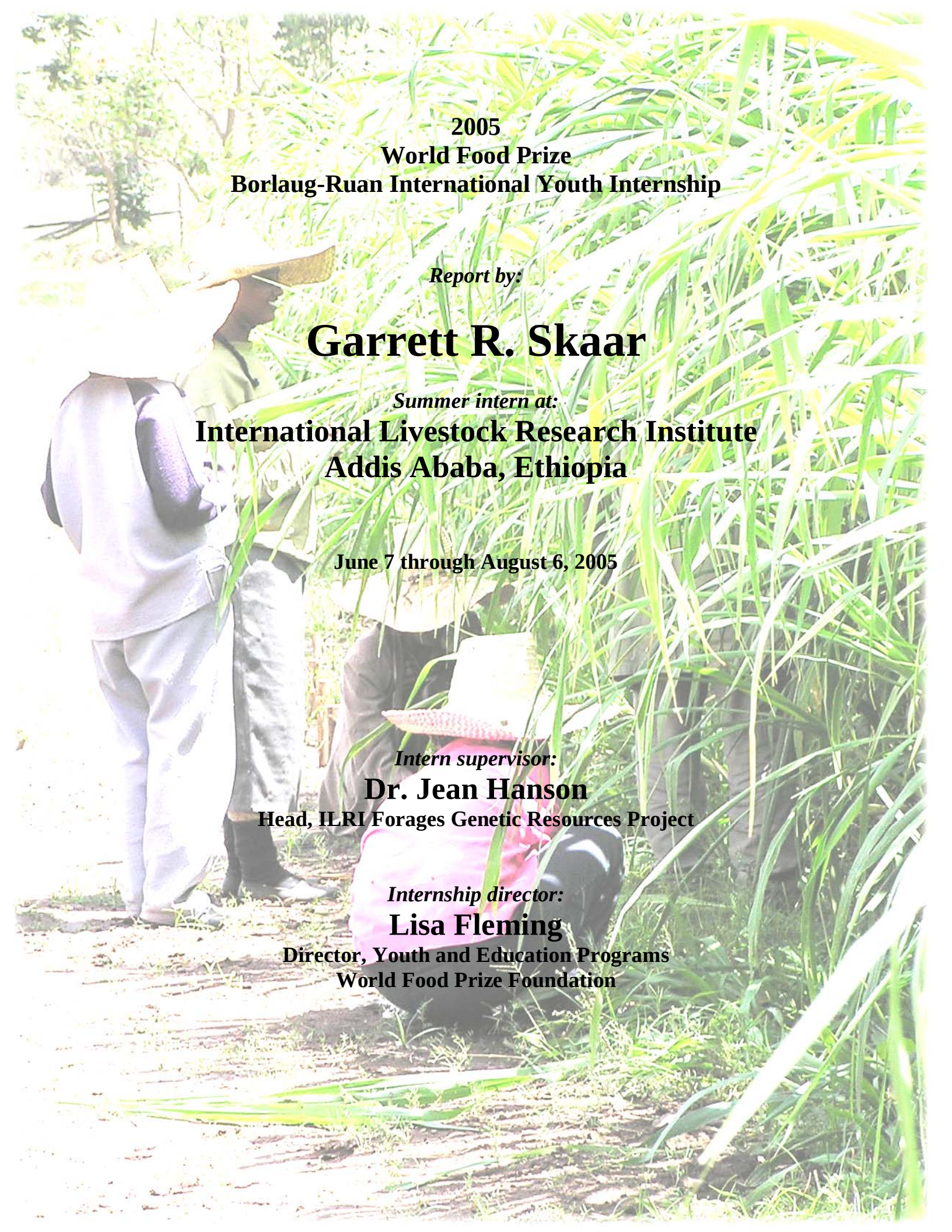

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World Food Prize
Borlaug-Ruan International Youth Internship

Report by:

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International Livestock Research Institute
Addis Ababa, Ethiopia

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CONTENTS OF REPORT

	page
INTERN BACKGROUND	
Personal Background	**3**
Interest in the Internship Program	**3**
BACKGROUND OF HOST CENTER	
The Place: International Livestock Research Institute (ILRI)	**4**
The People: Researchers and Staff of ILRI	**4**
DESCRIPTION OF INTERNSHIP RESEARCH PROJECT	
Project Background	**6**
Project Mission and Goals	**6**
Project Results	**7**
RESEARCH SUMMARY	
Abstract	**10**
Introduction	**10**
Performance on Station – Basic Research Findings	**12**
Performance on Farm – Farmer Interviews	**15**
References	**20**
REFLECTIONS ON THE ETHIOPIAN EXPERIENCE	**21**

INTERN BACKGROUND

Personal Background

Born in 1987, I have lived in the small town of Story City, Iowa for all of my life with my parents and two younger brothers. I first gained interest in food science as a 4-H and FFA member. I have raised sheep and cattle my whole life, and from participating in these experiences, I developed a particular interest in meat science and food production. From visits to the Food Science programs at the University of Nebraska and Iowa State University, I found that product development was a very exciting career field and one with great demand.

I am currently a freshman working on a Bachelor of Science degree in Food Science at Iowa State University. While I have planned for this major for over a year, my internship with the World Food Prize has encouraged me to work towards graduate degrees and a career in food production research.

Interest in the Internship Program

Being from such a tight knit community can be extremely beneficial in a lot of ways, while slightly hindering in others. Having personally only been to a handful of other states within the USA, it was difficult to imagine a world outside that in which I had grown up. One of the many values I have learned and supported in my young life is that of taking advantage of opportunities, especially those that are available only once and that often change your life in ways you never plan. One such opportunity was the World Food Prize Symposium and Youth Institute.

