

Observations on the potential of Dangila sheep for improved food security around Quarit and Adet, West Gojjam, Northwestern Ethiopia

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A Field Study Hosted by International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.

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1. Introduction

1.1. Who I am

The 2003 World Food Prize intern in Ethiopia is Jerad Allan Chipman. I am nineteen years old and have recently graduated from Harlan Community High School. I was extremely active in my high school career in organizations such as Destination Imagination, band, National Honor Society, FFA, and 4-H. Harlan is a small community of around five thousand five hundred people. I grew up six miles southwest of Harlan on Chipman Farms where we grow swine, corn (maize), and soybeans. Knowledge of sheep production and aiding those of the cattle industry has given me valued experience relevant to the present project as described in this report. My plans for the near future include attending Iowa State University in the College of Liberal Arts and Sciences with a major in History. Even though my current major is not in an agricultural field I intend to take courses in International Politics and International Studies for the purpose of accessing opportunities for rural development of developing countries in ways other than just agriculture. I attended the 2002 World Food Prize Youth Institute through writing a paper regarding the tribulations and possible solutions of India's water resources.

The interest in this program started before the Youth Institute with the influence of a friend and former Borlaug/Ruan Intern, Gary Sullivan. Gary was constantly supportive and enthusiastic when conversing upon the project. Having always thoroughly enjoyed traveling and experiencing cultural differences I had been eager to volunteer my services as an intern. This enjoyment started with the opportunity to travel overseas with my French class two years ago and escalated with my FFA Chapter's embarkation to Japan last summer. I became even more interested in the internship program through the scientific experience I gained in a college chemistry class offered at Harlan Community High School. The class dealt with a great deal of laboratory time and I became accustomed to the riggers along with the enjoyment of laboratory work. The experience the class gave only added to what I had gained from working in the artificial insemination laboratory on Chipman Farms.

1.2. Where I spent my Internship

I was deployed to the International Livestock Research Institute (ILRI) in Addis Ababa, Ethiopia. The ILRI campus is located on the eastern end of Addis Ababa near to the new Bole International Airport. ILRI is one of the 16 centers of the Consultative Group for International Agricultural Research (CGIAR), established in 1995 from the merger of the former International Livestock Center for Africa (ILCA) and the International Laboratory for Research on Animal Diseases (ILRAD). ILRI has its principal site in Addis Ababa. I was very pleased to have visited the Debre Zeit Research Station of ILRI and some of its research activities. A fellow intern and I, while visiting the station, were joined by a BBC Reporter, and together we had a guided tour of the research facilities.

1.3. Program I wanted to work with

ILRI placed me under the supervision of Dr. Workneh Ayalew, a Research Officer in the Animal Genetic Resources (AnGR) department. AnGR integrated well with the preferences I developed growing up on Chipman Farms since I was very active in the swine genetics that occurred on the farm. I find genetics

to be a fascinating field of opportunities for livestock improvement and enhanced food production. It can therefore offer these opportunities for poverty alleviation and elimination of hunger. Genetics has already been demonstrated as a powerful tool for bringing about major changes in global food production.

1.4. Goals of the program

The primary purpose of the AnGR program consisted of sustainable utilization and improvement of animal genetic resources for improved capacity to support human livelihood in developing countries. Short term goals of the program include identification of opportunities for important livestock development in areas with a heavy burden of poverty (as in the case of the Dangila sheep of this study), and interventions for conservation of livestock breeds endangered by extinction. Once such opportunities and activities are identified, analysed and documented, potential funding sources are explored to help finance the essential research and development activities. The present study on Dangila sheep is a small but vital first step in a process that could lead to major improvements in the contribution of these sheep in the lives of the poor communities who maintain them. If the potential of this sheep breed can be harnessed, it could open up further opportunities of rural development to help this culturally rich nation realize the benefits from its potential for agricultural development.

