



goat milk?



## ▶ "Goat Milk?"

Perceptions of Goat Milk and Patterns of Consumption in Abergelle District

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### ***About Me***

At the wise old age of 4 I had my entire life planned out. I had already decorated my Barbie house to match my future home, I had mapped out the land I planned to buy and plotted exactly where each barn and animal would be, I knew which college I was going to (mostly because it was all I heard about during basketball season), and I knew, beyond any shadow of a doubt, that I was going to be a veterinarian. My mom still has the newspaper article in which we were interviewed as kindergartners for what we wanted to be when we grew up, and I am proudly quoted as saying that I wanted to be a veterinarian so that I could listen to animals with my “telescope”. Since my days as a kindergartener, I have learned a few more things about the world I live in and the person that I am, including the difference between a telescope and a stethoscope; I have realized that there are some things that you just aren’t prepared for as a 4 year old. But it will forever be that first spark of interest in the animal industry which grew into a wildfire that has carried me to this point in my life.

I hail from the small but ever-growing town of Nicholasville in Jessamine County, Kentucky where I am currently a senior at West Jessamine High School/Jessamine Career and Technology Center. I grew up in a divorced household as the one and only child, and I spent the majority of my time running free down on the farm with the goats and occasional cousin as my playmates. My family has been involved in multiple agricultural endeavors, including tobacco and other crop production, beef production, and my absolute favorite: goat production. When I reached high school I had a healthy background in all things ag, but I was unrefined, as some would call it. I was an incredibly shy, meek, quiet little freshman, weighing in at a whopping 90 pounds. My first day of high school was probably the most dreaded experience of my life, because I was thoroughly convinced that I was going to get shoved in a locker by a senior. I could wrestle an animal 10 times bigger than me, and yet I was still completely terrified by the world outside of the rural life I knew. Something else you should know about my high school career: I have always been deemed “advanced” throughout my education, meaning I’ve been placed in all of the higher level classes. I took 8 AP courses over my past 3 years, as well as numerous other accelerated classes. This being said, I’ve never quite fit in the presumed demographics of Jessamine County. It still amazes some that I can have such a strong agricultural background and yet be thoroughly capable academically, a stereotype I loathe and wish to see completely blown out of the water for the sake of all ag kids.

My very first class of my very first day of high school was Principals of Agriculture with Mr. Simpson. From the moment I sat down and really experienced my first agriculture class, I have been hooked and haven’t lost interest since. For the first time in my life I could put a name to my life outside of academics. I could learn about the world around me in a new light, with people I could relate to for the first time in a classroom setting. I put a name to the concept I had fallen in love with from birth: Agriculture. And once you light that kind of a fire under someone, there’s no stopping them. I soaked up every chance I had to learn something new about ag. I joined and excelled in my local FFA and 4 H chapters. My first two years of high school were spent learning and experiencing and creating a strong foundation on the backbone of my heritage and the shoulders of my FFA chapter. I competed all around the state in speaking contests, because suddenly I wasn’t shy anymore, and there was a powerful voice hidden in the timid little girl. I also strove for knowledge in my animal science classes and competitions, becoming proficient in varying areas that I hadn’t previously dealt with in my own farm experience. I became heavily involved in the leadership of my FFA chapter, becoming the Public Relations Committee Chair, then the chapter Reporter, and finally becoming our chapter President this year. I am also the Regional Vice President, giving me a chance to interact with other chapters here in Kentucky. I say all of this because I attribute

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where I am today to the FFA, and that I would never have found such an outlet that has put me on the path to the World Food Prize and other aspects of my life without it.

My freshman year I had been a member of my Agricultural Issues team, in which we traveled our community discussing where our food comes from and how food affects our everyday life. It was during our research for this presentation team that my advisor stumbled upon the World Food Prize Global Youth Institute. He informed me and a fellow member of my team about the opportunity to learn more about this subject that we had been very passionate about during our time together presenting. The other member of my team, Katie Cross, was a year older than me, and she attended the Institute my sophomore year. I still remember the day she came home talking about it; she was so excited. It had really opened her eyes and she talked about how amazing it was. Of course, I was super excited to also be given this opportunity the very next year. This brings us to my junior year, in the fall of 2012, when I finally had my own chance to travel to Iowa for the Youth Institute. I left Kentucky on a tiny jet plane bound for Des Moines, and I came home a different person, honestly. I can't really say that I knew what to expect when I arrived at the Institute. This was the closest I had ever been to this level of my agricultural world. This was the first time I was able to see that there really is something bigger than my own little community, and for the first time I really felt connected to the world outside of Jessamine County. I had always heard about world hunger, I knew the statistics, and I had heard the names. I had even spent some time learning all about Norman Borlaug. It was amazing to see it all in real life, to put a face and a cause with Mr. Borlaug's name, to see all these people that I had previously only read about. My favorite story to tell about my Global Youth Institute experience was walking into that very first breakfast and running into the Princess of Jordan and the Secretary of the UN. The fact that I, this little girl from Kentucky, was that close to a Princess, of all things! I think that pretty much sums up my entire awe at this past year's journey with this organization.

By the end of my three days in Des Moines I was beyond excited because I finally had something I felt like I could really do, something bigger than just my small community that I had been working with. I was thoroughly aware of the hunger problem in Kentucky alone, but now I was fully aware of the global hunger issue as well. My entire life I have strived to do something, anything, to help someone else. I believe in living to serve. I have always wanted to know what was out there, wanted to know how I could possibly fit in somewhere to help someone. That's why I first became interested in this opportunity. I found the potential for this on the Saturday of my Institute, as I sat listening to these people, who were my age, talk about their experiences abroad. I won't lie, at first I scoffed at the idea of even applying. There was something in me that wanted nothing more than to try for the internship, and there was a part of me that knew I could probably do it. I think my FFA advisor saw that, because without her encouragement I don't know if I would have ever had enough confidence to pick up the application in the first place. But I took it home to Kentucky and thought on it a little harder. When I got home, we hit the ground running. I've always been kind of crazy, and when I find something I love I just run with it. We put on a Hunger Banquet like we saw at the Institute to raise support for our Thanksgiving Food Drive. Here, I talked about what I had seen at the Institute, and I truly believe people were interested. I presented about the experience to some classes, and to our Board of Education. It was amazing how much support we were able to raise for hunger awareness when we really put our mind to it with the fuel from the World Food Prize Institute. All the time that I was watching my FFA chapter getting excited about helping our community, I was tossing the idea of this internship around in the back of my mind. Three days before the deadline, I finally decided to take a chance and go for it. Never did I ever believe that I would get called back for that second interview. I knew I could do it, and I knew that there was nothing more I wanted than

to find out what I might be able to do for someone else on the other side of the world with the experience I had. But the idea that someone from Kentucky, from my background, could even be considered for this amazing opportunity was just unthinkable for me. I can still remember the odd looks I got from members of my community when I told them with joy that I would be spending two months working in a livestock institute in Africa. I was backed by nothing but loving support, but it was still just an odd idea for everyone around me. I have woken up every day since my internship completely humbled and still shocked. I can honestly say that this experience changed my life, and I am beyond thankful that I had the opportunity.

