WELCOME

We deeply appreciate your attendance at this 17th Annual Goat Field Day of the E (Kika) de la Garza Institute for Goat Research of Langston University. The Field Day is one of the most important activities of our year. The primary purpose of the Field Day is for education and extension in areas of greatest interest to clientele of the Institute. Thus, please share your thoughts with us on today's activities and suggestions for the Field Day next year. In addition to extension and education, the Field Day provides an excellent opportunity for the staff members of the Institute to meet other people that work with and own goats. Such interactions helps make our program the best that it can be.

The proceedings of the Field Day is a very useful tool for the Institute beyond the impact realized from the program today. First, there are reports on Field Day presentations. After this information, there are highlights of research and extension activities of the Institute in the past year. This section is an aid to assess our recent progress, display current activities, and contemplate future directions to be followed. We hope you will take time later to look through this information.

As noted above, an exciting day is planned. This year's Field Day theme is:

"Creating Your Own Market"

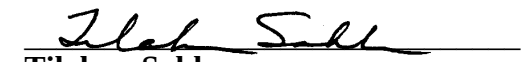
The morning program consists of:

* **Goats for Weed Control**	*Lani Lamming*
* **Meat Goats**	*John Edwards*
* **Dairy Goat Products**	*Denny Bolton*

This afternoon, you can choose from a variety of workshops including:

* **Marketing**	*All morning speakers*
* **Scrapie Identification Program**	*Nancy Roberts*
* **Basic Goat Husbandry I**	*Lionel Dawson*
* **Basic Goat Husbandry II**	*Jerry Hayes*
* **Goat Production & Quality Assurance**	*Langston staff*
* **Forage-based Dairy Goat Management**	*Steve Hart*
* **Inbreeding in Dairy Goats & Pedigree Analysis**	*Terry Gipson*

Please let us know your wishes for the 2003 field day, and we will do our best to again provide a quality program. On behalf of the staff of E (Kika) de la Garza Institute for Goat Research, we thank you for your continuing interest and support.



Tilahun Sahlu
Director, E (Kika) de la Garza Institute for Goat Research

CREATING YOUR OWN MARKET FOR MEAT GOATS

John and Jackie Edwards

Erath General Genetic Services
Stephenville, Texas

John and Jackie Edwards have carved out a success niche in the meat goat industry. They are owners of EGGS (Erath General Genetic Services) located in Stephenville, Texas. Two areas that the Edwards have excelled, in addition to a highly successful reproductive technologies business, are showring success and Ennobled Boer goats.

History

The history of EGGS starts with John and Jackie Edwards. John was born in Texas and raised on a cattle ranch in Ft. Sumner, NM. Jackie was born in Kerrville, Texas and raised in Ozona and Iraan, Texas and has a sheep background. They married in 1978 in Iraan, Texas. John was managing the William B. Wilson Ranch, raising Limousine and Angus cattle. In 1979, Dr. Bob Long told John about a ranch in California, Ankony Shadow Isle Angus, that had an extensive embryo transfer program. At the time, it was one of the only programs using both surgical and non-surgical procedures. The Edwards moved to California for John to head the artificial insemination program and to learn about E.T.

The ranch sold and moved to Minatare, Nebraska. John was promoted to Field Manager, responsible for the breeding program, the bull evaluation center, nutrition, sales, and heifer development programs. The ranch consisted of about 2,500 registered Angus and 500 commercial cows. While in Nebraska, both John and Jackie became addicted to riding and showing cutting horses.

After two Nebraska winters, Jackie decided it was time to head back to Texas and a warmer climate. The next stop was McKellar Ranch, Mt. Pleasant, TX. John was General Manager of about 800 head of Red Brahman cows and several thousand head of recipient cows. McKellar Ranch produced close to 1,000 embryo pregnancies and five production sales annually.

Several years later, the chance for a partnership with McWilliams Ranch saw the Edwards moving further east. While partners with the McWilliams, they continued raising Brahman cattle and opened a custom embryo transfer / semen collection facility.

Jackie's step dad, Rod Richardson, a world renowned sheep breeder, had John and Jackie constantly scouting for A.I, E.T. and semen collection programs for sheep. Eight years later, after dissolving the partnership and selling the cattle, the Edwards made the move to Stephenville, TX. Stephenville was picked because more of their cattle E.T. customers were located in central Texas. The fact that Stephenville was the unofficial cutting horse capital, I'm sure was never considered!! Stephenville is located in Erath county. Erath General Genetic Services--EGGS-- was founded.

John and Jackie continued doing embryo transfer work on cattle and horses, primarily cutting horses. When the first Boer goats came into the U.S. from New Zealand, they were the only ones in the area with experience in semen collection on sheep or goats. They were able to evaluate hundreds of bucks. When the first South African imports, via Canada, came to EGGS, (Mzuri, Ubora, Nelson, Martin, Johaan, Hudson, etc.), the Edwards knew they had to have some. Greg Coalson is a cutting horse breeder and trainer and a cattleman. Greg raises Romagnola cattle. Jackie and Greg made the trip to Canada in the early fall of 1995. They visited many Canadian goat

facilities. They bought several goats, six head to keep and some to resell. The "keeper" goats consisted of four Venter does, one Lukas Burger doe, a Nico Botha buck (Sasquatch), and a Van Zyl buck (Top Gun No. 2). Greg and Jackie, working together, had a very good eye.

One Venter doe, Nkai bred to Sasquatch, produced EGGSpensive, the 1997 ABGA National Champion Jr. Doe. Nkai is also the dam of one of the only two living ABGA Ennobled bucks, EGGStreme and is the grand dam of the other ABGA Ennobled buck, EGGSfile. The Venter doe, Lukuni, bred to Ubora, produced the 1997 ABGA National Champion Jr. Buck, owned by Downen Livestock. Top gun No. 2, owned by Bobby and Ida Ogle, sired the 1998 ABGA National Reserve Champion Jr. Percentage Doe, owned by Pete and Beverly Warlick (Hilltop Ranch). The Lukas Burger doe, Midnight, bred to EGGSfile, produced the 1999 ABGA National Reserve Champion Jr. Doe and the ABGA National Champion Pair of Doe Kids. John and Jackie are members of the American Boer Goat Association, International Boer Goat Association, American Meat Goat Association, National Cutting Horse Association, American Quarter Horse Association, and the TS&GRA.

John serves on the Board of Directors of the ABGA and as a senior judge for International Boer Goat Association. He has passed both the ABGA judges schools, Level 1 and Level 2. Jackie has passed Level 1 and hopes to try Level 2 in 2000.