1.5. Brief background of the people I worked with in the program

My supervisor was Dr. Workneh Ayalew who assisted me on any queries that I may have had and organized my field programs. Dr. Ayalew was an extremely busy, hard working gentleman. He is from Debre Markos about 300Km to the North of Addis Ababa on the way to the four research sites used in this project.

I had also the opportunity to work with Dr. Markos Tibbo in data compilation for the electronic database on indigenous animal genetic resources. Dr. Tibbo is originally from Awassa about 270Km South of Addis Ababa and is in the process of applying for a PhD study. Mr. Ephrem Getahun was the handy computer technician that was constantly ready to aid in anyway possible. Mrs Wagaye W/Marian the AnGR administrative assistant was always very helpful in arranging the paper work and in helping me with any questions I might have had. Alex Baron, from Seattle, would read through some of my papers and provide helpful comments. Alex is working in ILRI for three months through the University of Washington and shared an office with me. During my stay I was able to assist Mr Gian Nicola Francesconi, an Italian working at ILRI for six months, in some veterinarian aspects.

2. The Project

The overall project started with a trip to the Sheno Agricultural Research Center, a government research facility collaborating with ILRI on various aspects of sheep genetic studies, to observe the facilities and outline the present study based on the on-going research project of the Center. One major research activity of the Center is its on-farm performance monitoring study on the Dangila (Washera) sheep at two sites in West Gojjam Zone of the Amhara Regional State. The present study was intended to document and publicize the potential of this sheep breed for improvement and poverty alleviation in those

areas using the baseline information already compiled in the on-farm study as well as first-hand observation of the situation in the farmers' villages. These involve determination of typical flock sizes, assess their growth performance in relation to other known breeds, examine their utility by the rural communities, explore major constraints to its development and identify potential areas for quick intervention to help the communities. The information so collected will then be delivered to interested parties who can work and research on the identified opportunities or constraints. Attempts will also be made to solicit funding to support some of the recommended activities. The breed information will also be entered into the DAGRIS database for wider reference.

2.1. Background of the Dangila sheep

Dangila sheep is said to be a fast growing, large framed breed with potential for commercial mutton production. It is indigenous to Ethiopia and found in the highlands of northwestern Ethiopia south of Lake Tana. It is maintained by mainly subsistent smallholder farmers who farm small plots of land and raise a mix livestock including sheep, cattle and chicken. There is no major livestock market in the area to encourage intensive sheep production. There is no development program on this sheep. The Sheno Agricultural Research Center has been implementing for the last year and half an on-farm performance monitoring research at four sites to document the level of performance and common management practices of this sheep under farmers' management. A preliminary progress report of this research on a sample of 17 flocks (Table 1) shows that the average flock size in the area is 8 heads of sheep with about half of these being breeding ewes and the rest being lambs and sheep just weaned; there were no breeding rams in these flocks, but there were a few castrated males for fattening (SARC, 2003). The data in Table 1 shows that the nearly equal proportion of males and females at birth changes by the age of 6 and 12 months because of the larger sales of young males while retaining more females as replacement stock; by the age of 6 months the proportion of males decreases to about 31% and this falls further to 10% by one year of age.

Table 1: Average flock composition of 17 sample flocks

Category	Size
Average flock size	8
Lambs: Male	1
Female	1.06
6 months: Male	0.29
Female	0.65
Yearling: Male	0.06
Female	0.53
Older sheep (F)	4.24
Castrates	0.18

The same report also shows that average birth weight in the sample flocks was about 2.8kg with average weaning weight of about 14kg and 6-month weight of 22kg (Table 2). The reported market age is about 6 months, but farmers are known to sell their sheep from the age of 4 months as the animals grow relatively fast. This indicates good potential for mutton production, although there is no major market outlet in the area.