### *Two Month Duties in Africa*

For my two month internship I had the pleasure of travelling to the contradictory country of Ethiopia. I say contradictory because I’ve always believed Africa to be hot, dry, and desert like. Arriving in Ethiopia during the rainy season, I had to keep my heater on at all times in my hostel and I made sure I never went anywhere without a sweatshirt. For the majority of my time I stayed on the ILRI campus. ILRI, the International Livestock Research Institute, is headquartered in Kenya but also has a site in Addis Ababa, Ethiopia, the capital city where I stayed. Here, the Institute is host to over 13 various other international institutes, hosting a staff of over 600 people from all around the world. The research in Ethiopia is focused mainly on productivity and value chain development of crop and livestock systems, as well as focusing on reducing market vulnerability through development, risk management, and diversification. The mission statement of ILRI is **“to improve food and nutritional security and to reduce poverty in developing countries through research for efficient, safe, and sustainable use of livestock-ensuring better lives through livestock.”** It should also be noted that ILRI is a member of the CGIAR. CGIAR, or Consultative Group on International Agricultural Research, is a global partnership for a food-secure future. This group is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources through scientific methods and research. The work of the CGIAR is carried out by 15 research centers globally. It is said that one dollar invested in CGIAR research and work programs results in about a \$9 impact. Mostly, the CGIAR works to fix developmental problems and ease research by collecting donors together in a way that can enable scientists to focus on their work. This makes the program incredibly efficient and has resulted in a multitude of scientific breakthroughs and progress in the fight to end world poverty. ILRI has been a major contributor in a large number of these poverty reduction initiatives. It was amazing to be that close to the root of a lot of major scientific breakthroughs and working side by side with some extremely important people.

During my two months in Ethiopia I was placed under the Food Safety and Zoonoses unit at ILRI, specifically on the “Safe Food, Fair Food” project, with Dr. Barbara Szonyi. The main goal and purpose of this ILRI unit is to **“combine risk analysis from veterinary epidemiology and cost–benefit analysis to identify, test and adapt appropriate options for food safety assurance and control of zoonotic diseases within the context of developing countries.”** Under this program are the four major areas of study: Emerging Infectious Diseases, Food Safety, Neglected Zoonoses, and One Health/Ecohealth. I worked with the Food Safety area, where I was put to work studying the value chains of Ethiopia in regards to how livestock and people relate to each other, and how this relationship can indicate the relative safety of the food these people consume. The goat value chain is especially important in the Northern regions of Ethiopia, where my own project was conducted, but in a broader sense the

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project is lighting new paths for all areas of safe food research. It is an accomplishment to be able to sustain oneself in the harsh world of hunger we live in, no doubt. But what good is it to have livestock if they are not healthy, if they are a hazard to a people’s health as opposed to a help? I did not choose to be placed in this unit, however I cannot imagine a better place for me to be. It combined everything I felt strongly about from the very beginning: the correlation between a healthy animal and a healthy human, the importance of livestock to all areas of life, and the practical need to solve hunger problems and food inadequacies at the root, which is all too often a zoonotic disease.

Being placed with the Food Safety and Zoonoses unit, I was able to meet a very remarkable woman who I am beyond thankful for and miss very much now that I have returned home. Barbara Szonyi joined ILRI on June 17, 2013 (very close to my own arrival) as a Post-doctoral Scientist – Veterinary Epidemiologist in the Food Safety and Zoonoses Program. Barbara holds a PhD specialized in Diagnostic Epidemiology, Infectious Diseases and Ecology, and also has Doctor of Veterinary Medicine from Cornell University. Before joining ILRI she worked as Postdoctoral Research Associate in the Department of Veterinary Integrative Biosciences College of Veterinary Medicine, at Texas A&M University College Station. She is from Hungary and helped me along every step of the way.

Also while at ILRI I met one of the most inspiring and encouraging people I’ve ever known, Tigist Endashaw. She is the Capacity Development director at ILRI and spends most of her time coordinating travel plans, interns, and new arrivals. She was incredibly helpful the entire time in sorting out everything that went far above my head.

These two women, along with innumerable others, were the driving forces behind my project and my experience in learning while I was in Ethiopia.

### ***My Contribution***

My first official ILRI duties, besides shaking hands and answering questions about America with literally every single person on campus, were to do a little research digging into the fundamentals of the value chain process. I wrote up my conclusions on what exactly the value chain involves, as well as the research done thus far. I also tracked patterns amongst the research already done with the value chains. All of this I turned in to Barbara at the end of my first week. Being brand new at ILRI herself, Barbara said this would all help her get oriented and was what she would have had to have done anyways once she got settled in. But this also gave me some level footing as well, considering I was still fresh off the jetlag kick and had to align myself with my two month educational journey. The following is my first contribution which was handed to Barbara and stands as a good starting point for both of our journeys with ILRI:

### **Value Chains**

A value chain in its general definition is the process following a product or service from its conception/production to the final market and consumption. As we move along a value chain, it is assumed that value is added to the product. The chain is a vector for the movement of finances and technology from producer to consumer, as well as a method for tracking the preferences of producers and

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consumers. The method most used in value chain work is Value Chain Analysis (VCA) programs in which questions and studies are asked of locals and those involved in the chain. A flow chart is made to organize the information and make it efficient to track. The following is a list of things to be considered in the sheep/goat value chains:

- Overview of the market in the area, breeds of sheep/goat, major contributors to the market
- Rules/regulations, prices, etc. set for the market
- Constraints and opportunities in production
- Major suppliers, relationships between producers and consumers, characteristics of buyers
- Flow of trade, where trade takes place, seasonality of trade
- Effect of seasons on supply/demand of livestock
- Amount of product needed annually, consideration of shortages
- Feed: types available, price, trends in market, availability, relationship with feed traders, ability to buy on credit, sources of feeds and their vulnerability to seasons, rules/regulations in the market on production of feeds for the livestock
- Major livestock diseases in the area, availability of vets in area, gaps in efficiency of vets/medicine, source and availability of medicines, local rules/regulations on drugs, licensing of vets, etc.
- Welfare of animals in common vet practices/drug use
- Major constraints on the veterinary system and its development in areas
- Credit and Financing systems: availability, farmer knowledge and awareness of, constraints on growth, communication of funds and payments
- Transportation: how animals are transported to market and their welfare during this, safe handling practices of the animals during transportation (or a lack thereof), rules/regulations on transport of livestock in the area, mortality/weight loss rate of animals during transportation, opportunities and constraints on transporting livestock.

Site: <http://www.slideshare.net/ILRI/vca-approaches-nov2012>

Legese, G. 2012. Approaches to value chain analysis for sheep and goat value chains development in Ethiopia. Presented at the ICARDA-ILRI Training on Tools for Rapid Assessment of Sheep and Goat Value Chains in Ethiopia, Addis Ababa, 5-8 November 2012. Aleppo, Syria: ICARDA.

### **Goat Value Chains in Yabelo District in Borana Zone, Ethiopia**

Efforts were made to examine the goat value chain in Borana. They interviewed the community members, hotel managers, butchers, and veterinarians. Observations were made about goat health treatment and veterinary medicine in the area. Also, living conditions were examined, breeding practices, feeding and production. Problems addressed include lack of feed conservation, lack of good genetics in breeding bucks, lack of knowledge about inbreeding, lack of proper medical attention and drugs in an area of high prevalence for goat diseases. This is mostly important because there is becoming a problem genetically with inbreeding and lack of breeding bucks. Also within the value chain there is a lack of a controlled market, with no standard of buying and selling. Markets are very far from production areas,

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and there is a high cost for transportation. During the study, the value chain was identified, along with major contributors. Major constraints to the area were identified. Methods include observation, interviews, and secondary data review. Conclusion is that Borana has a great potential in the goat market, but that necessary intervention is required. This conclusion is useful as the researchers now know where to send in extension services, etc.

Site: <https://www.slideshare.net/ILRI/vca-borana-apr2013>

Husen, N. 2013. Goat value chains in Yabelo district of Borana zone, Ethiopia: Results of a rapid value chain assessment. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Lowland Sheep and Goat Value Chains in Ethiopia, Debre Zeit, 1-2 April 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish.