In 2004, I prepared an informational research paper for the Youth Institute on the subject of sustainable rice development in the country of Cote d'Ivoire, located in Western Africa, in anticipation of acceptance to the World Food Prize Symposium to be held in October of that year. The paper itself was rewarding to prepare. Considering I had never studied rice before, let alone genetic strains of rice bred for developing countries, I grew quickly interested in the work of others to defeat hunger in the world. I was excited to be able to participate in the Symposium. My experience from the World Food Prize Youth Institute showed me that there is a large and growing world-wide demand for greater and more sustainable food supply systems. In particular, I was influenced by the research activities of the speakers, and their obvious sincerity in helping supply the food needs of developing countries especially through developments in biotechnology and genetics.

Admittedly, I had given little thought to the possibility of ever going on an international internship. But after listening to the previous year's interns I realized that there was probably never going to be another time in my near future that I would have this kind of opportunity. When I applied, I told myself "maybe"; when I interviewed, I thought "no way"; but once I got accepted and assigned to the International Livestock Research Institute in Addis Ababa, Ethiopia, I could hardly believe it! I had to recheck a map just to remember even where Addis Ababa was. No worries though; and just a few months later, I found my self walking out of the Addis Ababa International Airport, looking for a sign with my name. And the best two months of my life had barely started.

BACKGROUND OF HOST CENTER

The Place: International Livestock Research Institute (ILRI)

The International Livestock Research Institute (ILRI) is a non-profit, non-governmental organization that began its first operations in January of 1995. It developed from the combination of two former institutions under the Consultative Group on International Agriculture Research (CGIAR): the International Laboratory for Research on Animal Disease (ILRAD) and the International Livestock Centre for Africa (ILCA). ILRI is headquartered in Nairobi, Kenya with a second primary compound located in Addis Ababa, Ethiopia. With over 700 staff members employed from over 40 different countries, ILRI follows two main objectives: to increase animal health, nutrition and productivity (milk, meat, traction) by removing constraints to tropical livestock production, particularly among small-scale farmers, and to protect environments supporting animal production against degradation by tailoring production systems and developing technologies that are sustainable over the long term.

ILRI has several research centers in Ethiopia. I worked in Addis Ababa and Debre Zeit.

The People: Researchers and Staff of ILRI

My project supervisor was Dr. Jean Hanson. She is the head of the ILRI Forage Genetic Resources Department and Plant Gene Bank. Originally from just north of Manchester, England, Dr. Hanson has been employed at ILRI for seven years. She has developed quite a reputation in her field of plant genetic research through numerous, published scientific research papers. Dr. Hanson helped me immensely during my time at ILRI and really made me feel comfortable taking on the biggest project I have ever completed. I would go as far to say that Dr. Hanson was the best supervisor I could have had. She really made my experience unique and memorable.

In addition, there were a number of people who made my time at ILRI really special. During the first week of my internship I was introduced to Dr. Salvador Fernandez-Rivera, another researcher employed at ILRI for many years. Dr. Salvador was very willing to share his expertise and help me take advantage of opportunities to see the country. He invited me to travel with him, a graduate student working at ILRI, and the student's major professor (from the Netherlands) to the northern region of Ethiopia by Lake Tana. The trip was originally planned so that the major professor could understand the region in which his student had conducted research studies; however, it allowed me to gain a greater understanding of another region of the country for a few days. I was very grateful to all of these amazingly educated men for allowing me to tag along on their important trip. It gave me insight into the lives of rural farmers before I conducted my own informational studies.

While I was conducting my own surveys in the Peasant Associations around Debre Zeit, Mr. Abate Tedla and Mr. Aseba Abdena played pivotal roles in making my survey project a reality. Mr. Tedla is in charge of the ILRI Debre Zeit research station. He organized the travel dates to the various villages as well as served as a translator between English and Amharic. Mr. Abdena runs the actual research field located at the Debre Zeit research station. He is also in charge of administrating payroll to the various research sites ILRI manages in Ethiopia. He was kind enough to allow me to travel with him to these various stations to give me an idea of what ILRI does at its different locations and from where they collect test data.

Researchers, staff (and me) at ILRI, Addis Ababa, Ethiopia.

During my time spent in the office reviewing previous studies and information, I shared an office with Mrs. Yanrong Wang. She is also a researcher in the Forage Genetic Research Department. Besides the endless kindness she showed me in putting up with all my little questions, she was extremely helpful while I was processing the data I had received from my surveys and previous reports. She really enjoyed the pictures I received from home. We spent a lot of time talking about the differences between America, Ethiopia and her homeland, the People's Republic of China.

Everyone with whom I met and worked really molded my experiences in Ethiopia. They all provided me with such unique insight and greatly helped to make my project not only interesting, but truly a scientific learning experience. It is really hard to describe the feeling I had once my final results were written for the center. These people deserve more credit than can ever be written in a review paper. They are all so dedicated to their work. I only wish that I could bring them all to the United States to see our agricultural system and practices first hand. I know they would love it.

My concluding seminar to the staff at ILRI.

DESCRIPTION OF INTERNSHIP RESEARCH PROJECT

Project Background

Pennisetum purpureum, commonly know as Napier grass, is a forage that has received attention in the past few years for its use in smallholder farming systems as a cut-and-carry livestock feed. ILRI has made major contributions to the introduction of this new livestock forage as a means of improving the nutritional profile of feed for sheep, beef cattle and dairy cattle raised by local smallholder farmers. As with any feed, there are benefits and detriments to its use; Napier grass is no different. However, ILRI's development of new techniques to distinguish between different accessions or clones has resulted in disease resistant and climatically adapted plants to various regions. ILRI research staff members have been very involved in learning new ways to enlist the help of local smallholder farmers to test the varieties in a field setting. With an increased amount of knowledge being shared between farmers, researchers, Africa and the world community as a whole; the lives of those in need can only be improved.