Table 2: Observations on birth weight and growth of sheep in 17 sample flocks

Descriptor	Sample size	Value
Total sheep	136	136
Average flock size	17	8
Recorded average birth weight (kg):		
Female	15	2.80
Male	17	2.76
Recorded average weaning weight (kg):		
Female	13	13.39
Male	13	14.18
Recorded average 6 months weight (kg):		
Female	7	21.63
Male	7	23.84
Recorded average yearling weight (kg):		
Female	2	22.60
Male	0	0

A comparison of the growth performance of these sheep with other indigenous and exotic breeds shows that the growth rate after weaning in this breed is indeed comparable and even better than the other breeds. In particular, the growth of Dangila sheep was much better than the on-station growth performance of the Menz and Horro sheep, similar indigenous highland sheep breeds in Ethiopia (Table 3). This indicates the potential of this breed for commercial mutton production for the local as well as export market .

The observed performance of these sheep was under the management of unsubsidized farmers with very little additional feed and veterinary care provided to the sheep. The Dangila sheep are able to thrive on simple grazing and so far their true growing potential has not been realized.

Table 3: Comparison of average daily gain of Dangila sheep with selected indigenous and exotic sheep breeds.

Descriptor (kg/day)	Dangila	Menz	Horro	South African Merino	Landim	East African Blackhead
ADG birth to weaning: Male	0.113					
Female	0.118					
Overall	0.116	0.124		0.148	0.083	
ADG birth to 6 months: Male	0.117					
Female	0.105					
Overall	0.111	0.040 5.5 months (on-station)				0.082 5 months
ADG 3 to 6 months: Male	0.107	0.028 (on-station)	0.027 (on-station) 0.041 0.118			
Female	0.092					
Overall	0.100	0.090				

2.2. Method of study

Reviews of available documents, consultations with researchers as well as field observation were employed in this study. I visited the Sheno Agricultural Research Center and consulted Mr. Solomon Gizaw, a researchers involved in the work on Dangila sheep. We then planned my field observation of sample Dangila flocks and decided to have a five-day field trip to and from the research sites. We decided to visit the flocks together with Dr Workneh Ayalew and Mr Asfaw Bisrat, a field Officer of the Sheno Agricultural Research Center.

A suitable questionnaire of 11 questions was then prepared to interview some 20 sample farmers in the villages (the questionnaire is attached as an annex).

The field visits between 01 and 05 July 2003 took us to four of the villages covered by the On-farm flock performance monitoring study of the Center. A total of seventeen farmers were interviewed during the visits. The four small towns that were surveyed are located off the all weather roads where few large markets are readily available. The towns surveyed were Enangia, Denga Tsion, Mento Debir, and Geregera. Compilation and analysis of the data was placed onto an excel spreadsheet for greater breakdown and calculations.

2.3. Findings of the study

2.3.1. Size and composition of the sheep flocks

Most flocks are made up of several ewes and their offspring for that time period. Some flocks which do not grow as rapidly may still have some older males and market ewes. The flock sizes of 17 sample farmers ranged from 1 to 36, with average of 10.8 heads of sheep. An average of 4.6 sheep were sold from these flocks during the last one year, which is about half of the flocks sizes. Similarly about 1 sheep was slaughtered from each flock for home consumption. On average about 1.4 sheep (or about 13% of the flock

size) died during the same period. In the same way about 1.2 sheep were purchased and added into the flocks (Table 4).

Table 4: Flock sizes and reported changes in the flocks during the last 12 months

Descriptors	Range	Mean	Standard Deviation
Flock sizes	1 - 36	10.8	8.3
Sheep sales during last one year	0 - 24	4.6	5.6
Percent sales	0 - 90	49.5	44.0
Sheep slaughtered during last one year	0 - 4	1.06	1.03
Sheep deaths during last one year	0 - 5	1.4	1.8
sheep purchases during last one year	0 - 4	1.2	1.3

Only a few of the flocks have their own breeding rams in their flocks, and the rest use any available rams in the villages without considering their potential and breed type. This means that the breeding of sheep in the villages is not properly controlled, and this leads to unwanted genetic dilution of the breeds with unknown sheep. Genetic dilution of this type will gradually reduce the pure Dangila sheep population, and eventually even endanger the breed. This is one of the issues that ILRI works on in collaboration with government institutions like the Sheno Agricultural Research Center.