Showring

The Edwards have actively shown their Boer goats and have been very successful. Their show results are presented in Table 1.

Table 1. Show Results.

Show	Results
1997 ABGA Nationals	Champion Jr. Doe - EGGSpensive
1998 West Texas Fair	Reserve Champion Sr. Buck - EGGStreme
1998 Heart of Texas Fair	Champion Sr. Buck - EGGStreme
	Reserve Champion Jr. Doe - EGGSemplary
	Champion Get of Sire
	Champion Buck / Doe Pair
1999 Cream of the Crop / Henderson, TX	Reserve Champion Jr. Buck - EGGSfile
1999 Austin / Travis County	2nd Place 0 - 6 month Doe
	2nd Place 6 - 12 month Doe
	2nd Place 12 - 24 month Doe
	1st Place 0 - 6 month Buck
	2nd Place 0 - 6 month Buck
	1st Place 6 - 12 month Buck
1999 Goldthwaite / Mills County Spring Show	Reserve Champion Buck - EGGSfile
	2nd Place 3 - 6 month Bucks
	4th Place 4 - 6 month Bucks
	5th Place 3 - 6 month Bucks
	2nd Place 12 - 24 month Bucks
	1st Place 2 year old Bucks
	1st Place 3 - 6 month Does
	2nd Place Yearling Does
	3rd Place Yearling Does
	Best Pair of Buck Kids
1999 ABGA Nationals - Bay Springs, MS	Reserve Champion Jr. Doe - EGGScent
	Reserve Champion Get of Sire
	Champion Pair of Doe Kids
	Champion Premier Exhibitor

Show	Results
	8th Place 0 - 6 month Does
	1st Place 3 - 6 month Does
	2nd Place 3 - 6 month Does
	3rd Place 2 year old Doe
	2nd Place 0 - 3 month Bucks
	4th Place 3 - 6 month Bucks
	7th Place 3 - 6 month Bucks
	8th Place 3 - 6 month Bucks
	6th Place 2 year old Bucks
	3rd Place Produce of Dam
1999 $elect $ire $uper $takes	1st Place 3 - 6 month Does
	8th Place 3 - 6 month Does
	1st Place 6 - 9 month Bucks
	4th Place 6 - 9 month Bucks
	6th Place 6 - 9 month Bucks
1999 West Texas Fair	Reserve Champion Jr. Buck - EGGSorcist
	Grand Champion Sr. Buck - EGGSfile
	Supreme Champion Buck - EGGSfile
	1st Place 8 - 12 month Bucks
	4th Place 8 - 12 month Bucks
	1st Place 1 - 2 year Bucks
	1st Place 2 - 3 year Bucks
	4th Place 4 - 8 month Does
1999 Duncan, OK	Reserve Champion Jr. Doe - EGGScessible
	Reserve Champion Jr. Buck - EGGScelerate
1999 State Fair of Utah	Grand Champion Sr. Buck - EGGStreme
	Reserve Champion Sr. Buck - Del Rio
	Grand Champion Jr. Buck
	Reserve Champion Jr. Buck - EGGSport
1999 State Fair of Texas	Grand Champion Buck - EGGSfile
	1st Place 6 - 12 month Bucks
	1st Place 12 - 24 month Bucks
	2nd Place 2 - 3 year old Bucks
2000 El Paso	1st Place 0 - 6 month Bucks
	3rd Place 0 - 6 month Bucks
	2nd Place 6 - 12 month Bucks
	5th Place 12 - 24 month Bucks
	7th Place 12 - 24 month Bucks
	1st Place 0 - 6 month Does
	3rd Place 0 - 6 month Does
2000 Houston Stock Show	1st Place 0 - 6 month Bucks
	3rd Place 0 - 6 month Bucks
	3rd Place 12 - 24 month Bucks
	1st Place 0 - 6 month Does
	4th Place 0 - 6 month Does

The Edwards were also the recipient of the 1999 and 2000 ABGA National Premier Exhibitor Award and the first recipient of the Donald Bird Memorial Breeder's Cup at the 2000 ABGA Nationals.

Ennobled Boer Goats

The Edwards are the owner/breeders of more Ennobled bucks or does than any other owner or breeder. Eight of the 33 Boer goats that have earned entry into the Ennobled Herdbook were bred

by or are owned by the Edwards'. These include EGGS RYALS MAGNUM, EGGSELLENT, EGGSFILE, EGGSORCIST, EGGSPENSIVE, EGGSPLICIT, EGGSTRASENSORYPERCEPTION (ESP), and EGGSTREME. A complete listing of Ennobled animals is presented in table 2.

The American Boer Goat Association (ABGA) has implemented a program to recognize the superior individuals. In 1996, ABGA established the Ennobled Herdbook. To obtain the title of "Ennobled", a fullblood or purebred Boer goat must meet or exceed the certain criteria. These criteria are listed at the end of this section. Fullblood and purebred Boer bucks and does which attain registration into the Ennobled Herdbook provide breeders with visual definitions of the Breed Standards as adopted by the American Boer Goat Association. The Ennoblement program is meant to provide a direction and an incentive for the continual improvement and growth of the Boer goat.

Table 2. List of Ennobled Boer Goats. *Source: http://www.abga.org/ennobled/ennobledframes.htm*

