it was really awesome to be able to partake in this. The plow is run by two oxen that are tied together with a wooden harness where the plow shaft is attached to. The plow is made up of two wood pieces to make a V and a metal point for the front. The job of the person is to hold the plow in the ground and steer where it is

going while keeping the oxen going with the whip. At first this was a little difficult but after a little getting used to it I really got the hang of it. The toughest part for me was getting the oxen to turn around at the end, as they kind of just want to keep going. The first time turning them around they almost ran away from me but after a little experience I also got the hang of this. Being able to plow really gave me a deep respect for the farmers of Ethiopia as it is very time consuming and much harder work then sitting in a tractor like in the United states. But one thing I also noticed is the farmers really seem to enjoy their work and care for their oxen very well. This was a very big change for me running a 4 wheel drive tractor to a pair of oxen.



The change in food was really also an experience for me. Unlike the US, where our animals are fattened before taking them to market, here the animals are rather slim and are much older. This makes the meat need much more added to it and different cooking for it to have good flavor. They often use peppers and onions to add most of the flavor along with other spices. This makes the food spicier which I was not use to at first but really came to enjoy. Also, traditionally all meals are eaten with enjera, which is like a sponge type bread in which you use your hands to pick up the food and eat it. It's frowned upon at home to eat with your hands but here it is the culture. I really enjoy this part of eating the food! Also, it is part of the culture to

eat from a single large pan sharing with everyone you are with. This is really cool and just goes to show how friendly everyone is here. One last change with the food was that the portion sizes were much different than that of the US. This took some getting used to eating much less, but I see now how much more correct this is. It also brings the question to me of why we have to eat so much more than what we need in the US.

## A Different Kind of Experiment and the Questions It Raises

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Dr. Azage, through many talks at the Zebu club, has also helped me put a different view on my internship. This was to think of myself as an experiment in a way through the adventure of coming to Ethiopia. It is actually a very interesting way at looking at it as it shows everyone in my family and community that it is not as bad as people really think it is. As an example for the first two weeks my stomach was a little queasy from the food and water differences, but it is not like I didn't survive. It can really show that maybe everything that we are doing in the United States to reduce all the bacteria in our food and water isn't always a good thing. Maybe we are just weakening our immune systems to the point that with one little bit of bacteria we get sick.

There are also many things that have been able to take away that can only come from looking in from the outside. It has really opened my mind up that things you do anywhere in the world affects everything else. With global warming putting great changes to the climates of many developing countries, it really shows that many people's abuse of fossil fuels has made it tough for people who rely on the rain for drinking water, crops, livestock, and, in Ethiopia, electricity. So it just really makes me also think of the question of if we are living sustainable

lives and thinking of future generations. It is interesting to think about and something that we can look to places like Ethiopia who have been around for a very long time for some possible advice.

This internship has truly been a lifetime experience in which I have learned so much not only about research but all of the differences in a developing country. It has shown me so much that will stay with me for the rest of my life. I hope that someday I will be able to come back and give back to the people of Ethiopia for everything they have given me.



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