Napier Grass is tall, productive and very drought resistant.

Project Mission and Goals

The mission of my project was to assist Dr. Jean Hanson of ILRI in combining knowledge learned of farming practices and farmer perceptions of Napier grass with the plant variation information held in research centers. Linking the basic research knowledge with the applied knowledge might lead to new and better clones of Napier grass that can be developed and promoted for use by the farmers in Ethiopia.

Because my background and interests lie in beef and sheep production, Dr. Hanson suggested that I focus on two goals of this mission as a part of my work at ILRI.

- Goal #1: I was asked to complete a literature review on the work done at ILRI regarding the development and testing of several accessions of Napier grass. Specifically, I read many of the research reports completed at ILRI regarding Napier grass, extracting information regarding its viability and use as a livestock feed in Ethiopia. My focus was upon the accessions of Napier that were distributed to farmers for field testing.

New plantings of improved accessions of Napier provide an option for farmers challenged to find better ways to feed their livestock.

- Goal #2: I was asked to develop and administer a survey of smallholder farmers in the farming regions near Babogaya and Genda Gorba, Ethiopia to determine their level of satisfaction with new clones of Napier grass which had been provided to them to grow as a test.

Four days were scheduled during the first full week of July for a small survey to interview farmers from the Babogaya and Genda Gorba villages.

Project Results

The results of my literature review, the survey questions and information collected from my farmer surveys are summarized in the *Research Report* section of this document. I am, in particular, most pleased with the results of the farmer surveys because they represent the opportunity I had to do some creative work for the internship. My responsibilities included developing the survey instruments, administering them to the farmers, interviewing the farmers and then summarizing the results. I asked each farmer a series of 15 questions and recorded both demographic and anecdotal information.

I learned that the best way to learn what attributes of a crop are most important in a farming system, is to see how it functions as a part of the system itself. Primary uses, disease or management problems and environmental issues are all considered when looking at the role or possibilities of a crop. The best source of answers to these questions ultimately is the farmers themselves. Therefore, I was encouraged to interview a number of farmers who had been given accession 14984. They farmed around several villages in the Ada'a Woreda. Four days were scheduled during the first full week of July for a small survey to interview farmers from the Babogaya and Genda Gorba villages, 4 km and 10 km from the ILRI Debre Zeit station respectively. Six farmers from Babogaya and nine farmers from Genda Gorba were contacted with a goal of interviewing all the farmers using Napier from Babogaya and at least six from Genda Gorba. This allowed for a greater chance to survey the required number of farmers on the day scheduled to travel to Genda Gorba.

The farmer (woman in green dress) is one of the farmers I had the opportunity to interview. She has found the new clones of Napier more productive and plans to plant more next season.

The survey questions gathered much information about the success of Napier grass on their farm. Information gathered included:

1. How much total land do you farm?
2. Has your cropping system changed in the last two years?
3. What was the total land area planted in Napier grass?
4. How/where was the Napier grass planted?
5. Do you have plans for planting more Napier, and if so how much more?
6. Of all forages being raised which ones will be expanded or would you expand?
7. How often did you harvest? And what time of year did each harvest occur?
8. In what ways did you use the Napier grass?
9. How many animals can be fed with the Napier grown? How long does it last?
10. Was Napier fed on its own or with other forages?
11. Does having a crossbred animal change your demand for Napier as feed?
12. For primary usage, is there enough Napier when needed or not?
13. What level of satisfaction do you have with Napier, and does it perform as expected or promised?
14. Have there been any problems? (Ex. Disease, waterlog, insects)
15. Are you comfortable with your knowledge of Napier or do you need to know more?

When questioned about their Napier grass, almost all the farmers had it planted in the backyard or another fenced area to protect it from grazing livestock, and along a fence row due to a general shortage of land. The one farmer who did not have it planted in a fenced area expressed problems with grazing animals, and planned on moving it to a fenced area for the next year. This is the main reason Napier grass is known and has been recognized as a cut-and-carry livestock feed. Continuous grazing does not allow the plant time to regenerate, and it often begins to die as it is not permitted to produce foliage. A majority of the farmers also expressed that they would be moving their Napier to better soil away from the fence row, where it would not have to compete with the fence row bushes. Since Napier grass needs good water and nutrients from the soil to produce at its highest potential, farmers saw problems when it is planted around other crops and was required to compete for resources.

Cattle of local farmers fed with new accessions of Napier grass show good growth and milking ability. Over half of the farmers I surveyed grew Napier to support their cattle.

The farmers who had already established their Napier in a location where it was isolated from other crops did not express any problems and were very pleased with its production. Over half the farmers named Napier as the single crop they would most like to expand. Despite the need to move the Napier to better soil, all the farmers but one said they were planning to expand their crop in the coming years, even if it was not the first crop they would increase. The one farmer who did not plan to expand Napier plantings was experiencing a

tough land shortage and simply did not have room to expand; however, he stated that he would, should more land be acquired.

If farmers are so set on expanding their Napier crop, how are they using it? Obviously it is a readily accepted livestock feed, but there are many different species of livestock raised in Ethiopia for a variety of purposes. Is there a specific purpose that farmers have associated with Napier? Eleven of the twelve farmers interviewed used Napier primarily as a cattle feed. The other farmer found it most useful to feed to animals that are weak and appear to need it most. Of the eleven farmers who use Napier as a cattle feed, eight of those farmers named its primary use as feed for dairy cattle while the other three fed it to oxen. However, whether dairy or oxen, seven of the eleven farmers indicated that the cattle they were feeding Napier were crossbred animals. Every single farmer who owned or was planning to purchase a crossbred animal, mature or young, said that their need for Napier increased by having that animal. This suggests that Napier has been associated, by farmers, as good feed to use when supporting crossbred cattle.