Ennobled Boer	**Gender**	**Date of Honor**	**Owner** (on date of ennoblement)	**Breeder**
UBORA	Buck	08/01/99	Downen Livestock	
KAPTEIN	Buck	08/01/99	Kohls/Smith/Payne	Jurgen Schultz
JOHAAN	Buck	08/01/99	Powell~Holman	Bloem
TABU	Buck	08/01/99	Powell~Holman	DuToit and Van Rensburg
519 (994 152)	Doe	08/24/99	Downen Livestock	
2 SIS TAMU	Doe	10/04/99	Powell~Holman	Bloem
EGGSFILE	Buck	03/09/00	John & Jackie Edwards	John & Jackie Edwards
EGGSTREME	Buck	03/09/00	John & Jackie Edwards	Coalson/Edwards
OAKRIDGE HUDSON	Buck	03/09/00	Keith or Rita Curry	J C Venter
ORF 1147	Doe	03/09/00	Oak Ridge Farm Rocky Hill Farm	Jurgen Schultz
OSCAR	Buck	03/28/00	Stegal/Long Boer Goats	Lukas Burger
EGGS RYALS MAGNUM	Buck	04/10/00	Bill Ryals	John & Jackie Edwards
CANADIAN CLUB	Buck	05/04/00	Hugh & Ann Schaffer	N&K Ranches
MOJO MAGIC	Buck	05/29/00	Jim & Lynn Farmer	
GAR ADUWA-SASQUATCH	Buck	07/21/00	Bill & Sylvia Self	
TOP GUN NO 2	Buck	07/21/00	Bobby & Ida Ogle	Neil Van Zyl
EGGSELLENT	Doe	08/15/00	Rocking R Boer Goats	
LSBG AFRICAN AMY	Doe	10/10/00	Lone Star Boer Goats	
DOWNEN BIG 85	Buck	10/10/00	Downen Livestock	Downen Livestock
DOW "PIPELINE"	Buck	12/04/00	Downen Livestock	Downen Livestock
JLF DELLO	Doe	12/15/00	Ward, Pete & Lance	Jim & Lynn Farmer
ORF LYLE	Buck	01/29/01	Oak Ridge Farm Rocky Hill Farm	Oak Ridge Farm Rocky Hill Farm
EGGSPENSIVE	Doe	02/28/01	John & Jackie Edwards	John & Jackie Edwards
HILLTOP 16R	Doe	05/01/01	Hilltop Boer Goats	Hilltop Boer Goats
HMR SUMO	Buck	05/22/01	Stephen & Dianne Farmer	Stephen & Dianne Farmer
EGGSPLICIT	Doe	08/05/01	John & Jackie Edwards	John & Jackie Edwards
CONCHO	Buck	10/18/01	Tony Cain	
EGGSORCIST	Buck	10/23/01	John & Jackie Edwards	John & Jackie Edwards
RYALS TOP BRASS	Buck	10/23/01	Rocking R Boer Goats	Rocking R Boer Goats
FRANCES 1407	Doe	10/23/01	Jim & Lynn Farmer	Tollie Jordaan
BULLDOG	Buck	11/19/01	Circle R Boers	Orvil L. "Butch" Patterson
EGGSTRASENSORY PERCEPTION (ESP)	Buck	02/13/02	Robert & Nancy Hughes	John & Jackie Edwards
BBO Cape	Doe	02/13/02	J.R. & Bobbie Patterson	Bobby and Ida Ogle

Criteria for the Ennoblement of a Boer Goat
Approved by the ABGA Board of Directors, March 10, 1999
Source: http://www.abga.org/ennobled/criteria1999-03-10.htm

A fullblood or purebred Boer Goat must meet or exceed the following criteria to attain the distinguished title of "Ennobled." A Boer goat must pass inspection (see exception in IV) and earn a total of eighty (80) points, with no less than thirty (30) of these total points having been earned by combining points from at least three (3) or his/her progeny (sons and daughters). Upon attainment of the required points, either through performance testing, show ring or a combination of both, the Boer will be registered in the "Ennobled Herd Book" and the owner will receive a certificate designating this status.

Ennoblement of a Boer Goat

I. Inspection

A. The Boer Goat must pass visual inspection, except as defined in IV, by meeting a minimum breeding standard.

1. One ABGA Board certified inspector must do the inspection.

a. The "Breed Standards' established by the American Boer Goat Association will provide the indices for inspection.

b. The earliest age at which a buck or doe may be visually inspected is ten (10) months of age and must have been registered with ABGA.

c. A buck or doe that fails his/her first visual inspection may be inspected a second time no sooner than six (6) months following the first inspection. After two (2) failed inspections, the goat will no longer be eligible for reinspection.

d. A certificate from the Executive Director's office will be issued the owner of the Boer Goat indicating a pass status of the Boer Goat and declaring the Boer Goat a nominee for ennoblement.

2. At least three (3) of the Boer Goat's progeny (sons and daughters) must be registered and on record in the Executive Director's office as having passed inspection (no exceptions).

II. ABGA Approved Performance Test (See appendix A for Performance Test Requirements)

A. A Boer buck to be a nominee for "ennoblement" should pass a pre-performance test inspection conducted by one (1) or more ABGA approved breeders. (See Appendix A) Because of age requirements, the bucks will not have passed an official inspection before the performance test.

B. Ten (10) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the top five percent (5%) of the animals on test.

C. Five (5) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the next fifteen percent (15%) of the animals on test.

D. All bucks must gain at least three-tenths (.3) pounds per day to be awarded any points.

E. A certificate from the Executive Director's office will be awarded the owner of the Buck showing his point status on the performance test and a copy of the results will be maintained by the Executive Director.

III. Show Ring

A. Boers will be judged against the ABGA established American Breed Standard.

B. Junior and Senior Grand and Reserve Champions of the ABGA National Show will receive in addition to class points, additional Champion points according to published scale for number of animals in their division of the show. National Grand and Reserve Champion will receive an additional fifty (50) and thirty (30) points respectively.

C. Grand and Reserve Champions of all other ABGA sanctioned shows will receive Class Points plus points correlating with the total number of fullblood/purebred Boers entered in the show.

D. The following point system will be awarded to a Boer goat who places as follows in an ABGA Board Sanctioned Show. Please note that points are earned by only Fullblood or Purebred goats.

# Entered in Class	Placing in Class							
	1st	2nd	3rd	4th	5th	6th	Grand Champion	Reserve Champion
10-less	5						5	
11-25	10	5					10	5
26-50	15	10	5				15	10
51-100	20	15	10	5			20	15
101-175	25	20	15	10	5		25	20
176-up	30	25	20	15	10	5	30	25

E. A formal show report, containing the animals' names, registration numbers, tattoos, and the total number of animals in the show and classes shall be completed by show secretary and signed by the judge and forwarded to the ABGA Executive Director within 90 days.

V. Non-inspected Boer Bucks and does can achieve Ennobled status through their progeny, when at least three (3) of their progeny (sons and daughters) have earned a combined total of one hundred (100) points as certified by the ABGA Executive Director. This requirement includes but is not limited to deceased bucks and does.

Appendix A

I. ABGA Performance Test Requirements

A. The Performance test is designed for male kids only.

1. The test must be conducted under the supervision of a disinterested agency, such as a State Agricultural Institution, State Extension Agency, etc.

2. Testing procedures and any requested deviations from these requirements must be submitted in writing to the ABGA Board of Directors for approval at least 3 months prior to the start of the test.

3. The test must be between 84 and 112 days long.

4. Bucks must be less than 6 months old at the start of the test.

5. The test must be open to all who want to participate and have qualifying animals.

6. A final Test Report will be submitted by the test supervision to the ABGA Board within 90 days of the conclusion of the test.