2.3.2. Feed resources used for the sheep

Grazing is clearly the key source in the nutrition of Dangila sheep, with the possibility of getting various rare supplements to the diet (Table 5). Supplements are not given regularly, but are provided as become available to selected sheep (e.g. pregnant and nursing sheep, castrated fattening males). Little intensive management goes into many of these sheep farms. If the sheep stray to another pasture controlled by a different set of farmers they are quickly herded back to their own pasture and strict words will be exchanged amongst the two sets of farmers.

Table 5: Reported sources of feed for sheep (N=17)

Description	N	Percent %
Grazing	17	100
Crop residue	8	47.06
Residue of local beer	8	47.06
Oil cakes	4	23.53
Salt licks	4	23.53
Improved forage	3	17.65
Roasted grains	2	11.76
Boiled sorghum	1	5.88
Crop leaves	1	5.88
Hay	1	5.88

2.3.3. Constraints to sheep production

The reported constraints to sheep production in the villages are scarcity of grazing, animal health problems (together with poor veterinary services) and occurrence of drought particularly during this year. The study area has a heavy human and animal population density. Communal grazing lands are very rare in the area, with many of the farmers grazing their sheep only around their farm plots. Health problems were reported as the second important constraint. The specific health problems indicated were external parasites, internal parasites, orf, respiratory diseases and foot rot. Poor delivery of veterinary services was cited by some farmers. The farmers said supplies of drugs are not adequate at government clinics and the drugs purchased from private drug vendors were said to be ineffective.

The utmost constraint for the farmers is the scarcity of grazing, and this coincides with those that mentioned drought since the study area has a nine month dry season and only a three month rainy season. Grazing is extremely scarce during the dry season causing many animals to grow far slower and eat such materials that have little nutritional value. There are only a few plots set aside by the farmers and they are not large enough to support the number of livestock set to graze there. The farmers who have these small grazing plots use them continuously without pasture rotation; so much of their pasture land is in a constant state of grass deprivation.

Farmers are also plowing more ground for crop fields and some of their fields have already lost their top soil from heavy rains and run off. When the top soil is gone in the valleys the farmers simply move up the hill to farm on tough slopes, that if under the same management as the valley, will only speed up the erosion process. It is no longer a curiosity of mine how the Nile Delta grows so quickly, with the unadvisable management of many farmers in Ethiopia. Most of the land is also covered by rock that the plow turns up. These rocks are a sign that much of the soil is not prime for growing crops. They are also a nuisance to the farmer, but when removed they can cause quicker erosion unless they are used productively in terraces. The large majority of the farmers simply do not move the rocks and attempt to raise their crops around the nuisances.

With a little effort to creating awareness and some funds to implement recommended support services, many of these problems could well be resolved.

Table 6: Reported Frequency of Major Constraints to Smallholder Sheep Producers (N=17)

Description	N	Percent %
Scarcity of grazing	13	76.47
Health problems: External parasites	10	58.82
Internal parasites	10	58.82
Orf	5	29.41
Respiratory	4	23.53
Foot rot	1	5.88
Emaciation (related to poor feeding)	1	5.88
Drought	4	23.53
Poor veterinary services	4	23.53

2.3.4. Uses of sheep

Sheep are used for a variety of functions in the study area. They are mainly used to generate income through sales of live animals. The cash obtained is used to buy clothing and food items, pay taxes, buy breeding stock, fertilizer and household supplies. It is covered part of the cost of buying oxen (Table 7). The purchase of clothing and food grains are more prominent in these poor communities of large family sizes. The average family size of sample households was 6.6 people with the range of three to nine. The curious thing is that in only one case sheep are used to save cash. Even though these families do not seem to have a lot of cash to save, as is apparent from the rare use of purchased veterinary supplies and purchased feeds.