Most significant is that all but one of the farmers, when questioned on their general satisfaction of Napier as a crop, said they were very pleased with its performance. In addition, none of the farmers reported problems with disease or insects though it was commonly mentioned that plants required good soil conditions, adequate protection from grazing animals, and did not perform well when forced to compete with other plants. If any new forage becomes well accepted by those who would use it, and is more problem-free than that which is currently available, then it is obviously a development with a more sustainable, more secure future in the agriculture of the region. This, above all, is the most exciting result that those working at ILRI could hope for from the research work completed.

RESEARCH SUMMARY

USE OF NAPIER GRASS AS LIVESTOCK FEED BY SMALLHOLDER FARMERS IN BABOGAYA AND GENDA GORBA, ETHIOPIA[1]

- by Garrett R. Skaar

Abstract

With the introduction of Napier grass over the last several years, a new livestock feed has been established in Ethiopia. Development of new techniques to distinguish between different accessions or clones have resulted in disease-resistant and climatically adapted plants to various regions. New techniques have also been developed to educate smallholder farmers on proper management techniques to maximize their production. Combining an increased knowledge of farming practices with the plant variation information held in research centers, new and better clones can be selected for use for the farmers of Ethiopia. With an increased amount of knowledge being shared between farmers, researchers, Africa and the world community as a whole; the lives of those in need can only be improved.

Introduction

Pennisetum purpureum, commonly know as Napier grass, is a forage that has received attention in the past few years for its use in smallholder farming systems as a cut-and-carry livestock feed. Recognizable at a mature state by its often tall stature, and its large percentage of green, leafy foliage, Napier grass can offer huge yields when grown in proper conditions. Naturally growing Napier grass found in a riverbed with an estimated two years of growth was measured at a height of 10 meters and recorded an incredible yield of 29 t/ha dry matter (DM) in one cutting (Boonman, 1997). On average, Napier grown in Ethiopia yields around 40 t/ha fresh, with about 15 percent DM (ILRI, 2001). With such a low DM percentage Napier grass does have a lower feed efficiency rate; however, it is a very palatable feed in the leafy stage (Van de Wouw *et al.*, 1999) and is readily accepted by livestock.

[1] **This study was carried out as a World Food Prize International Intern in cooperation with the International Livestock Research Institute**

With only a handful of harvests possible each year, it is recommended that the plants be harvested at a height of 125 to 150 cm. Harvesting before this height can stunt growth for second or third cuttings, and late harvests may result in coarser, less desirable foliage and a slight reduction in nutritional value. As a perennial crop that regenerates after each harvest and grows through out the year, it was thought to be a drought resistant crop when it remained green during the dry season. This caused considerable interest in countries with definite wet and dry seasons, like Ethiopia. It is now realized, however, that it can tolerate only four to five months of minor drought before supplemented irrigation is required. To better prepare the plant for the dry season, however, longer intervals can be used between the wet season harvests. This allows the crop to establish a deeper root base.

Napier grass has also been recognized for its vegetative propagation abilities. Once a good base crop has been established, it can be expanded by using portions of mature plants to establish new ones. Much like sugar cane, a three-segment portion of the stalk is cut from a mature plant. This is planted with two of the three segments submerged beneath the soil. With water and fertilizer, the stalk segment will root and begin to function as an individual plant. Napier grass can be planted by seed, too; however, vegetative propagation is more widely preferred (Boonman, 1997).

While specific management practices are recommended for the production of quality Napier grass, two separate crops of Napier grown in the same conditions can have different outcomes. How can two seemingly identical plants, growing side by side, mature at different rates, require different amounts of fertilizer, and react differently to deadly crop diseases? The answer is held at the molecular level.

The International Livestock Research Institute (ILRI) in Addis Ababa, Ethiopia, in cooperation with other major research institutions, has established a genebank including 59 different accessions or clones of Napier grass. These multiple accessions, while showing minor differences at the phenotypic level, have been analyzed using molecular tools to study diversity (Lowe *et al.,* 2003). One such accession, known as Kakamega-1, is resistant to smut, a fungal disease that causes premature flowering and stunting of growth, which leads to a severe

reduction in plant biomass (ILRI, 2001). When smut disease was first located in Kenya around 1996, it posed a huge problem. Napier grass is the most important forage crop in the cut-and-carry livestock system of the Central Kenyan Highlands (Staal *et al.,* 1997). Work was begun to find possible smut-resistant accessions. Farrell et al. (1998, 2002) worked with two smut-resistant varieties of Napier grass, including Kakamega-1, and they were distributed to farmers in Kenya. With the success of smut-resistant accessions, further work in the study of molecular diversity was done. With genetic differences established, researches are now better able to recommend specific accessions to farmers in regions that have different growing seasons, soil qualities and disease problems.

Performance on Station - Basic Research Findings

In 1995 a multilocational study headed by J. Ndikumana, AFRNET Coordinator, looked to find common accessions and/or hybrids (*Pennisetum purpureum x Pennisetum typhoides*) of Napier grass that preformed well in a variety of sub-Saharan African regions for use in the development of Napier-based feeding packages for smallholder dairy farmers in Africa. The five accessions from ICRISAT held at the ILRI Gene Bank included in the study were numbers 15746, 16786, 16789, 16797 and 16798; and the four *Pennisetum* hybrids examined were ILRI numbers 16834, 16835, 16837, and 16838. These nine accessions or hybrids were evaluated at ten sites in nine different sub-Saharan countries: Bouake, Cote d'Ivoire; Dschang, Cameroon; Holetta, Ethiopia; Kumasi, Ghana; Kakamega, Kenya; Kiajansoa, Madagascar; Makurdi, Nigeria; Morogoro and Tanga, Tanzania; and Kabanyolo, Uganda. Each accession or hybrid was compared, along with a number of local varieties at each site, to find which ones performed best, in accordance with the local agro-climatic conditions, at the largest number of study sites (Ndikumana, 1995). The nine accessions and hybrids were also planted as a single plot at the ILRI Debre Zeit station to test for morphological characterization within the group. Figure 1 summarizes the information presented in the multilocational study.