B. It is suggested, but not required that at least 4 animals by one sire be tested.

C. Pre-Performance Test Inspection

1. It is recommended that animals submitted for performance testing be parasite and disease free, with trimmed hooves and a current vaccination for clostridium perfringens.

2. The following areas will be inspected by a one (1) or more ABGA approved breeders as a prerequisite for entry into the performance test for the purpose of accruing points toward "ennoblement".

a. Mouth
b. Feet and Legs
c. Testicles
d. Pigmentation (defined as some)

Appendix B

I. Clarification of Accrual of Points

A. There is no order for the accrual of points.

1. A registered fullblood/purebred Boer may begin earning his or her points either through the show ring or performance testing prior to visual inspection.

2. The progeny, fullblood/purebred (sons and daughters) may begin earning points for their sire and/or dam as well as themselves either through the show ring or performance testing prior to visual inspection. However, the progeny

must pass visual inspection at some point before their earned points become official and are applied toward the ennoblement of their sire and/or dam as well as their own ennoblement.

B. It is possible for a buck or doe who has passed inspection to earn an "Ennobled" status entirely through his/her progeny.

C. It is possible for a buck or doe who has NOT passed a visual inspection to earn an "Ennobled" status entirely through his/her progeny. (See "IV")

D. The points earned by the progeny will count toward the progeny's ennoblement as well as that of the sire and/or dam.

E. Progeny is defined as the direct offspring of a buck or doe, i.e., sons and daughters (not grandsons and granddaughters). The progeny may come from live coverage, artificial insemination and embryo transfer.

II. Clarification of Color Requirements

A. In order to NOT dilute the trademark of the Boer goat, "correct" coloring is required to "pass" visual inspection.

1. Shadings between light red and dark red are permissible.

2. A minimum requirement for head color requires a patch of red at least 10 cm in diameter on both sides of head, ears excluded.

3. Both ears should have at least 75% red coloring.

4. The red coloring may extend from the nose to the heart girth and no lower than an imaginary line extending from the flank to the breast bone.

5. Only one patch, not exceeding to 10 cm (4 in.) in diameter, is permissible on the barrel, hindquarter and belly.

6. Patches of red on the legs may not exceed a total of 5 cm (2 in.) in diameter.

7. The tail may be red, but the red color may not continue onto the body for more than 2.5 cm (1 in.).

8. Very few red hairs are permissible at the two (2) tooth stage.

B. Pigmentation

1. Eyelids and hairless parts must be pigmented.

2. The hairless skin under the tail should have 75% pigmentation with 100% the ideal.

The proper citation for this article is:

Edwards, J. and J. Edwards. 2002. Creating Your Own Market for Meat Goats. Pages 1-8 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

CREATING YOUR OWN MARKET FOR MEAT GOATS (Part II)

John and Jackie Edwards

Erath General Genetic Services
Stephenville, Texas

As in all business, obtaining a fair price for the sale of the product is essential. There are two basic marketing tools that are utilized in selling goats. These are private treaty sales and auction sales. At EGGS we have used both techniques for several years and have learned some important and practical points that have been of great help in our marketing strategy of Boer goats.

Private treaty marketing is the most common means of selling the product by many Boer goat producers. Private treaty, marketing is selling your animals at your farm or ranch for a predetermined price. There are several key points to remember in selling your goats at private treaty.

It is vital that the goats that are for sale be presented in an organized and attractive way. If possible, they, should be grouped in small bunches, no more than 10 to 15 head per group, according to age, size, general appearance, condition, quality and of course, price. Any goats that are behind in their conditioning should be removed from the bunch and placed in a more intensive feed program. Animals that you intend to keep for your own use should not be presented with the animals that are for sale. Any animal that has been previously sold should be removed from the sale bunch to avoid buyer confusion.

Private treaty selling requires that someone be available at all times to present the goats for sale any time a customer arrives at the farm. Having pre-sorted and pre-priced the goats make you better able to meet the buyers' needs. Pedigree information with regard to sire and dam must be available and time should be taken to view the parent animals if the buyer so desires. Any performance records should also be provided. These records might include birth weight, number of siblings, weaning weight, gain test data, ribeye area, conversion ratios and group index scores.

With any private treaty sale goes the producer's personal guarantee of the animal being a breeder. All breeding age bucks should have a thorough fertility exam prior to shipping as well as other appropriate health tests. Females that might have been bred need to be pregnancy tested using ultrasound and any does found to be pregnant need to be accompanied with a breeder's certificate. Your reputation is made over the years according to your production capability and integrity. There are industry standards that provide guidelines for determination of non breeding animals and if you have sold such an animal be prepared to replace it or refund the purchase price.

Auction sales break down into three groups, the production sale, breed sponsored or special sales, and barn sales.

The production sale has become a very popular tool for breeders with larger numbers of sale animals or as a coalition or group effort of several individuals with smaller numbers of sale animals. The substantial cost of an adequate facility, sale catalogs, auctioneer, ring help, refreshments, presale

grooming, transportation, etc., etc., etc. require fairly large numbers of sale animals to average the cost against. Also, a larger number of sale animals are generally necessary to encourage participation of a good crowd of perspective buyers from all parts of the country.

As with private treaty sales, appropriate health documents should be provided and the terms of the sale and all guarantees should be noted in the sale catalog.

One of the advantages of a production sale is the ability to concentrate your efforts and resources for a short period of time to manage the entire sale group for the best possible presentation. The right amount of fat is always the prettiest color. Bred females should be in service to the most popular herdsires available. Avoid selling herdsire prospects in auction sales unless the buck has been highly promoted.

Special sales such as the MidWest at Sedalia, Missouri and the Top of the Rockies in Colorado combine a show and sale aspect where the placing in the show arranges the sale order. They also provide the majority of the advertising and produce the sale literature, mandate health requirements and define any guarantees and are very good at issuing post sale information that is valuable for the next year's sale effort. Regional goat associations present similar events but you must be prepared to be an active participant in the association business and a willing part of the necessary work force.

Also several commission company sale barns have taken the initiative to provide bi-monthly sales that feature full blood and percentage animals. These are normally well advertised but the owner is usually required to provide any sale day literature and should be prepared to personally represent their animals. As already mentioned, every effort should be taken to have all sale animals looking their very best.