Purchasing livestock was fairly high on the list of items to purchase using the sales income; however, buying feed, seed, and other sheep inputs are extremely low on the list. This means that the farmers train of thought is not to have a small to medium size herd of exceptional quality sheep that sell for top price, but to produce many more scraggily sheep that bring in less income and have more illnesses.

Table 7: Uses of sheep in the study area (N=17)

Description	N	Percent %
Income: Buy clothes	16	94.12
Buy food	12	70.59
Pay taxes	7	41.18
Buy breeding Stock	7	41.18
Buy fertilizer	5	29.41
Buy household Supplies	5	29.41
Buy oxen	3	17.65
Buy stationary for children	2	11.76
Pay family health care costs	2	11.76
Saving cash	1	5.88
Pay school fees	1	5.88
Buy feed for animals	1	5.88
Buy seed	1	5.88
Buy other sheep inputs	1	5.88
Cultural (holidays)	3	17.65
Social values	1	5.88

2.3.5. Holdings of other livestock

All the sample farmers keep a mix of livestock including at least one or two oxen, a few other cattle, plus donkeys, chicken and beehives (Table 8). Virtually no smallholder farmer in the study area is specialized in a single form of livestock or crop and this was found to be well upheld by the results of the survey. Six bulls for seventeen farmers and seventeen cows are tremendous compared to the few rams that are found on those same farms. The donkey is an important pack animal in the area, but not all farmers can afford to have them. Several farmers have a number of beehives as additional income generating activity. This small activity needs little care and maintenance until harvest time. Bees are also useful in the pollination of the extremely important crops.

Table 8: Holdings of livestock other than sheep in the 17 sample households

Descriptor	Number of animals in their holding
Cattle: Oxen	22
Bulls	6
Cows	17
Calves	18
Heifers	5
Donkeys	7
Chickens	2
Bee Hives	26

2.3.6. Crop cultivation

All of the farmers interviewed except one grow crops, and all of those that do grow crops grow diverse cereals, beans and other food crop species (Table 9). Teff is highly valued in Ethiopia since Ingera, one of Ethiopia's most common food items prepared in the form of thin pancakes, is made from flour of the seeds.

Table 9: Frequency of crops grown by the sample farmers (N=17)

Description	N	Percent %
Barley	13	76.47
Teff	13	76.47
Beans	13	76.47
Maize	10	58.82
Sorghum	8	47.06
Wheat	6	35.29
Potatoes	1	5.88
Kale	1	5.88

2.3.7. Other major problems

A general problem is the low level of economic development in rural areas. Developing countries like Ethiopia need the support and encouragement of developed nations in order to break away from the difficulties of poverty in their communities. Many of the rural inhabitants seem to have not seen opportunities to advance themselves economically. The will to thrive and prosper has not had the effect on the general populous that has made many of the developed nations grow so rapidly. As observed in the study villages, poor rural communities have opportunities to develop economically if they are upheld and managed well. However, they may need some critical assistance to utilize these opportunities. The assistance could be in the form of promoting suitable technologies, increasing the level of awareness and encouraging their economic activities.

Another major problem is the difficulty of marketing agricultural products both locally and internationally. The roads to the major urban markets are not good. In the case of eventual drastic increase in sheep production for export the single practical means of exporting is by aircraft from one of the few airports in and around the Region. Shipping by means of large cargo ships is not as simple a way to export as aircraft since a great number of sheep would have to be driven by expensive trucks and shipped down to Addis Ababa (about 450 km) to arrive at the only railroad in the entire country. This single railroad runs through the eastern portion of Ethiopia to the small country of Djibouti, a former Ethiopian region, to be loaded upon the ships after the tariffs and shipping fees are dealt with. At present times, Djibouti is the only country through which goods can feasibly be exported since Somalia is in political unrest with anarchy at the helm, Eritrea is still politically hostile from the last war, the Sudan is far and no convenient rail road goes over the mountains to a Sudanese port, and Kenya is also far away and again has no convenient rail road from Ethiopia. As a result the farmers have limited opportunities to use the export market.