### **Value Chain Analysis of Sheep in Atsbi District of Tigray Region, Ethiopia**

Examination of the value chain system and sheep production in Atsbi. Participatory Rural Appraisal (PRA) tools, Focused Group Discussions (FGD) used, as well as interviews from key informants and visual observations. Problems found include: limited veterinary care, shortage of transportation available to transport farmers and their products to markets, feed shortages, lack of credit flexibility, production constraints (including: poor housing for animals, traditional breeding methods, high incidence of parasites/disease, lack of knowledge on sheep production/market). Conclusions and results find that there is a large dependence on the sheep market in Atsbi. Sheep are used for many things, like milk and meat. People depend on them during festivals, as a source of wealth/income, and for health purposes. There is a low quality of sheep being introduced into the market. The value chain is highly inefficient, a little attention is given developmentally to the area. The main conclusion is that agencies need to design strategic intervention plans for this area.

Site: <http://www.slideshare.net/ILRI/vca-atsbi-mar2013>

Kidanu, E., Regassa, M. and Legesse, G. 2013. Value chain analysis of sheep in Atsbi district of Tigray Region, Ethiopia. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Atsbi sheep and Abergelle goat Value Chains in Tigray, Ethiopia, Mekelle, 19-20 March 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish.

### **Safe Food, Fair Food: lowland goat and sheep value chains in Ethiopia**

Main idea: food that is safe being spread evenly across a population. This study focuses on protecting the health of poor consumers, and safeguarding the livelihood of poor livestock farmers and other actors in the value chain. Problems include the risk factors of the value chains and the various zoonoses/diseases identified in areas, and how they contribute to the food safety of the markets. Evaluated the value chain using VCA, focus group discussions with villagers, appraisals of local farms, relationships between producers/consumers. Results include the following: consumption of raw milk is common in these two study areas (Borena and Shinelle), leading to disease; people will consume milk that smells dangerous, and meat that looks/smells dangerous; producers get more nutritionally from the meat and milk, and it is less available to town people. Decided that people should boil and sift out the dirt/hair in the milk, and

cook all meat thoroughly. Avoid meat and milk that smells different. Should avoid all meat that has been affected by disease. Useful in being able to realize where to send in education and intervention in helping people realize what to do/not to do.

Site: <http://www.slideshare.net/ILRI/vca-sfff-dzapr2013>

Rischkowsky, B., Dewe, T. and Rosel, K. 2013. Safe Food, Fair Food: Summary of findings within lowland goat and sheep value chains in Ethiopia. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Lowland Sheep and Goat Value Chains in Ethiopia, Debre Zeit 1-2 April 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish.

### **Mapping of poverty and likely zoonoses hotspots**

In this study the research focused on identifying prevalent zoonoses in three categories: endemic, outbreak/epidemic, and emerging. They prioritized 56 types of observed zoonoses and identified the hotspots where these zoonoses were prevalent. Zoonoses were ranked based on previous reports of the diseases as well as observed prevalences. The diseases were tracked and recorded according to their hotspot area, and this data was mapped out to identify visually where the diseases were most impactful on poor farmers. The results found that there are flaws in the world’s current mapping technique of zoonoses and that the most important ones have been located and ranked. This should lead to further studies and research/intervention to be done in these areas. Now that it is known where the hotspots are and what the major zoonoses are in those areas, efforts can be made to reduce these diseases and further advance these areas into a more food secure state.

Site: <http://cgspace.cgiar.org/handle/10568/21161>

Grace D, Mutua F, Ochungo P, Kruska R, Jones K, Brierley L, Lapar L, Said M, Herrero M, Phuc PM, Thao NB, Akuku I and Ogutu F. 2012. Mapping of poverty and likely zoonoses hotspots. Zoonoses Project 4. Report to the UK Department for International Development. Nairobi, Kenya: ILRI

### **General Trends over 7 sites across Ethiopia: Safe Food, Fair Food Integration of Small Ruminant Value Chains in Ethiopia**

The seven sites studied are: Atsbi, Doyogena, Horro, Menz (sheep), Abergelle Amhara/Tigray, Borena (Goat), and Shinelle (sheep and goat). At all sites the nutritional benefits, food safety/risks, value chains, and techniques were examined. The research was conducted through interviews with locals involved in the value chain, such as producers, consumers, butchers, etc. The proximity and importance of different sources of small ruminant meat/milk was examined. It was also brought to light the importance of these animal products in the diets of small children.

Abergelle, Atsbi, Doyogena, Horro, and Menz were characterized as smallholder mixed livestock/crop production systems; Borena and Shinelle were pastoralist/agropastoralist sites.

- Abergelle is actually split into two sites, Tigray and Amhara. Generally they are similar but at times they differed during the study, so the difference was noted.

Religions: Ethiopian Orthodox Christian, Protestant, and Muslim, with the majority being Orthodox.

Small-ruminant production and its variation across seasons were examined. It was generally the same across same species areas. In the highlands, sheep production occurred more with climate, and in the non-highlands area it was more seasonal. Goat production was highly seasonal across all goat sites.

Meat Production: the availability of meat was dependent on season across all sites. The demand for meat aligned highly with religious festivals and fasting periods. Production peaked at 3 major times a year: April (Ethiopian Easter), September-October (New Year, Meskel, Eid al-Fitr, Arafa), and December-January (Christmas, Muslim MAwlid, and Timkat). People fast about 70% of the year in these areas.

- ~ Borena: prioritization of red meat in the diet, leading to higher rates of consumption at this site than at others.
- ~ Abergelle and Shinelle: farmers sold sheep and goats during food shortages to generate income.
- ~ Urban consumers in Dire Dawa (close to Shinelle) consumed meat much more often. Reported eating it 1-6 times a week.

Milk Production: 40% of yearly milk production occurred during August and September. If there was excess milk, it is given to young children/pets, or made into butter. Milk typically consumed first by the household then by local friends/relatives, then sold to villagers.

General constraints to small ruminant production according to producers across sites:

- |                             |                              |
|-----------------------------|------------------------------|
| • Disease                   | • Lack of finance            |
| • Feed Shortage             | • Water shortage             |
| • Lack of Breeding Programs | • Lack of supplementary feed |
| • Lack of Market access     | • Lack of housing            |
| • Predation                 | • Poor management            |
| • Land shortage             | • Consumption demands        |

Sites with the largest percentage of flock deaths due to disease were: Borena, Doyogena, Horro, Menz.

Sites with largest percentage flock deaths due to starvation: Atsbi, Shinelle.

Top 5 diseases of sheep morbidity across sites:

- Respiratory disease
- Liver disease
- Diarrhea
- Coenurosis
- Enterotoxemia

Top 5 for goats:

- Respiratory disease
- Diarrhea
- Coenurosis
- Peste de petits ruminants (PPR)
- Ectoparasites

Disease burden generally attributed by farmers to the lack of veterinary care. Specifics:

- ~Borena: lack of vet care, drugs, diagnostics, faulty vaccines
- ~Horro: lack of disease control education, grazing on swampy ground
- ~Doyogena: abuse of drugs, shared grazing
- ~Shinelle/Menz: poor nutrition
- ~Horro/Menz: environmental factors (ie climate variability)

Feed Shortages typically attributed to shortage of land/water. Specifics:

- ~ Doyogena/Menz: climate change
- ~ Abergelle Tigray/Atsbi/Shinelle: deforestation and erosion
- ~ Menz: high density of animals
- ~Abergelle Amhara: increased enclosure of grazing lands
- ~ Borena: God's Will

Quality Perception: the main factors in meat quality and safety examination are color, smell, and consistency. Dark color with a foul smell are most common in determining unsafe meat. Overall people like fatty animals, as this is indication of a well fed animal except at the Abergelle Tigray site where lean meat is preferred (fat is a health concern here). Smell and appearance were indicators of good/bad milk. People were generally more aware of concerns related to milk. Found that, overall, deficits in animal health, hygienic slaughter practices, and producers' knowledge of safe meat storage and handling were root causes of quality and safety issues.