Many local auction barns have daily ads on regional TV and radio stations that are used to generate interest in special consignments of sale animals. A visit with the barn manager some time prior to the sale date can provide you a surprising amount of low cost or no-cost advertising coverage. On the day of the sale, stand up and truthfully represent your animals.

The most elusive concept in the area of sales is how does a breeder create a market and need for their production. We are fortunate to currently enjoy a demand for our base product, goat meat, that exceeds US production capabilities by 300%. Now an individual producer chooses to expand beyond this basic terminal market will determine what their production and sales needs will be.

To some extent, the old adage of build a better mouse trap and the world will beat a path to your door is relevant. Know your product and understand the industry, the total industry. Take that knowledge and produce an animal with utility present and future. Do not be afraid to embrace new production and sales ideas. Visit other goat operations on a regular basis and study their strengths and needs. These trips can be beneficial in promoting sales as well as a source of new marketing and production ideas. Cattle and sheep are also raised in a pastoral setting making many of their production and marketing concepts models for goat husbandry.

You must advertise but it must be dollar wise. Judicious use of regional or national goat trade

publications, especially those editions that tend to be collectors items, are well advised. Depending on your target market, you may need to place ads in agricultural publications that are not specifically goat oriented as goats can be effectively produced alongside cattle and sheep. A web site or the basic Internet is rapidly becoming a new standard but be aware that many consumers are not yet comfortable with the.com concept. The show ring can also provide positive exposure. One of the very best options you have is to sell some of your very best stock into other programs. Having your animals succeed for other breeders is the ultimate compliment to your work and will stimulate more interest than all the other approaches combined.

Finally and maybe most importantly, approach your goat business with a positive attitude. The meat goat industry is one of the brighter spots in American agriculture and it needs to be presented that way. Any business will be met with adversity but if you cannot find more positives than negatives maybe this is not your niche. If you have problems with last week's judge, or the association, or the weather, or a fellow producer, do not vent those problems with a potential consumer and expect them to be inclined to jump at the opportunity to join your grief. Bring an honest enthusiasm to bear on a superior product and others will find your attitude contagious.

MARKETING OF WEED CONTROL

Lani Lamming

Ewe4ic Ecological Services
Alpine, Wyoming

Great Organic Agricultural Tools

Goat, that is. And there are over 1,200 cashmere goats in town cleaning up Crow Creek and Dry Creek drainages. Bob Lee, City of Cheyenne Environmental Manager, has worked these beautiful weed eaters into his progressive Integrated Pest Management (IPM) Program. Bob has reduced drastically the chemical inputs while increasing alterative tools over the past 28 years in dealing with Cheyenne's insect and weed problems. Weeds along Crow and Dry Creeks pose a challenge, especially noxious weeds like Leafy spurge, Dalmation toadflax, Purple loosestrife, and Canada thistle. "Noxious" is a legal term that describes certain non-native, aggressive, invasive plants that threaten our native ecosystems. These aliens have no natural enemies or competitors and once introduced by accident or on purpose, they potentially can displace native plants in our environment. When native plants are gone, neighborhood species that depend on these plant cannot survive: insects, birds, fish, small mammals, reptiles, wildlife, and people. Wildlife and livestock habitat is degraded, diversity is lost, erosion increases, productivity decreases. The price is high for all of who pay direct costs of mandated noxious weed control in addition to indirect costs of lower water quality. There is a federal Noxious Weed Law that the President signed as an Executive Order in 1999 for Invasive Plant Management. Each state has its own Noxious Weed List as well as each county in every state. By law, landowners must control these listed noxious weeds when growing on their lands. However, property owners may choose from several available chemical, mechanical, cultural, or biological tools.

Bob Lee has opted to avoid chemicals near Crow and Dry Creek for optimum health of the water, land, and people. He chose to use managed goat grazing in combination with re-seeding of desired plants. Mayor Spiker and the City Council have committed to long term responsible and bio-rational management of natural resources and increased health of Cheyenne's creeks as well as the citizens. Forethought and long term financial commitment will assure that water leaving the community is as high or of higher quality that when it came in. Ideally, this responsible community will send waters on to Nebraska free from harmful chemicals and noxious weed seeds. If Warren AFB will join the effort in the near future the goals from Crow Creek will be reached sooner and more efficiently.

"Weed" is a man-made word; plants do not care who their neighbors are. Plants are rooted to the ground and cannot run away so must protect themselves by making sharp spines or poison for defense, enduring late frost and early snow, severe wind, drought, and flood. Survival tactics are keen and those who can grow, reproduce, and compete in an open niche are rewarded. Some plants produce 500,000 seeds per plant and then disperse them by wind, water, your socks, wildlife hair, birds, the mud in car, and bike tire treads. More aggressive weeds produce seeds besides spreading by a vegetative root system and some can even poison other plants around them.

Weeds are symptoms that there is an underlying problem. Typical problems are drought, disturbed soil (constructions), poor soil quality, fire, flood, over-grazing, over-rest, and poor land management that remove competitive species, leaving open niches. A noxious weed requires minimal introduction to invade and thrives in an open niche. Americans are notorious for wanting

instant gratification and usually get an over-the-counter chemical to "kill the symptom" without asking why symptoms are growing there and "what is the real problem?" Short-sighted chemical weed control may result in a species shift, where one noxious weed is killed as another one replaces it that is resistant to that chemical. New chemistry is needed and the landowner is locked into continuous chemical use as symptoms are chased. Likewise, people sometimes get caught up in taking several different antibiotics, only to find themselves still sick but immune to all the drugs.

Weeds (symptoms) are indicators that land health is stressed. Looking beyond symptoms, land health is measured by four ecosystem functions: water cycle, mineral cycle, energy flow, and succession of plant community. The real problem lies in one or more of these categories and land managers may review land use goals to see which category needs augmented. Goals for Crow Creek are a functioning healthy riparian ecosystem where access allows the public to enjoy exercise while strolling with the natural world, where wildlife, fish, and birds can reproduce and live, and Cheyenne's children may enjoy while they are playing, viewing, and learning.

Stability begins in the soil. All plant life above and microbial life below with micro and macro fauna depend on soil health and available nutrients. When noxious weeds are seen in full flower, the land manager is 2 years late. He should have been tending to the soil much earlier. Small mammals, insects, birds, reptiles, wildlife, livestock, and people depend on production from the soil and *humans* manage these resources. People in the 21st century typically are one generation removed from the land. Stability in the soil has a domino effect through its products, continuing up through individuals, families, communities, and corresponding economics.