Every effort made by farmers is also gobbled up by the expanding human population until farmers learn new techniques for feeding their livestock and to expand their own enterprises.

2.4. Conclusions and Recommendations

This Dangila breed of sheep has been found to be a relatively fast growing breed under harsh circumstances with good potential to aid the producers and the economy of Ethiopia. The mutton produced would greatly aid the income of those villages and may some day bring economic rejuvenation through the exportation of such sheep. Further research is needed on this breed, such as extensive study on the breed in a controlled environment to explore the potential of this breed. When the results of such studies are published and compared with other known breeds, the relative significance of this breed will be understood with greater ease and clarity. Meanwhile the developed nations and donor foundations need to furnish aid in the form of technical and financial to help deliver veterinary services and improved management skills. Help is also needed to set up large commercial sheep farms to increase sheep production while at the same time teaching the smallholder farmers about improved

technologies and best tactics in raising these high potential sheep. Some extension service could be useful to advise and encourage farmers to give their sheep better supplement and medication for higher mutton production.

3. Significance of the study

This study is important for publicizing a potentially desirable and prominent breed that could be used to improve food security in the rural communities and bring about economic prosperity. The publicity could lead to more research and development assistance to the area and the people. Increased sheep production and marketing certainly increases the farmers' income. It also means greater supplies of food to the consumers in the towns. Increased incomes and higher food production means improved food security to both the farmers and the consumers of mutton. But this can happen only if the farmers can produce good quality sheep. More funds for research and development are needed to facilitate this progress. Overall economic prosperity is also needed to increase the wages people now make in order to improve the standard of living.

3.1. My responsibilities and contributions

The first week I was adding to my own knowledge of Ethiopia and sheep production by reading several ILRI publications on the Amhara Regional State and Highland Sheep. This was followed by reading some text books on sheep production in the tropics and general sheep production. The responsibilities retained by myself included engineering the short questionnaire that was the basis of the study, which was reviewed and improved by Dr. Ayalew. I also aided the Animal Genetic Resources Department by placing information on to the DAGRIS raw data compilation sheets for latter input into the DAGRIS database. I was assisted by Mr. Bisrat in the data collection since it was performed in Amharic for the farmers' sake. It was translated into English for me by Dr Ayalew. I summarized the data from the surveys to compile for analysis. The data compilation and breakdown were the most time consuming of the tasks I was in charge of since all the data had to be converted unto an electronic excel sheet and then summarized. A presentation of the study was also made at the end of the study to inform the AnGR staff and other interested professionals of the findings of the research. A copy of the report was submitted to the the Sheno Agricultural Research Centre for their comments and documentation.

3.2. Contributions of this study towards improved food security

This project focused on one good opportunity to improve food security in the rural communities. The information generated allows researchers and extension staff to better understand the opportunities as well as constraints with the Dangila sheep. With this knowledge absorbed and taken into account more research and development works can be implemented to improve the use of this breed by rural communities. It was found out that simple assistance in veterinary services and provision of good breeding rams could improve the production of Dangila sheep. The information generated will also be included in the DAGRIS database for use by many other people including researchers, development workers, teachers, students, and farmers. It is hoped that the report can help attract more development and research workers into the area.

As more is researched the food security of the area will heighten from the advancements that researchers and other livestock managers bring. With the coming of improved veterinary services other livestock species will also benefit.

Another important observation is on the problem of soil erosion. Rivers, streams and ponds are filled with the top soil. Apart from losing the soil, the water bodies are also spoiled.

4. Impact of this study on my views on food security

Much more aid is needed to ever attempt to conquer food insecurity in rural areas like this study area. This contrasts with the economic prosperity in the developed world where I was brought up. I can see that a lot has to be done to improve the situation in the poor rural villages, but all this starts with very practical works like what is possible to do on the Dangila sheep.