A field test conducted in 2004 by ILRI at its Debre Zeit station used the information found in the multilocational study to find possible accessions or hybrids of Napier that would be best suited to the climate and farming systems of Ethiopia. Using accession 16786 and hybrids 16835 and 16837 from the multilocational study along with two other highly productive accessions from

the Debre Zeit station, numbers 14984 and 16803, ILRI conducted an eight-week harvest study from the beginning of September to the end of October to test if any of these top-growing materials showed performance differences in Ethiopia.

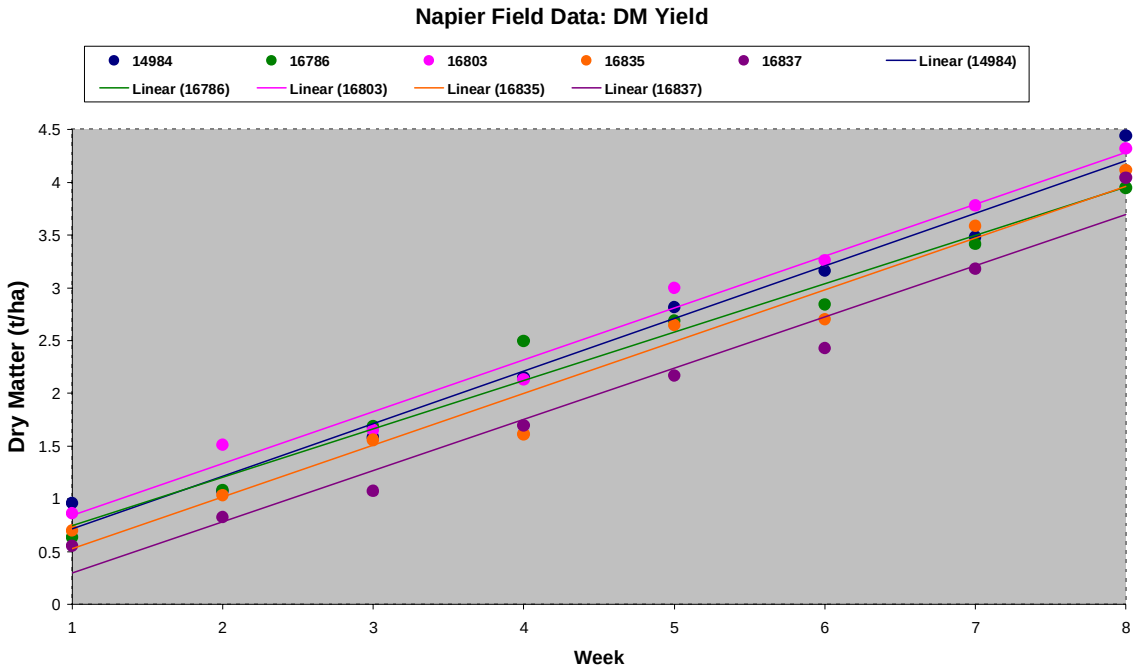
Fig. 1 Multilocational Study Top Performers

City (Country)		Kakamega (Kenya)	Morogoro (Tanzania)	Tanga (Tanzania)	Bunda (Ethiopia)	Kumasi (Ghana)	Holetta (Ethiopia)	Bouake (Cote d'Ivoire)	Kabanyolo (Uganda)	Marondera (Zimbabwe)	Debre Zeit (Ethiopia)		Total
Acc. #													
15743											*		1
16786			*	*				*	*				4
16791		*		*									2
16797													0
16798			*										1
16834							*	*					2
16835					*	*	*			*			4
16837			*				*			*			3
16838				*	*								2
	* = top performing accession or hybrid at location												

A variety of information was recorded daily, with emphasis being placed on the plants' weekly harvest yield. Figure 2 shows the average DM yield each of the eight weeks for the five test materials as well as the linear trend lines for each accession.

Interestingly, it can be seen by the inserted linear trend lines that all five accessions and hybrids show an almost identical rate of increase over the eight week period in their dry matter yields. This suggests a highly significant positive correlation between the DM yield and the week in which it was collected (R^2 =.98). While accession 14984 showed the highest yield in the first and last weeks, it was accession 16803 which performed best, having the highest DM yield for five of the eight weeks. Hybrids 16835 and 16837 showed the lowest DM yields over the eight-week test period.

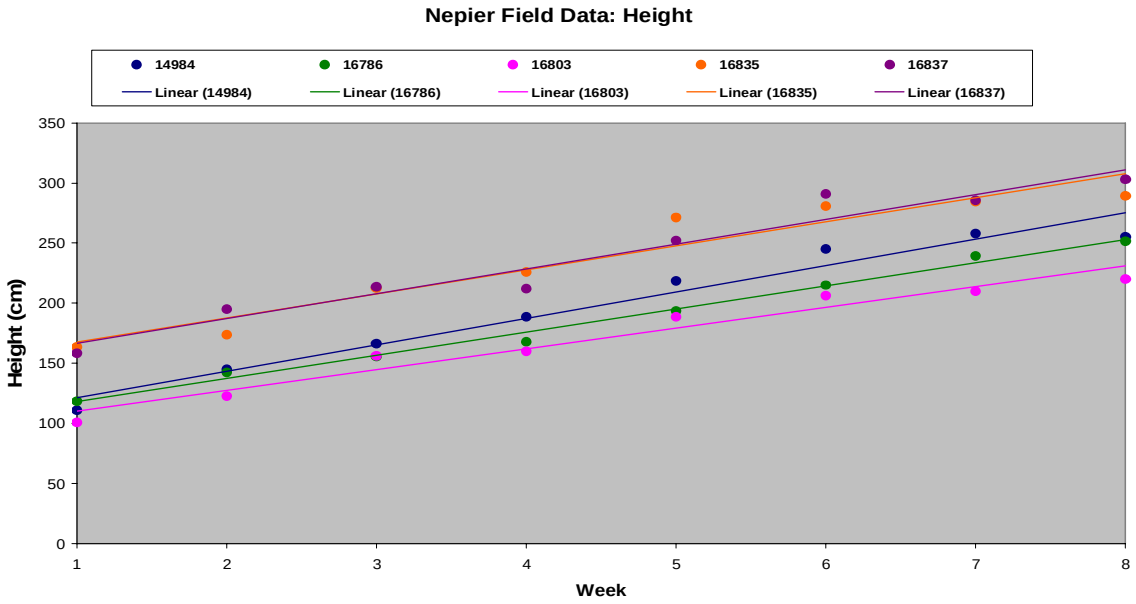
Figure2: Dry matter change per week of various accessions of Napier Grass.