See tables in report.

Consumer Perceptions: Small ruminant meat considered most nutritional at all sites. Most important meat/animal product at Abergelle and Doyogena. Borena did not value sheep meat, considered it to be lower nutritional value than goat meat. Shinelle valued sheep over goat. In Shinelle sheep meat considered to have medicinal properties, and same for goat meat in Abergelle. Problems reported with milk consumption occurred only at Abergelle/Shinelle (diarrhea) and Abergelle Tigray (early onset of puberty in girls).

Taste: sheep meat in Abergelle, Atsbi, Borena, Menz and Shinelle = higher taste than goat. Goat ranked poorly in taste for Abergelle and one village in Borena.

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More trends:

~ At all sites, only women prepared meals. Occasionally men would purchase meat, or women would. Decisions regarding milk made only by women.

~ Women not allowed to drink milk in Abergelle

~ Women overall seen to be more susceptible to cancers and lung problems due to most exposure to smoke, carcinogens during meal preparation.

~ Animals dying of disease typically avoided, unless in poor areas or there is no alternative.

~ Milk from sick/mastitic sheep/goats avoided at all sights. In Abergelle Tigray milk of abnormal color still consumed after amount of boiling time.

~ Children given small ruminant foods (milk, meat) to aid in growth and development. Milk most common for sick children. Paper discusses health risks and possible solutions at end.

### ***My Contributions (cont.)***

From here, Barbara and I began thinking about something that I could do that might stand as an additive to the Safe Food, Fair Food project and benefit in some way. We noticed a trend in all research done thus far that showed how important goat milk was to certain value chains. Therefore, we decided to hone in on this. We developed a project in which I would study the patterns of consumption and generally get a feel for the goat milk perceptions in the Abergelle region, specifically the villages of Tanqua and Zaquala. To do so, I spent the second week of my internship developing a three page questionnaire with which to interview farmers, while Barbara and Tigist coordinated with the Biotech unit to find transportation to the region (I traveled with the Biotech unit while they conducted research in the Abergelle region as well) and find some plastic Falcon tubes with which I would take samples from those farmers who were willing.

The following is a write up of the results of the Questionnaire, a copy of which can be found in Appendix 1.1.

## **General Findings in Abergelle Milk Study**

### Perceptions on goat milk

Several questions were asked in the questionnaire process to determine the general attitude and perception of goat milk. Generally, the perception on goat milk was positive, with few problems reported. All 11 respondents from both villages said that they both like goat milk and find it to be important. Each respondent also gave reasoning for why they believed the milk to be important: 9 out of 11 respondents say that milk is important for strength and muscle development, 4 out of 11 find it important as a source of income, and 3 out of 11 named other various benefits, including cosmetics and consumption. 8 of the 11 respondents said simply “Yes,” that goat milk is healthy; 1 said no due to diseases; another said that it is generally healthy and when it isn’t it is given to pets; and 1 respondent said that “they don’t care about health, they just drink it.” The answers on milk safety resulted in 8 out of 11 saying yes, it is safe; 3 out of 11 saying yes, with exceptions; and 1 out of 11 did not perceive goat milk to be safe. Those who claimed

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it not to be safe attributed this to many factors, including: potential for diseases, mishandling resulting in spoilage, and contact with threatening diseases such as TB and malaria. Generally, milk presented itself to be safe for consumption, as 8 out of 11 respondents report never having been sick from goat milk, with 2 of 11 saying yes, they have been sick, and 1 respondent reporting having seen someone get ill from goat milk. The general symptoms from milk sicknesses include diarrhea and “malarial symptoms” (cold shakes, etc.). One respondent said that they believe only people who are not adapted to the area and to goat milk are the ones who typically get sick off of goat milk. There was also a large array of opinions on the risks associated with goat milk, as well as methods to reduce risks.

Risks	Risk Management
Disease (Diarrhea, malaria, TB, parasites)	-Boil the milk -Add salt -Smoke and clean container
Storage (improper storage leads to exposures, might spoil, might not be clean)	-Clean containers -Lids, close containers properly -Store in cool areas
Transportation (takes too long to get from milk to home, might not be sealed properly during transportation)	-Use/store products soon after milking -Be quick to get the milk back and out of the sun
Temperature (sun exposure, color change)	-Store in cool place -Keep out of contact with sunlight -Add cool water to the milk

### Goat Milk Production

Goat milk production was determined by a series of multiple choice/open-ended questions that allowed for classification of producers/consumers as well as respondent methods for goat milk usage. The production of goat milk and its uses remained fairly consistent, with slight variations across households for children. 10 out of 11 respondents classified themselves as both producers and consumers, with 1 respondent saying he is only a consumer (had no goats, made comment that he wished he had a goat herd of his own). This respondent with no goats claims to get all of his goat milk from friends and neighbors. The majority of responses report storing their milk for 2-3 days (5 out of 11 say 2 days, 6 out of 11 say 3 days). The typical products and uses of goat milk were: butter (11 out of 11 respondents), yogurt (9 of 11), raw drinking milk (9 of 11), cooking purposes (3 of 11), and 7 out of 11 reported other products (cheese and whey). The methods for making these products were fairly consistent, with small variations among respondents. Typically, children were given the same types of milk products as adults, with little variation in preparation. 4 of 11 respondents say there is no difference in the way they prepare milk given to children, 5 out of 11 say they store the children’s milk in different containers/cups, 1 out of 11 say they only give children skim milk, and 2 of the 11 respondents say they are unsure of how milk is prepared for children in their household. One respondent reported that the male children drink whole milk, as opposed to the boiled skim milk given to some female children.

A common reoccurring theme throughout the questionnaire was the mention of the weba tree, by which the villagers smoke the milk container. This tree is considered medicinal and cleansing. The villagers will sit under the tree and burn some of the leaves into the pot. This probably creates a smoky flavor and a thin layer of film on the inside of the pot, so it is feasible that this in some way helps.

Considering that the only real precautions they take are boiling the milk and fumigation cleaning of the pot, the milk still does not get them sick. Perhaps there is something behind the weba burning. Beyond this, the people were quick to point out the different pots and cups they use for storage of their milk. A certain cup was used just for children to drink out of. There was also a separate storage container for milk and butter. One woman showed me the method of storing the milk by using lids and stacking two containers, one on top of the other, to conserve space in the limited cool areas. (See pictures of weba tree and storage/cups in Appendix 1.2 and 1.3)

#### Patterns of Goat Milk Consumption, Access and Availability

Respondents varied in their responses on the availability for milk products. 2 of 11 respondents said that they have enough milk, 4 of the 11 say they do not have enough, and 5 of 11 say that it depends on the season. When asked if they would consume more if more was available, 9 of the 11 say yes, they would consume more, while 1 respondent said no they would not, and 1 respondent said not if more was to be gotten during fasting. It was found that mostly male adults and children consume the most milk, as well as the goat keeper watching over the goat herd. Women are not allowed to consume milk due to the cultural taboo of the Abergelle district. According to popular belief, goat milk makes women uncontrollable for their husband by off balancing various hormones, causing women to “show signs of heat.” If women drink milk they may only drink the boiled, skim milk. The entire family consumes the products of milk, including butter, yogurt, etc. The amount of times varied in response to how often the respondent got milk from their goats, with a majority of people getting milk at least twice per week, with 2 respondents receiving it every day. The following chart breaks down each respondent’s answer and their gauge on the bottle, though this is only understood with the 2 liter water bottle lost during transport.