I believe that the experience has heightened my independence and yet has emphasized the value of friendship. The program has also made me much more grateful. The research side of the program has enticed my interest in further experimenting and exploration in the sense of my academic self. I now know the meaning of desperation for the rural communities and that any small assistance can make a difference in the life of poor people. Rural communities can be very isolated and are surprised by a mere glimpse of a foreigner and often relate it with any help to ease the current poverty of their life.

The time I have spent here gives me an even stronger desire to work internationally. I have also learned to be thankful for the small things and attach great value to the time I spend with friends and colleagues.

Food security is an important issue that is taken for granted in many developed nations. Since people do not daily see processes such as pasteurizing or butchering many forget how much work it took to bring them agricultural products. In Ethiopia every one of these processes or the lack of that process is very apparent. All of the local butcher shops have their meat on display in non refrigerated rooms. One of Ethiopia's main dishes, kitfu, is even raw by choice. This is also related to the broad issue of food insecurity and health through food.

Consulted References

Benin, Samuel, Simeon Ehui, and John Pender. 2002. Policies for Livestock Development in the Ethiopian Highlands. Socio-economics and Policy Research Working Paper 41. ILRI, Addis Ababa, Ethiopia.

DAGRIS 2003. Domestic Animal Genetic Resources Information System (DAGRIS). Version 1. (eds. J.E.O. Rege, W. Ayalew and E. Getahun). ILRI (International Livestock Research Institute), Addis Ababa, Ethiopia. [<http://dagris.ilri.cgiar.org>]

Desta, Lakew, Menale Kassie, Samuel Benin, and John Pender. 2000. Land Degradation and Strategies for Sustainable Development in the Ethiopian

Highlands: Amhara Region. Socio-economics and Policy Research Working Paper 32. ILRI, Addis Ababa.

Devendra, C. and G. B. McLeroy. 1982. Goat and Sheep Production in the Tropics.. Logman Group Ltd. London.

ILRI (International Livestock Research Institute). 1996. Building a Global Research Institute. ILRI, Addis Ababa, Ethiopia.

ILRI (International Livestock Research Institute). 2002. Livestock: a Pathway Out of Poverty, ILRI's Strategy to 2010. ILRI, Nairobi, Kenya: ILRI.

Lemma, S. 2002. Phenotypic classification and description of indigenous sheep types in the Amhara National Regional State of Ethiopia. M.Sc. Thesis, University of Natal, Pietermaritzburg. 104 pp.

SARC (Sheno Agricultural Research Centre) 2003. Preliminary report on progress of the On-farm performance monitoring of Dangila sheep. Unpublished report.

SARC (Sheno Agricultural Research Centre) 2003. Survey and Monitoring of on-farm flocks of Dangila/Washera Sheep Types in West Gojjam zone of the Amhara region.

Speedy, Andrew W. 1980. Sheep Production: Science into Practice. New York: Logman Group Ltd.

List of people consulted

Mr. Abebe Mekoya (Sheno Agricultural Research Centre)
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Mr. Asfaw Bisrat (Sheno Agricultural Research Centre)
Dr. Markos Tibbo (ILRI)

Annex 1

Dangila/Washera Sheep Questionnaire

1. How important are sheep to the family?
2. What other livestock species besides sheep do you possess? (specify their numbers, if possible)
3. What crops do you grow? What is the size of your cultivated land?
4. What types of off-farm income generating activities are practiced in the family? What is the size of your family/household?
5. Could you tell us the total sheep disposal events (sales, gifts, deaths, etc.) during the last one year? (Relate this with the current size of the sheep flock of the family). If there was any sale of sheep, what were the prices?
6. Could you also tell us the total sheep acquisition events (birth, purchase, gifts, etc.) during the last one year (relate this with the current size of the sheep flock of the family).
7. What sheep records, if any, do you have?
8. Do the sheep have any housing?
9. What are the major sources of feed for your sheep? Do you buy any feeds for the sheep?
10. Do you select particular rams as sires for your flock? How do you pick them?
11. What do you think are the major problems to sheep production in the village?