Accession 14984:	Y= 0.498x + 0.2173	(R^2= .979)
Accession 16786:	Y= 0.4583x + 0.2868	(R^2= .975)
Accession 16803:	Y= 0.4909x + 0.3558	(R^2= .987)
Hybrid 16835:	Y= 0.4898x + 0.0407	(R^2= .969)
Hybrid 16837:	Y= 0.485x - 0.1858	(R^2= .968)

Much like the DM graph, it can be seen in the height data that there is a similar rate of increase between all five accessions and hybrids over the eight-week harvest period. A highly significant correlation can be made between the height of the plant and the week in which it was harvested ($R^2 \geq .93$). Slightly contradictory to the DM data, hybrids 16835 and 16837 were the fastest growing for each of the eight weeks. Accession 16803, which performed well in the DM findings, had the lowest height recording for seven of the eighth weeks. Figure 3 shows the average height for the five test materials as well as linear trend lines over the eight-week period.

Figure 3. Height changes in various accessions of Napier Grass over time.



Accession 14984:	Y= 21.919x + 99.81	(R^2= .961)
Accession 16786:	Y= 19.28x + 98.768	(R^2= .992)
Accession 16803:	Y= 17.253x + 92.985	(R^2= .956)
Hybrid 16835:	Y= 20.047x + 147.42	(R^2= .927)
Hybrid 16837:	Y= 20.655x + 145.89	(R^2= .949)

From the data recorded and shown here, it can be observed that while all the accessions and hybrids developed at a similar rate, there are still clear performance differences between the various accessions and hybrids of Napier grass. No single accession or hybrid performed best in all the areas tested. While it may not be clear enough to state that one of the five materials tested is better suited to Ethiopia, it can be said that there are several well-suited varieties of Napier that will perform in accordance with the Ethiopian farming systems, each with their own attributes.

Performance on Farm – Farmer Interviews

The best way to learn what attributes of a crop are most important in a farming system is to see how it functions as a part of the system in question. Primary uses, disease or management problems, and environmental issues are all considered when looking at the role or possibilities of

a crop. In order to acquire all this desired information, a source must be established. The best source is the farmers themselves.

Napier grass is a new crop in the last several years to smallholder farms in Ethiopia. ILRI, along with the Ministry of Agriculture in Ethiopia, has distributed a wide variety of Napier grass clones to farmers across the country with hopes of establishing it as a valuable crop. It has been largely accepted as a quality cut-and-carry livestock feed since it is highly palatable and a perennial crop. To get a better idea of the uses and opinions about Napier grass at the farmer's level as well as get an important look into the farming system of Ethiopia, a number of farmers who had been given accession 14984 were interviewed from several villages in the Ada'a Woreda.

Four days were scheduled during the first full week of July for a small survey to interview farmers from the Babogaya and Genda Gorba villages, 4 km and 10 km from the ILRI Debre Zeit station respectively. Six farmers from Babogaya and nine farmers from Genda Gorba were contacted with a goal of interviewing all the farmers using Napier from Babogaya and at least six from Genda Gorba. This allowed for a greater chance to survey the required number of farmers on the day scheduled to travel to Genda Gorba. Due to the onset of the rainy season, farmers were busy planting and preparing fields and therefore could not be scheduled at a specific date or time to be questioned.

On the first day, two farmers from Babogaya were available in the afternoon and took a break from planting to be surveyed. Upon arrival to Babogaya on the second day it was learned that all the farmers were away to pick up fertilizer. Only one day is scheduled each year for the farmers of a village to receive their fertilizer distribution from the government. If the fertilizer is not picked up that day, then the farmer is without fertilizer until the next year's distribution. Two farmers did return mid-morning, however, and were available to be surveyed. The last two farmers contacted from Babogaya would not return until the afternoon and would not be available to be surveyed. On the third day, the last two farmers from Babogaya were available in the morning and were surveyed.

At Genda Gorba, four farmers were available and surveyed in the morning and two more were questioned in the late afternoon after returning from the fields.

The goal of surveying twelve farmers, six from Babogaya and six from Genda Gorba was met, and provided a sufficient understanding of the use and effects of Napier grass in their respective systems. It also provided an interesting look into the daily lives of the farmers and their families, especially around planting time.

The fifteen question survey was centered on the farmer's main uses and thoughts of Napier grass. A few general questions, such as total land farmed, whether or not the farmer utilized crop rotation, and total number of animals owned were also included to get a better understanding of various farmers' situations. Figure 4 shows the demographic and quantitative summary from the survey.

Figure 4. Summary of farmer survey data.