In an arid environment, grazing is the most powerful tool for land management. Animal impact on the land with corresponding hoof action, manure additions, and selective grazing may be used to enhance ecosystem functions. Goats are browsers, not grazers, and prefer 10% grass, which is opposite to diet preferences of cattle and horses that prefer 90% grass. So goat grazing may be applied along Crow Creek and Dry Creek to stress noxious weeds while encouraging desired plants to be the best competitors. Seven hundred pounds of native grass seed mix was scattered during the goat grazing in May along Crow Creek in an attempt to increase desired plant diversity that all compete against the weeds.

Goats are advanced technology recycling machines that are self-propelled. They eat noxious weeds and brush in preference to grass, and recycle all consumed plants to organic fertilizer pellets that are scattered evenly on the grasses as they leave. Irrigation is accomplished by getting the goats a drink of water from the creek and depositing it a pint at a time up on the dry hillsides where grass seed has been sown. Hoof action from 600 goats (2,400 sharp little hooves) incorporates seed, plant materials, and fertilizer into the soil where all can help soil stability, our starting point. Bare ground is covered. Hooves break soil capping so water from rains and snows can be captured and used effectively without waste and run-off. Hoof action helps to mellow steep banks and slow erosion while plant cover is achieved. Federal Emergency Management Assistance (FEMA) requires that all trees and brush be cleared from water channels to minimize flood hazard along Crow and Dry Creek. Goats do an excellent job of trimming, pruning, and clearing plant debris that impedes water flow besides removing weed seed sources from the water ways. Goats have a narrow, triangular mouth and they chew and nibble very fast that result in most seeds being crushed. Enzymes and digestive juices further destroy weed seed viability. Goats have an enzyme in their saliva that detoxifies poison hemlock before they swallow. This allows goats to eat poison hemlock without harm to them. Poison hemlock threatens people, wildlife, livestock, and pets along Crow Creek and history tells us that Socrates committed suicide with hemlock.

The weeds along Crow and Dry Creek have a head start, but with goals and goats we can help desired species to better compete. Energy flow on several trophic levels can be achieved. Bare

ground can be covered with re-seeding efforts, hoof action, and fertilizer. Flood threats will be lessened by two-fold: cleaning brush and thick plant debris from creek bottoms that impede water flow while vegetating upper slopes to trap and hold precipitation for infiltration minimizes run-off and erosion. Increased diversity in insect, plant, bird, fish, and wildlife levels makes a healthy sustainable, neighborhood without chemical inputs. Displaced ag workers can make a living using the skills and knowledge they have. Their wealth of knowledge can be recycled to young people who want to pursue ag employment and generations can move back toward the land. Economics can be stabilized in the community where no additional inputs are needed to allow three families to make a living.

All Cheyenne people are invited to come look at their land. Greenway Friends are cleaning trash, i.e., human plastic and paper (goats do not eat tin cans). If we could just get people to recycle their own trash.....

Ready To Rent for Weed Control and Extra Income

Vail, Colorado, is known more for it's alpine skiing than it is for its agriculture. But it wasn't always so. Long before the 10th Mountain Division designated the pristine Rocky Mountains as a training ground for World War II soldiers headed to the Alps to fight German storm troopers on skis, goats and sheep roamed the summer-green slopes of the now-famous area and represented one of the few agricultural enterprises of the region. Now the goats have returned, and it's the skiers that are applauding.

The cashmere goats, owned by Jackson, Wyoming-based Ewe4ic Ecological Services, offer an alternative to using controversial herbicides when controlling serious weed problems. And Vail, with its abundant annual rainfall and mild summer temperatures, is teeming with wild weeds. Or was.

For the second year in a row, the Vail Town Council decided to rent the goats as an alternative to herbicide application in the environmentally-sensitive Eagle River watershed. Electric fences, dogs, and goat herders were used to help confine the animals. Several signs and cones were posted around the grazing areas in order to warn recreationists. There were no reported accidents involving outdoor enthusiasts or the herd with the exception of a pair of unrestrained pet huskies that killed two goats while grazing.

And the cost for goat rentals these days? The Town of Vail paid $1 a day per goat, plus the cost of shipping, a figure Town officials say was less expensive than the herbicide program they had originally planned.

But did the project work as planned? Suzanne Silverthorn, a spokesperson for the town of Vail, said town officials are "more than pleased" with the results. Although the figures on the total number of acres grazed during the eight days of the program (which ended last week) were not available, she said the Town plans inviting the goat herd back next year.

"The goats have successfully been used in recent years in the neighboring counties of Eagle, Summit and Pitkin, as well as in Montana, Wyoming, Nebraska, Oklahoma, Utah, and California," Silverthorn reports.

In addition to weed removal from grazing, Lani Lamming, owner of Ewe4ic, also seeded the grazed areas in Vail with native plants to combat non-native weeds. And a selective broad leaf herbicide will be used on the grazed land in order to kill the weeds' roots.

Will goat grazing represent the next great auxiliary enterprise for stock owners? Maybe not. But at least one Wyoming cashmere herd has the rare designation as the only herd alive that will annually vacation in America's busiest ski resort. What a deal for the goats!

Source: http://agriculture.miningco.com/library/weekly/aa082501a.htm
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100 Goats Can Eradicate Weeds From 1 Acre Per Day

By Jason Gewirtz
Camera Staff Writer

SUPERIOR — Goats chomped away pleasantly in the foreground. Out of view, nestled somewhere in the rolling hills of the Lastoka Open Space, weevils and beetles feasted on the same enemy.

For those advocating non-chemical approaches in the war against noxious weeds, the scene Thursday marked the wave of the future. With more than 50,000 acres of Boulder County-owned open space, the question of how to handle rampant weed growth has come to the forefront of public policy.

"Control measures on large tracks are the issue," said Tim Seastedt, a University of Colorado biology professor.

Boulder County and other local governments use an integrated approach to handle the growing problem of invasive weeds, which compete with native vegetation on thousands of acres in Boulder County. Weeds such as knapweed, leafy spurge and Mediterranean sage can be killed by hand pulling, mowing, burning, insects, goats or herbicide application.

But herbicide critics say that governments are too quick to go the chemical route before exploring other options. To highlight other possibilities, the Boulder chapter of the Sierra Club invited supporters of several alternative methods to show off their weed-be-gone stuff on the Lastoka property Thursday.

Seastedt has been conducting an experiment on the Lastoka property since 1997 using insects to kill the weeds.