Respondent	How often do you drink milk?	How much?
1	3 times per day	Claims not to know, “would have to ask the man”
2	July-August, once per day	No answer
3	Always	Claims not to measure, just drinks the milk
4	2 times per week	According to the child’s age (older children get more)
5	Once per week, Kids drink 4 times per week	Older children get more
6	Seasonal (wet = every day, dry = up to every 4 days)	2 <sup>nd</sup> line on the bottle
7	When with the goats = 3times per day, When at home = once per day	3 lines up on the bottle
8	Once per week	Half of the bottle
9	Twice per day	2 ½ lines up on the bottle
10	Twice per week, morning and afternoon	No answer
11	3 times per week	Most of the bottle

During the dry season it was noted that milk is very scarce and therefore answers may differ during that time as to how often goat milk can be gotten. The months generally reported to be part of the dry season in the region are January (5/11), February (10/11), March (10/11), April (9/11), May (6/11), June (6/11), July (2/11), and December (1/11). Answers also varied for how often respondents drink milk, with a majority of respondents being able to consume milk/milk products at least twice a week, or more. Many respondents reported being able to drink goat milk daily during the wet season. Children are often given preference in goat milk consumption due to the belief that goat milk is important for muscle development. One respondent reported that children drink goat milk 4 times per week, while the adults may only drink it once a week. Another respondent reported that goat keepers (who are typically children) consume more milk and that when one is with the herd they may drink up to 3 times per day, while those at home still may only drink once per day. All 11 respondents reported giving goat milk to their children, though the amount given to children varied across households. In general, the goat milk was given in a scaled order according to age, so that as a child gets older, they receive more milk per serving than the younger children.

### Goat Husbandry

The majority of our respondents were goat herders, who all shared the same general techniques, with small variations on their opinions about health and limitations. Farmers were very wary of other goat herders when answering questions about their herds, giving the impression that they do not trust the quality/health of other herds. 10 out of 11 respondents confirmed rearing their own goat herds, so that a small separate set of questions was asked of them about the herd. In all cases the goats were kept away from the house, with 3 respondents saying they keep their goats by the river and 7 respondents saying they keep the goats in the fields/near forage areas, and all reported that the goats were watched by a herder. It was found that farmers were divided over health issues, with 5 respondents reporting that they believe their goats are healthy, 4 saying their goats are not healthy, and 1 respondent saying the goats are healthy, but there are frequent outbreaks of PPR (this is a viral disease of sheep and goats, called peste des petits ruminants). To care for sick goats and to prevent illnesses, all 10 goat owners claim to vaccinate their animals with vaccines from the Woreda Bureau of Agriculture, which provides services to both Zaquala and Tanqua villages. 2 respondents say that they believe the vaccines are ineffective and weak. 5 respondents also keep their animals away from other herds, as well as separate sick animals from their own herds. For all farmers it was found that goats typically eat forages and browse the field materials when these are available (wet season), while in the dry season supplements of crop residues (such as: maize, sorghum, peanuts, hay, legumes and seeds, etc.) are provided for the animal, as little browse can be found to supply all goats. It was also asked of the farmers to express some concerns and opinions on what they think limits the production of goats and therefore goat milk. Some of the most common and reoccurring concerns were: seasons (wet/dry), shortages (food/water, land, etc.), health conditions (such as frequent outbreaks of disease), market accessibility, and kidding cycles.

### Interesting Information about Respondents

There were some interesting notes to be made about some of the 11 respondents they may shed some light on their answering. Respondents number 1, 6, and 8 were all female. They were able to provide more in depth answers on the children and cooking aspects of the questionnaires. The Zaquala enumerator made the comment that the women know less about the goat herds, though this was not found to be evident in their responses as they provided fairly consistent answers with that of their male counterparts. Interviews in the Zaquala village were conducted on two separate days, so that there was a

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mix up of households and we wound up interviewing a man on the first day (respondent 2) whose wife we interviewed on the second day (respondent 6). Although they possess the same goat herd and receive the same milk, they provided slightly varied answers in their interviews. The wife was able to tell us more in depth answers that dealt with milk products and usage, as well as information on the children of the house. The man could give more in depth answers on goat husbandry and did not pick up on differences in milk preparation. The wife identified economic benefits of milk and showed more precaution towards risk than did her husband. The man reported that milk is generally consumed once a day, while the wife reported every two days. The woman identified a dry season containing two months more than that of the man's identification. An odd finding in comparing the husband and wife comes when asked how many children in the house drink milk. The man stated that there are 8 children and they all drink milk, while the wife stated that there are 6 children and they all drink milk. I can find no explanation for this. Respondent 5 kept putting a large emphasis on water shortage throughout his interview. He contributed lack of water as a main limiting factor in goat production. Respondent 8 was our only non producer, but he put a large emphasis on the fact that he wished he owned goats. He identified them as a major factor in economic success and believed he would be better off if he had his own herd. He also claimed to consume more milk than any other respondent. Respondent 9 was the youngest, as he was the only single young adult, with no children of his own, and he still lived with his parents. He answered on behalf of his family's herd and his age does not seem to have skewed his answers in comparison to the other respondents'. Respondent 10 put large emphasis on disease, stating repeatedly that his area is infested by disease and is unsafe for his goat herd. He said that a large disease outbreak usually occurs in December, that the Woreda vaccines do not work, and that there is a risk of getting TB, malaria, and worms from goat milk. It was also found that the Tanqua village was stronger in their beliefs about the taboo on women drinking milk, as more Tanqua than Zaquala responders mentioned it, and the Tanqua responders were more vehement in discussing it.

It should be noted that we started this experiment with a 2 liter water bottle on which we asked the respondents to indicate how much milk was used for 2 questions (how much do you get, and how much is given to children). This was confusing to the respondents and the enumerators had a hard time explaining to each of the 11 what exactly we wanted. Often, they would either say that they do not measure the amount of milk, or they would not be able to give us a definite answer (“sometimes we drink this much, but sometimes we drink this much”). These results were hard to follow. We had been marking the answers on the bottle with a permanent marker and recording their answers on the questionnaire form. It also would have been much easier to explain this, had our bottle not gotten lost somewhere on the trip back from the villages. I believe it was thrown out to one of the children who dance on the side of the road for water bottles (“highlands”) by someone in the truck who was unaware of the bottle's significance. Whatever happened, our bottle with the markings was lost, and it therefore is difficult to explain those responses in detail, they may only be generalized.

Something that I found interesting was the lack of responses on methods of collecting goat milk. It was not a question in the questionnaire, however I expected the villagers to at some point talk about how they collect the goat milk from the animal. They never mentioned cleaning the teats, methods of selecting goats for milking, etc. I believe this should be a further study and in hindsight wish that it had been included in my own questionnaire. I can report from my observations that the herders do not clean the teat prior to milking, they just start milking. They did not milk out the first milk, suggesting that perhaps they use this milk as well. At one point I saw a method of rolling a piece of long grass into a type of stopper, placing this inside the teat so that no milk comes out, then wrapping it tightly around the teat.

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This is a method used to conserve milk, though it was unclear whether this was to prevent kids from nursing (weaning technique?) or just to prevent any possible loss of milk.

### ***Contributions (Cont.)***

Beyond the survey portion of this project, we collected samples of goat milk from three different places in the Abergelle region: Tanqua, Zaquala, and the Abergelle research center. To do so, we asked farmers if they would be willing to allow us to take a small Falcon tube's amount of milk from their herd. The following is a write up on the sample analysis.