Farmer Name	Date	Village	Gender	Land Farmed (hac)	Crop Rotation	Napier location	Napier expansion	Most want to expand	# harvest/yr.	Primary Use	# animals owned	Wks. fed after harvest	Own Xbred	Napier Feeding	Satisfied with Napier	Problems	Comfortable w/ knowledge	Comments
Ato Kflu Truneh	7/5/2005	BG	M	3	Y	1,3	1	1	3	2	12	2	Y	mixed	Y	N	Y	animals like Napier
Ato Regussa Dudi	7/5/2005	BG	M	2	Y	1,3	3	1	3	2	8	2	Y	mixed	Y	6	Y	animals love Napier, good for dairy
Ato Orgeoha Bedaba	7/6/2005	BG	M	2.5	Y	1,3	3	1	3	*11	15	4	N	mixed	Y	6	Y	animals love it
W/o Tchai Muluneh	7/6/2005	BG	F	2.25	Y	1,3	3	3,2	3	2	21	2	Y	mixed	Y	5	Y	all kinds of animals like it
Ato Gemechu Borena	7/7/2005	BG	M	1.25	Y	1,3	3	5,6	3	1	6	1.5	Y	mixed	Y	N	Y	all animals like it
Ato Abebe Bejiga	7/7/2005	BG	M	1.5	Y	2,3	3	4	3	1	12	n/a	Y	grazed	Y	7	Y	good crop, but not to graze
Ato Tekloa Moges	7/7/2005	GG	M	3	Y	1,3	3	1	3	2	21	2	Y	mixed	Y	N	Y	very productive/useful crop
Ato Abushu Negash	7/7/2005	GG	M	1.5	Y	1	No	1	3	3	5	1	N	alone	Y	N	Y	needs more land to expand
Ato Muleta Belda	7/7/2005	GG	M	1.5	Y	1	2	1	1	3	2	1	N	mixed	Y	6	Y	planted by a tree, too much comp.
Ato Negussie Feleke	7/7/2005	GG	M	2	Y	1,3	3	1	2	2	27	2	Y	mixed	Y	6	Y	good feed, can't have competition
W/o Desu Belda	7/7/2005	GG	F	1	Y	1	3	2,3	n/a	1	5	n/a	N	n/a	N	6	Y	planting under tree=poor growth/ no harvest
W/o Geta Roba	7/7/2005	GG	F	2	Y	1	3	5,6	2	3	22	2	N	mixed	Y	7	Y	good crop, but needs good protection

Coding Key

Key:	Village	Napier Location	Napier expansion	Most want to expand	
	BG- Babogaya	1- fenced area	1- expand crop	1- Napier	5- Lablab
	GG- Genda Gorba	2- open area	2- improve growing conditions/location	2- Vetch	6- Maize
		3- along fence row	3- both	3- Oats	7- Teff
				4- Pigeon Pea	
	Primary Use		Napier Feeding	Problems	
	1- Local dairy	6- Goat	mixed (with other forages)	1- Disease	5- Soil quality
	2- Xbred dairy	7- Horse	(Fed) alone	2- Insect	6- Crop competition
	3- Oxen	8- Donkey	grazed (by animals)	3- Waterlog	7- Animals
	4- Fattening cattle	9- Poultry		4- Drought	N- no
	5- Sheep	10- Sale			
	* weak animals	11- other			

Of the twelve farmers surveyed, nine were men and three were women. The average farmer utilized around two hectares of land, or 4.9 acres in their cropping system. This included any land the farmer owned, rented, or sharecropped for farming purposes. Interestingly, all the farmers questioned utilized crop rotation, and a majority of the farmers followed a rotation of two years cereal crop (ex. Wheat or Teff) and one year legume crop (ex. Pigeon pea or Chick pea). This allows for nutrients to be replenished into the soil from one year to the next. Farmers owned anywhere from two donkeys to a total of 27 animals, including oxen, dairy cows, sheep, donkeys, horses and improved breed chickens. Importantly, however, all the farmers had Napier planted from the previous growing season.

When questioned about their Napier grass, almost all the farmers had it planted in the backyard or another fenced area to protect it from grazing livestock, and along a fence row due to a general shortage of land. The one farmer who did not have it planted in a fenced area expressed problems with grazing animals, and planned on moving it to a fenced area for the next year. This is the main reason Napier grass is known and has been recognized as a cut-and-carry livestock feed. Continuous grazing does not allow the plant time to regenerate, and it often begins to die as it is not permitted to produce foliage. A majority of the farmers also expressed that they would be moving their Napier to better soil away from the fence row, where it would not have to compete with the fence row bushes. Since Napier grass needs good water and nutrients from the soil to produce at its highest potential, farmers saw problems when it is planted around other crops and was required to compete for resources. The handful of farmers who had already established their Napier in a location where it was isolated from other crops, did not express any problems and were very pleased with its production. Over half the farmers named Napier as the single crop they would like to expand most. Despite the need to move the Napier to better soil, all the farmers but one said they were planning to expand their crop in the coming years, even if it was not the first crop they would increase. The one farmer who did not plan to expand Napier plantings was experiencing a tough land shortage and simply did not have room to expand; however, he stated that he would, should more land be acquired.

If farmers are so set on expanding their Napier crop, how are they using it? Obviously it is a readily accepted livestock feed, but there are many different species of livestock raised in

Ethiopia for a variety of purposes. Is there a specific use that farmers have associated with Napier? Eleven of the twelve farmers interviewed used Napier primarily as a cattle feed. The other farmer found it most useful to feed to animals that are weak and appear to need it most. Of the eleven farmers who use Napier as a cattle feed, eight of those farmers named its primary use as feed for dairy cattle while the other three fed it to oxen. However, whether dairy or oxen, seven of the eleven farmers indicated that the cattle they were feeding Napier were crossbred animals. Every single farmer who owned or was planning to purchase a crossbred animal, mature or young, said that their need for Napier increased by having that animal. This suggests that Napier has been associated, by farmers, as good feed to use when supporting crossbred cattle.