He has released four weed-eating insects onto the 160-acre property to see how effective they can be in dwindling the weed count. Seastedt said initial results show that areas with the weevils and beetles have shown a 50-percent reduction in seed growth compared to areas without the insects.

But that percentage should be higher, he said.

"Asking why it's not doing better is a research question," Seastedt said.

Weed-eating insects have proven successful at reducing the weed count at Chatfield Reservoir near Littleton, said Jerry Cochran, a program coordinator for the Colorado Department of Agriculture. Since 1991, the department has been measuring the growth of diffuse knapweed and found the insects have spread and done their job.
But insects are just one means of weed control.

"I liken the whole thing to a jigsaw puzzle," Cochran said. "You don't have a complete puzzle until

all the pieces are in place."

Another piece that is gaining popularity is goats.

Lani Lamming, who runs Wyoming-based Ewe4ic Ecological Services, said that 100 goats can eradicate weeds from about 1 acre of weed-infested property per day. Lamming said federal, state and local governments as well as private property owners have begun hiring her goats to eat away at the problem for about $100 an acre.

"They like weeds, especially noxious weeds," she said as dozens of goats chomped nearby. "They love leafy spurge, it's one of their favorite foods."

Sierra Club member Kirk Cunningham said that as governments continue to acquire more public land, the issue of providing a range of weed-killing methods will remain important.

"It's a matter of emphasis," he said. "Given their restraints, they may not be doing a bad job. But we want to push them toward more non-herbicide uses."

Source: http://www.bouldernews.com/news/local/11cweed.html
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Gobbling Goats Can Eradicate Noxious Weeds

By Janelle Holden
Cortez Journal Staff Writer

Socrates died from eating poisonous hemlock, but Lani Lamming's goats love it.

On a daily basis, her 2,000 cashmere goats annihilate even the most toxic, noxious and prickly of weeds.

Lamming, founder of Ewe4ic Ecological Services in Alpine, Wyo., was in Cortez June 11 to speak to the Mancos and Dolores soil conservation districts.

Lamming, her husband, Fred, and her sons Reggie and Donny Benz have developed a profitable, environmentally sound alternative to the normal practice of controlling noxious weeds with pesticides – goats.

A former cattle rancher, Lamming obtained a master's degree in weed science at Colorado State University, where she conducted research on how sheep eat weeds. Her research led her to goats, which eat more types of weeds at a faster pace than sheep.

After graduating from CSU, Lamming bought 100 cashmere goats and has built the herd to 2,000 over the four years she has been selling their services to landowners with weed-infested properties.

As in Montezuma County, weeds are a problem across the West. It is estimated that invasive species take over 4,600 acres of land per day and 1.5 million acres per year, Lamming said. They destroy animal habitat, increase erosion, create fire hazards and decrease land values. Many states, counties and cities – including the city of Durango and La Plata County – mandate that landowners control noxious weeds on their property.

Unlike cattle and horses, goats prefer weeds over lush grasses. Goats can also reach the more difficult places where weeds grow – cracks in rocks, steep hillsides and beneath bridges and highway overpasses. With intensive grazing over several years, goats can eliminate even the most aggressive weeds, including leafy spurge, purple loosestrife and musk thistle, Lamming said.

"The weeds are smarter than the plants, the goats are smarter than the weeds, and the only thing smarter than the goats is a border collie," said Lamming.

Lamming said she has never advertised her service; word of mouth has managed to build a lucrative business. Her clients have included the city of Denver, the towns of Meeker and Parker, and the Vail and Breckenridge resorts as well as public-land managers in several states.

Lamming used to charge by the acre, but now she charges per goat, from 25 cents to $2 per day, plus goats transportation costs.

Although Lamming doesn't own land, she has never had to buy feed or supplements for her goats. They will eat weeds at any time of the year, she said, but the best time for grazing is the fall and winter when the weeds are down.

When the goats have finished their assignment, Lamming reseeds the newly turned soil with natural grasses fertilized by the goats' waste. Any extra "fertilizer" is bagged and sold to organic farmers. The waste is not contaminated with seeds because of the unique shape of goats' mouths and their powerful digestive enzymes.

Lamming said any type of goat will eat weeds, but she chose cashmere because of their "handleability" and wool product. The cashmere from the goats is sold for $15 an ounce.

Source: http://199.45.202.146/1news4883.htm
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Goats Enlisted in War Against Weeds

By ROBERT WELLER
Associated Press Writer

VAIL, Colo. (AP) -- The "goats at work" signs along the bike paths of the nation's busiest ski resort are no joke.

Goats have been hard at work in Vail, munching on noxious weeds and providing an environmentally friendly alternative to herbicides that have proven ineffective in wiping out the weeds.

"In terms of environmental stewardship, this is a far better approach than using pesticides," Town Manager Bob McLaurin said.

Lani Lamming owns the herd of more than 600 goats, and she is also seeding the area with natural plants that will compete with the alien weeds.

She says the natural weed-eaters work much better than chemicals.

"Humans depend on eyesight. By the time they see weeds, it is two years too late. The goats can sense them," said Lamming, who has a master's degree in weed science from Colorado State University. "And they're better at vegetation management because there is no politics."

Some residents and guests say they prefer the animals over pesticides.

"They're cool," said Ann-Brit Hawkansson, 10, of Truckee, Calif., as she tried to persuade the shy goats to nibble on a carrot across the electric fence Lamming set up to keep them from wandering.

The fence only carries a small, harmless, charge, but enough to keep the goats in check.

Lamming's Alpine, Wyo.-based company, Ewe4ic Ecological Services, has been in business for four years.

In addition to Colorado, she has also done work in Montana, Wyoming, Nebraska, Oklahoma and Utah, charging $1 per goat for each day, plus the cost of shipping.

With the Agriculture Department estimating that weeds cost the economy $30 billion, there is plenty of demand for companies like Lemming's.

A company based near Sacramento, Calif., Goatweedeaters.com, has been in business for three years, renting South African Boer crossbreeds to get rid of weeds and reduce fire risk.

Ewe4ic Ecological Services: http://www.goatapelli.com

Goatweedeaters.com: http://www.goatweedeaters.com

Source: http://www.morningsun.net/stories/081901/sun_0819010054.shtml

Weed Eaters: Colorado Ski Town Turns to Goats to Munch on Weeds Along Bike Paths

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Source: http://www.adrenalineadventures.net/news/307.html

The proper citation for this article is:

Lamming, L. 2002. Marketing of Weed Control. Pages 9-16 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

CREATING OUR OWN MARKET

Denny Bolton

Pure Luck Grade A Dairy
Dripping Springs, Texas

Overview of Workshops

Hour #1 - Pure Luck's Marketing Mix

We'll look at all the more than a dozen ways we have marketed our dairy products over the past twelve years. What has worked, and what has not worked for us? There are distinct advantages and disadvantages to each of the industry's three markets – distributors, retailers and consumers. What is the best market for you?