### **Milk Sample Analysis**

Beyond the questionnaire portion of this study, 19 milk samples were taken from the Abergelle region, from 3 different sites: Zaquala village, Tanqua village, and the Abergelle research goat farm near the Tanqua area. 11 samples were taken from Zaquala, 5 from Tanqua, and 4 from the research farm. Of these, 1 sample (A12) from the research farm was found to be fermented by the time the samples reached the dairy lab. The samples were transported to the Holetta Dairy Research Center on July 30, 2013. Here they were examined through microbial analysis and chemical constituent analysis.

#### **Microbial Analysis**

The following is the procedure conducted for the microbial analysis on the 18 milk samples:

The micropipette tubes and Petri dishes were sterilized for one hour in an autoclave. The media agar, called plate count agar, was prepared by mixing 1 liter of distilled water with 17.5 grams of the powdered agar mix. 1 Petri dish received 15-20 ml of agar. The agar was mixed then boiled until clear to sterilize prior to plating. Fire alcohol (purple colored liquid) was placed in bottles with a cloth wick, which was lit with a match. 4 bottles of this alcohol were placed in the opening of the Laminar Flow Hood in order to sterilize the air flowing around the plates. Participants working with the materials also washed their hands with the fire alcohol. The now sterile agar was then removed from the boiling water and placed in cool water to facilitate cooling to a temperature suitable for handling. Agar in the Holetta area solidifies at 30°C due to the relatively higher altitude of this area, so it must be in the plate by the time it reaches this temperature. 10 agar Petri dishes were prepared for the 10 samples to be tested. The plate count agar was stored overnight in the refrigerator as there was not enough time to plate that day. The samples were to be plated the next day, July 31, 2013.

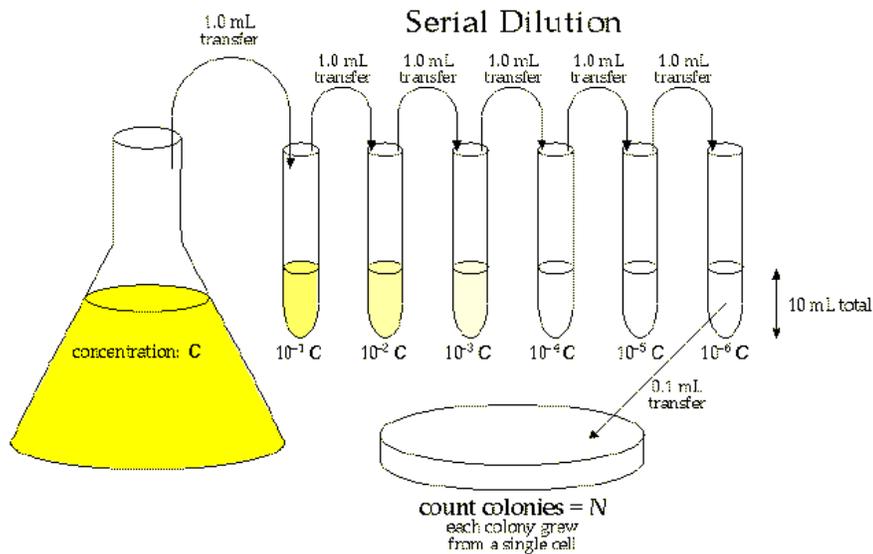
Next the dilution was prepared, as it was found to be most conducive to dilute each sample by the serial dilution. The dilution was done with Pepton water, a powder mixed with distilled water to create a clear, yellowish solution. 7 test tubes were prepared with 9 ml of pepton water, for each of the 10 samples. Dilution and plating of each sample: 1ml of the milk was taken up with a micropipette. This was mixed thoroughly with a 9 ml tube of pepton water. 1 ml of this new, mixed milk/pepton solution was taken up and mixed with the next tube of 9 ml pepton water. This was performed 7 times. Finally 0.1 ml of the 7 times diluted milk solution was plated, so that the milk is technically 8 times diluted and will thus be calculated in the final bacterial count. This procedure was repeated 10 times for the 10 samples. After pipetting into the dish, the sample is then spread around thoroughly into the agar using a glass rod that has

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been sterilized and heated with the fire alcohol. The plates were then placed in an incubator at 30-32 centigrade for 24 hours.

Photo: Serial Dilution Procedure

(<http://talon.niagara.edu/~391s08/giacomini/SerialDilution.html>)



The plates were taken out of the incubator on August 1, 2013 and the bacterial colonies were counted. The colonies were also traced by marking them with a permanent marker on the Petri dish lid. This allowed for comparison of colonies. The number of colonies of bacteria for each sample was recorded. Contaminations in some dishes were found and also accounted for, though they have little impact on the results.

Samples were combined based on herd due to lack of funding for materials at the Holetta center. Therefore we may only know the bacterial colonies for a certain set of goats, instead of individuals. It should also be noted that the second set of A samples were for some reason excluded in the microbial analysis due to human error (I believe they were accidentally left in the refrigerator, though I am not sure. I only know that they were not included in this part of the study). Therefore we do not know the microbial analysis of the A21, A22 samples, which came from the Boer/Abergelle crosses at the Tanqua, Abergelle Research Center farm.

### Chemical Constituent Analysis

For the chemical constituent analysis the samples were mixed based on herd, so that there were 8 samples done. In order to use the Lactoscope properly, all of the containers for the analysis must be full. For one sample, distilled water had to be added. The proportion of water was noted and accounted for later in the experiment prior to finalizing results. The Lactoscope is a machine which measures chemical constituents in milk from different species. It had to be programmed to record for goat milk prior to the experiment. The Lactoscope must first be cleaned before performing analysis. To clean it, liquid soap and cold water must be put through the test, as if it was being analyzed. The machine pulls up a small portion of liquid that is placed under it and analyzes it, then the liquid is drained out through a tube. After running the soap through about 3 times, and running distilled water to rinse, it is then time for the 8 samples. For each sample, the percentage of fat, protein, lactose, and total solids were found and recorded.

The values in the chemical analysis were found to be significantly higher than the typical averages (Table 1). For example, the fat content and total solids content were very high. This is suggestive about the way the samples were taken. It was not possible to milk out the goat’s first milk prior to sampling. We had to take whatever the farmers gave us, as in many cases there was very little milk to be gotten in the first place. Therefore the contents may be of a higher percentage because it is coming from the rich first milk. I do not count this as a loss, however, because the farmers still used this milk, just as they used all other milk. We may not have seen the full picture, but we did get a read on a portion of the milk utilized by the people of the Abergelle region. As for the bacterial count, the results were highly scattered, with no logical pattern (Table 2). It is obvious that a large number of bacteria are present in most of the milk samples, while some samples have smaller amounts. You must multiply this bacterial count by  $10^7$  in order to read correctly the bacterial count for 1 ml of the milk. Due to the large amount of bacteria, it is safe to say that this milk is not totally safe for consumption when it comes straight out of the goat. There were relatively few contaminations, which suggests that the test was done in a sanitary manner. (Contaminations are caused by air pollutants, accidental human contact with the agar, etc.)

Milk Sample Chemical Analysis	Date Tested: July 31, 2013 @ Holetta Ag Research Center			
<b>(Table 1)</b>				
Sample	Fat %	Protein %	Lactose %	Total Solid %
Z31, Z32, Z33	3.52	5.97	2.35	11.84
T11, T12, T13	14.71	9.06	5.14	28.94
Z11, Z12, Z13	9.65	6.27	4.74	20.66
Z21, Z22	15.24	8.48	5.6	29.32
Z41, Z42	19.18	9.5	6.54	35.23
A21, A22	16.07	6.63	4.73	27.42
A11	10.87	6.31	3.31	20.28
T21, T22	16.65	9.1	5.93	31.69
Average for goat milk	3.5	3.1	4.6	12

Microbiology Analysis		1-Aug-13	
<b>(Table 2)</b>			
Sample	Colony	Contamination	x10 <sup>7</sup>
A11	9	1	
T11	22	0	
T12	5	2	
T13	13	0	
T21, T22	89	3	
Z11, Z22	52	0	
Z12	22	0	
Z21, Z22	27	0	
Z31, Z32, Z33	106	7	
Z42	13	10	

See pictures of the lactoscope and colonies in Appendix 1.4 and 1.5.