All the farmers noted that they did not grow enough Napier to last them for an entire year's feeding period. Most of the farmers harvest two to three times a year depending on the rains, twice during the wet season and possibly one more time if there are ample resources during the dry season. The Napier collected from one of these harvests is usually fed every other day as a part of a feeding program, and lasts one to two weeks depending on the number of animals being fed. Nine of the ten farmers who collected harvests from Napier this past year mixed it with another forage while feeding. Farmers recognized that mixing the forage during feeding increased the amount of time that the Napier could be fed.

When questioned on their general satisfaction of Napier as a crop, all but one of the farmers said they were very pleased with its performance. The single farmer did not harvest any feed from Napier during the past year, but planned on moving the crop from its current location under a tree, with hopes of improvement over the next year. None of the farmers reported problems with disease or insects; however, it was commonly mentioned that plants required good soil conditions, adequate protection from grazing animals, and did not perform well when forced to compete with other plants. In conjunction with these observations, any farmers who mentioned problems had plans of improving management to overcome them for the upcoming growing season. All the farmers said they were comfortable with their knowledge of Napier grass due to the production and management training sessions they had received through ILRI, but would welcome any new information or management techniques.

As a response to the increase in demand for production and management knowledge, ILRI and its partners have recently developed informational leaflets for farmers. The leaflets include general information, descriptions, uses, management techniques and performance data on different production crops in Ethiopia. Newly translated Amharic versions are being developed in order to reach larger number of farmers. With such devotion at so many different levels to improving the farming practices and crops of Ethiopia, the lives of people cannot help but be improved.

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REFLECTIONS ON THE ETHIOPIAN EXPERIENCE

I arrived in Ethiopia around 11:30 pm on June 7, 2005. Once I found my bags and the driver who would take me to the ILRI campus, I found it slightly unnerving to be riding through the unexpectedly empty streets of the city I would be living in for the next two months. Other than two or three large trucks of heavily armed military soldiers, there was literally no one to be seen in the city. I found out the following day that the normally safe city of Addis Ababa would be the number-one story on the CNN and BBC world news for the next day or so. Apparently, student-initiated protests on the recently-released election results had led to over 20 people being shot by military police. Needless to say, family and friends at home were worried as to my safety. Some would say it was the worst time for me to go to Ethiopia; however, looking back it was probably about the best time for me. If I had not been scheduled to travel to Addis by that time, the travel bans from the US and England that soon followed would have prohibited my internship from going through. Personally, other than the first week when even the locals didn't know what to expect, I can truthfully say I never felt that my safety was in jeopardy while in Ethiopia. I was not allowed out of the ILRI compound during the first week of my internship while the city returned to equilibrium. Other than being a good safety precaution, this really helped me get to know the compound, its layout, how things worked and the people with whom I would be working. While it was a scary week or so for many different people, my personal time there was greatly improved as I was allowed to experience first hand life in a country with a much less stable government.

While reading through a number of different studies held at ILRI, I found that many of the projects compared different growing locations, even within the country of Ethiopia. It was hard for me to imagine that there could be so many different growing climates within one country. So when the opportunity arose for me to travel with researchers and workers from ILRI, I obviously took advantage of them. The surrounding areas around Addis and Debre Zeit as well are considered highland crop ground, and other than the mountainous feel, is what you would probably think of right away when you think of farmland in Africa. In traveling just six hours down the Rift Valley through the ILRI Ziway Station and down to the research site in Soddo, I saw a number of large lakes, familiar looking corn fields and even sugar cane. There was a decisive change in the color of the landscape as everything appeared greener and the soil took on a black color, as opposed to the red soil of the highland regions. Everything changes.

Our media often shows only the most destitute of situations in Africa. Certainly there is a critical need in Ethiopia to build a sustainable food supply for an ever-increasing and demanding human population. I was told that I would return home with a deeper

appreciation for the many resources we have in our country. This proved to be a true prediction. Never again will I take for granted clean available water, my next meal or a nice home in which to live. I also learned that "waste not-want not" is an important habit to develop as well.

Nonetheless, my misconceptions of total desolation were quickly replaced with observations of natural beauty and the dramatic topography of Ethiopia.
During the months of June and July, Ethiopia was in the first part of what is considered the long rainy season. Upon initially hearing that I would be spending my summer in Africa, I automatically assumed my time there was going to be extremely hot. I was pleasantly surprised however to find that I often needed my jacket in the mornings and had to make excuses to wear the shorts that I had brought along. Often times, communications to home revealed that it was hotter in Iowa than in Ethiopia. On the down side, however, the rainy season lives up to its name. Rain poured out of the sky several days a week and I can recall several days when it rained the entire day and into the night. Needless to say, upon arrival home in the first week of August, the Iowa summer seemed about as hot and dry as it ever had before.

In addition to the data collected for the research project, I actually was able to meet many farmers and their families and visit them at their farms. I think this is where I learned the most about the similarities of our cultures as well as the differences. I expected more differences, but found as many similarities. The farmers were very warm and welcoming of the "young man from America." I enjoyed meeting their extended families. I also expected to find myself so very different than the people I would meet in Africa. And while it is true that I was of a different color (and much taller!), and from a different culture, I was struck by the similarities too. We all love our families; we work hard to provide for our needs; we aspire to improve our future. I was encouraged to see that with so little, their lives seemed rich and satisfying. Nonetheless, there is much poverty and need as well. This experience has only strengthened my desire to pursue a career in food science. I understand now so much better the paramount importance of sustainable agriculture and the incredible value of research which breaks the barriers which might prevent starvation in the world. The experience that the World Food Prize Foundation has provided has pointed out clearly the international implications of my future work in food science once I finish college.

I can't wait.