### ***Improving Food Security***

During my time working with ILRI on the Safe Food, Fair Food goat milk study, I learned a lot about food insecurity and the impact that all factors of the livestock value chains have on determining food quality and availability. The Food Safety and Zoonoses unit that I worked with and contributed to is working to solve food insecurity by seeking out areas where people rely heavily on livestock and identifying the parts of the value chain that are most heavily influenced by zoonoses and biological risks. I was put to work focusing on goat milk specifically, and I believed my findings will serve as a ground basis for future research. I was able to collect information from a particular region that relies very heavily on its goat herds for food and financial security. I was able to create a clear picture of how goat milk plays a role in the lives of these farmers through the perceptions questionnaire, as well as get a feel for some of the common problems facing the health of goat herds. The sample analysis portion also provided the first look into what the Abergelle milk actually contains and the density of bacteria within herds. These findings will hopefully serve as background knowledge for further in depth studies into what we can do to alleviate some of the common zoonotical issues within Abergelle goats, as well as clear up some misconceptions about the usage and perceptions of milk. Before leaving ILRI, I gave some suggestions for further research that can be gathered and started from my own project. One of the questions in the survey asks who drinks milk, and a majority of the respondents said that women were not allowed to drink milk because this apparently made them out of control and hard for their husbands to handle. I suggested that through education future researchers could perhaps break this taboo, so that women might also receive the benefits of the more nutritious parts of the milk that the men also receive. Another question involved asking the farmers about the health of their animals. They all said that their goats were in fact unhealthy, and they surprising all said that they vaccinated the herd with medicine provided by the local Abergelle Agricultural center. They all claimed that these vaccines are not effective. My suggestion

to future researchers here is to further study these vaccines and their uses, determine if they are indeed useful or ineffective, and then develop a response in which they satisfy farmers with more useful vaccinations. This could reduce herd mortality and enhance the lives of Abergelle goat herders. These are just a few examples of how my project creates a foundation and a corner stone for future research in this area. I think it is important to note that world hunger cannot be solved alone by a 17 year old girl who has embarked on her first research project half way around the world, within a two month time period no less. However, what I believe is so amazing about the Borlaug-Ruan program is that it creates possibilities. By taking me on as an intern, I believe the Safe Food, Fair Food project created a project for me that they did not anticipate as having such an impact. The write ups made by my advisor and I are simple compared to the more extensive and intensive projects conducted by ILRI, however it opens up a door to future studies and allows for many “what if’s” to be asked, which is where all good revelations start. It is my hope that my project has contributed to solving food insecurity by creating a connection to get Abergelle farmers on the map, as well as open up new possibilities for the work of the Safe Food, Fair Food project. I also believe I contributed just by being a helping hand. During my time at ILRI I focused a lot on my own small research project, however I also put in my assistance where necessary on many other things, including during a Forage Unit field trip, on my fellow intern Emma’s project, and on the goat and cattle projects (separate from my own) which the Biotech team worked on while I traveled with them. I say all this because I don’t believe food insecurity can be solved by one person, focusing on one specific thing. It’s going to take a lot of people, working together, on many different aspects of world hunger, in order to help our fellow mankind. I’m going to continue to help others and improve food security by talking about my experience and helping. Helping others is key.

### ***In Conclusion...***

If you had told me a year ago that I was going to spend a summer in Ethiopia, I would have laughed and shook my head. It still doesn’t seem like I am in any position to have traveled across the world, leaving behind everything I knew, to work with people who have done more in their lives to help others than I could even dream of. I thought I was really doing something just by collecting donations for church mission trips, or by helping out at the local food bank. I’m not a world renowned hunger fighter like Dr. Barbara Szonyi, Dr. Jean Hanson, or anyone else at ILRI. I’m a Kentucky girl who barely passed Trigonometry, who gets emotional watching the Lion King, who deals with all those cute little teenager issues that don’t even hold a candle to the world outside of high school. Or, at least I was. I used to go about my business in my small hometown, just like everyone else, aware of a greater world outside of Jessamine County but not aware enough to embrace it. The difference between me and a lot of my peers was that I cared. I cared about others and I cared about how everyone is interconnected. I cared about agriculture and appreciated its meaning. I was aware of the greater world outside of Jessamine County, but I never embraced it. I never thought I was important enough I guess. I never trusted my knowledge or my willingness to help. I never thought I could really do much beyond my hometown. That is, until this internship.

This internship changed me to say the least. While in Ethiopia, I saw a lot of things that really challenged how I think about some of the stuff that happens in the United States. There, religion plays a major part in everyone’s everyday lifestyle. Being strong in my faith really helped me to connect with the Ethiopians. I think it made me feel more at ease and get along easier, because having God play a central role in everything, undoubtedly, is something that I strove for at home. However, our country has a very hands-

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off view of religion, which can be both useful but also harmful in that it can make things uncomfortable. I really appreciated the general feeling of Christian faith that permeated the Ethiopian lifestyle, and I think that it plays a major part in the Ethiopian persona that attracts so many, even those of little or no faith. The one thing that really struck me about Ethiopia was how happy everyone was. That’s another thing that challenged my US brain. I think that relying on faith really does make the soul happy, and this is why the Ethiopians have such happy personalities. They don’t let things bother them; if something doesn’t get done today, it can wait until tomorrow. I’m not saying this is the best working environment, but as far as people to people interactions, this laid back ideal was not something I was used to. Nonetheless, I appreciated and enjoyed it. At first it was hard to make myself slow down; it was hard to go from fast-paced American to laid back Ethiopian speed. It frustrated me how nonchalant everything was at first. I felt like I should jump in and get to work immediately, but this wasn’t the case. I think that’s one lesson that I thoroughly enjoy and am glad I learned. Here at home, everything has a deadline. Everyone is constantly rushing to do something. I think passion and interest is often lost in the hustle and bustle of everyday life. In Ethiopia, having such a calm atmosphere really gives you time to think clearly, to explore, and to develop. You work better with others, because you take time to care about them. I think this is important to the rest of the world’s future. If we want to do something and do something right, we need to slow down. I’m not saying we should stop work and goof off, not in the least. But maybe if we spent a little more time focusing on the here and now, enjoying the people around us and genuinely concerning ourselves with helping someone else no matter the cost to us or the time lost, then just maybe we could win more battles. If we weren’t concerned with having the best of everything, if we weren’t concerned with forcing deadlines and reaching goals, if we just relied a little more on being happy with what we personally have and tried a little harder to care about someone else who doesn’t have what we have, maybe the world would be a little better.

Now, what does all of this have to do with fighting world hunger? Like I said, there is no way any intern could really do much to solve the world’s problems on a high school diploma and a two month adventure. But this internship gives you knowledge, and like Schoolhouse Rock has been claiming since 3<sup>rd</sup> grade, Knowledge is Power. Being aware of what the world is and the challenges it faces is a step closer to helping than just sitting at home and staying stuck in your daily routine. By going to Ethiopia, I saw firsthand that food insecurity exists and strikes with a vengeance. I learned more than I ever could have from a text book about Africa and the everyday life on the other side of the world. I’ve never been much on book learning; I’m more of a hands-on person any day. So this experience gave me knowledge.

Even so, I’m just one little person. A drop in the world’s bucket. But that’s my next point: even though I am but one person who has experienced this, I have the power now to tell others. I came home with a new perspective and a wealth of knowledge. Personally, I have a feeling of happiness from helping others, but I also have a new responsibility to teach others in my community and to spread the knowledge I’ve brought home. I think that’s the main thing that I take away from this internship. Food Security and poverty are not just one person’s problem or even a small group of people’s problem. It’s a worldwide thing, and it’s going to take every single person with an open mind and a caring heart to fix it. Yes, I think I helped some of the researchers at ILRI, and yes I think I personally gained a lot. But most importantly, I’m now an advocate to those around me. It’s my job to spread the knowledge and recruit more hunger fighters. It’s going to take everyone. That’s the main thing I learned from this Internship.

## Appendix

### Appendix 1.1 : Questionnaire

#### Abergelle Milk Safety and Consumption

Sarah Warren, ILRI intern

Date:

Location:

Translator:

Respondent:

Questionnaire #:

#### **General**

- 1) Do you like goat milk? Do you think it is healthy? Do you think it is important?
- 2) Who usually drinks milk/consumes milk products? (specific examples: Do men drink it more than women? Do you drink it more during holidays? Etc.)
- 3) Where do you get your goat milk?
  - a. Produce from family farm/goats\*
  - b. friends, neighbors, etc.
  - c. market
  - d. other:

\*(See additional questions for those who raise own goats)

- 4) Are you a consumer, producer, or both?

#### **Availability**

- 5) How often do you get milk?
- 6) Do you have enough milk? Would you consume more if you had more?
- 7) How often do you consume milk? How much? \*Use bottle to show how much
- 8) When do you not have milk? (shortages, seasonality, etc.)

#### **Preparation**

- 9) What do you do with your milk/how do you store it? 2 sections:
    - a. If you raise own goats: what do you do with it right after you milk the goat? (storage, cleaning, etc.)
    - b. If gotten elsewhere: what do you do with it after you receive it?
  - 10) How long do you store your milk?
-

11) What products do you make from milk (how do you use the milk)?

- a. butter
- b. yogurt
- c. raw milk to drink
- d. use in cooking, examples:
- e. other:

12) Generally, how do you make the products from question 9?

### **Food Safety**

13) Do you think goat milk is safe?

14) How do you minimize risks, make milk healthier?

15) Have you ever gotten sick from milk? Symptoms?

16) What are some risks you associate with milk?

### **Children**

17) Do you give milk to your children (if they have children in the household)? How many children in the house consume milk?

18) How much milk is typically given to children? \*Show on bottle

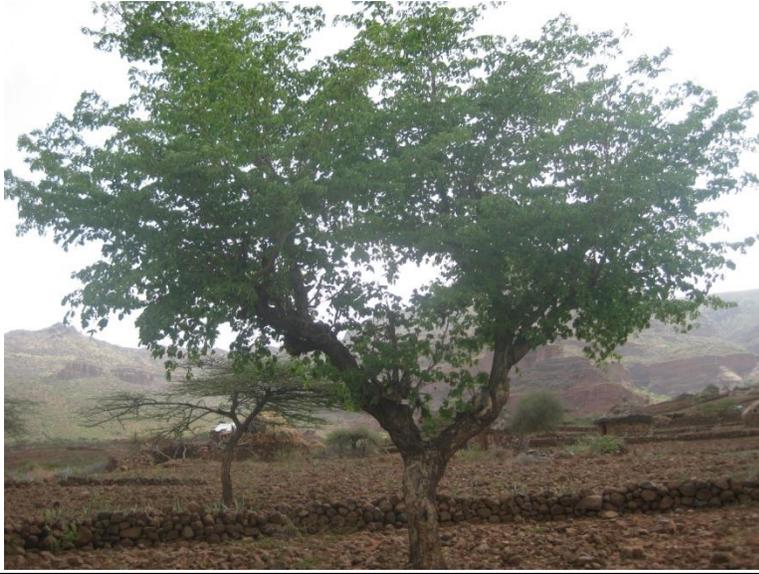
19) Starting at what age are children given milk?

20) Do you do anything different to process/prepare milk for children? (i.e. different containers, etc.)

### **\*Questions just for goat producers**

- 1) Where do you keep your goats?
- 2) Do you think your goats are healthy?
- 3) What do you do to keep goats healthy? (vaccines, etc.)
- 4) What do you feed your goats?
- 5) What are some factors limiting goat/milk production? (why does the goat produce more/less milk than desired?)

**Appendix 1.2 : Milk Survey Pictures, Weba Tree**



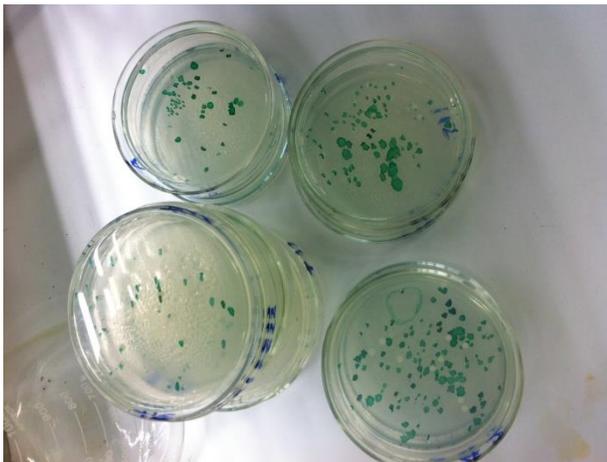
**Appendix 1.3 : Milk Survey Pictures, Cups and Storage**



**Appendix 1.4: Milk Sample Pictures, Lactoscope**



**Appendix 1.5 Milk Sample Pictures, Colonies**



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### Bibliography/Works Cited

Grace D, Mutua F, Ochungo P, Kruska R, Jones K, Brierley L, Lapar L, Said M, Herrero M, Phuc PM, Thao NB, Akuku I and Ogutu F. 2012. Mapping of poverty and likely zoonoses hotspots. Zoonoses Project 4. Report to the UK Department for International Development. Nairobi, Kenya: ILRI. Site: <http://cgspace.cgiar.org/handle/10568/21161>

Husen, N. 2013. Goat value chains in Yabelo district of Borana zone, Ethiopia: Results of a rapid value chain assessment. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Lowland Sheep and Goat Value Chains in Ethiopia, Debre Zeit, 1-2 April 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish. Site: <https://www.slideshare.net/ILRI?vca-borana-apr2013>

Kidanu, E., Regassa, M. and Legesse, G. 2013. Value chain analysis of sheep in Atsbi district of Tigray Region, Ethiopia. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Atsbi sheep and Abergelle goat Value Chains in Tigray, Ethiopia, Mekelle, 19-20 March 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish. Site: <http://www.slideshare.net/ILRI/vca-atsbi-mar2013>

Legese, G. 2012. Approaches to value chain analysis for sheep and goat value chains development in Ethiopia. Presented at the ICARDA-ILRI Training on Tools for Rapid Assessment of Sheep and Goat Value Chains in Ethiopia, Addis Ababa, 5-8 November 2012. Aleppo, Syria: ICARDA. Site: <http://www.slideshare.net/ILRI/vca-approaches-nov2012>

Rischkowsky, B., Dewe, T. and Rosel, K. 2013. Safe Food, Fair Food: Summary of findings within lowland goat and sheep value chains in Ethiopia. Presented at the Multi-stakeholder Workshop for Targeting Action Research on Lowland Sheep and Goat Value Chains in Ethiopia, Debre Zeit 1-2 April 2013. Addis Ababa: CGIAR Research Program on Livestock and Fish. Site: <http://www.slideshare.net/ILRI/vca-sfff-dzapr2013>