Hour #2 - Farmers Markets & Farm Stands

How have sales at farmers markets and at our farm/dairy farm stand helped us satisfy our goals to create more customers, bring in more business from our current customers and make more profit? We will look at what is needed to set up and sell at a farmers market and how to set up a successful farm stand, so that the experience is a positive, rewarding and profitable one.

Hour #3 - Designing and Building a Web Site

What are the benefits to having a web site for your company? What has it done for us? What steps you will need to make to create a successful site? We will look at the monetary and time investment needed. We will look at domain names, web hosting, the software needed to design and build a site, scanners, digital cameras, and becoming an on-line visa/mastercard merchant.

½ Hour #4 - Relationship Marketing

Why it is vital to move away from old style selling and use relationship marketing to take a stranger, someone who has never bought from you and may not have even heard of you, and convert this stranger into a loyal customer? We'll look at what we do at Pure Luck to keep our customers loyal.

Workshops

Hour #1 – Pure Luck's Marketing Mix

A short introduction to marketing in general.

All businesses can be divided into to areas of activity:

1. Production – making or growing something.
2. Marketing – causing what you have made or grown to be sold.

There are three marketing goals for businesses no matter what is produced and marketed:

1. To find and develop more customers.
2. To make more sales from current customers.

3. To make more profit per sale.

There are three basic markets, or places to sell, for every product. Each market has advantages and disadvantages. The three markets are:

1. Wholesale Sales to Distributors.
2. Wholesale Sales to Retailers.
3. Direct Sales to the Consumer.

As a farm and dairy, Pure Luck Texas has moved away from Wholesale Sales to Distributors (5% of our sales). We have for the past several years, concentrated on Wholesale Sales to Retailers (65% of our sales). However, we are now moving our marketing efforts toward Direct Sales to the Consumer (30% of our sales).

There are Advantages and Disadvantages to each market:

Wholesale Sales to Distributors

Advantages

One call will sell a lot of product.
If your product is uniform and consistent, you will be competitive.
Fewer but larger accounts, less driving time.
Cost per sale will be less.
You can contract for a known quantity of product.
Can be competitive with shipped in product since you are local.

Disadvantages

Price you receive will be lower since they have to sell to someone who is retailing.
You can't sell to the same customers the distributor sells to.

Wholesale Sales to Retailers

Advantages
Have much more control of prices.
Can sell on a cash basis.
You can choose when to deliver and how much.
Cost per sale will be more than sales to distributors.
You can sell to everybody.
Locally made/grown.

Disadvantages

Price often set by the marketplace.
May have to offer terms.
Will have to deliver (or ship) so you will need trucks if delivering.
Orders will be smaller than with distributors.
Will have to follow a schedule of delivery.
May meet with more competition.
Smaller customers take as much time as bigger ones.

Direct Sales to Consumer

Advantages

Price will be the highest you can get.
Price can be set by supply and demand.
Will not have to offer terms.
Will get to deal with the end user.
Is easy to get started.
Consistency is not as important.
Easy access to feedback, can easily find out what the end user wants.
Can sell surplus products at a price you set.
Minimal requirements to be met for packaging.
On farm/dairy sales cuts down on delivery costs.

Disadvantages

May have to become a Visa card merchant.
Will have to make many smaller sales.
There will be more transactions.
Transactions will often be one-time sales, lack of repeat business.
Competition is stronger.

There are two styles of marketing:

1. Push Marketing.
2. Pull Marketing.

In Push Marketing, the direction of your efforts is out.

Push Marketing Methods

* Door to door sales, cold calls.
* Telemarketing.
* Direct Mail.
* Spam E-mail.

We'll go over each of these methods. Pull is in the realm of selling. Sometimes to get your business started, you will have to put yourself and your company out there, and make cold calls either in person (door to door) or by telephone (telemarketing). An easier way is by direct mail or e-mail, but the average return on these is very low, well under 1%. The return goes up to 10% if you mail and then follow up by a phone call. We'll show how this type of marketing is not very effective.

In Pull Marketing, the direction of your efforts is drawing in.

Pull Marketing Methods

* Farmers Markets.
* Farm Stands.
* Web Site.
* Delivery Route (where you are expected).
* E-mail newsletter, opt-in (permission to send).
* Networking.

* Conducting a Survey.
* Public Speaking.
* Events, like open house, party.
* Advertising.
* Writing Articles/Columns.
* Putting on a Class or Conference.
* Farm/Dairy tours.
* Booth at Trade Show.
* Press Release.

We'll go over each of these methods. Push is more suited to our type of business, because when someone contacts you, they already know you. There is not so much selling involved as there is being there and ready when they are ready to buy. Farmers Markets and Farm Stands will be covered in detail in hour #2 because they are the keys to success in the Direct Sales to Consumer Market. Designing and Building a Web Site is the newest development in Direct Sales to Consumer marketing and will be covered in detail in hour #3. Relationship Selling, which works for all three markets, will be covered in ½ hour #4.

Hour #2 - Farmers Markets & Farm Stands

A short introduction on Direct Sales to Consumers and our marketing goals at Pure Luck.

As a company we have been moving away from Wholesale Sales to Distributors (5% of our business). We are moving away for this market because we do not like the commodity feel and the prices we get are the lowest. The bulk of our business is in the Wholesale Sales to Retailers market (65% of our business). We have had to buy and maintain a van, and have had to make scheduled deliveries. We actually offer three different products, our Goat Cheese, Cut Flowers and Cut Herbs. We have enjoyed much success in this market but realize that Direct Sales to Consumers is the most profitable and closest we can get to the actual end-user.

There are three ways we sell direct to the consumer:

1. Farmers Markets.
2. Farm Stands.
3. Sales from our Web Site.

This hour we will cover how to prepare for, set up and sell at Farmers Markets, and how to prepare for, set up and sell at your farm/dairy with a Farm Stand. We will cover Designing and Building a Web Site in Hour #3.

Farmers Markets

We attend a year around farmers market called the Westlake Farmers Market, which sets up at the Westlake High School in Austin, Texas. We also sell at the Georgetown Farmers Market, Spring to Fall (closed in Winter) on the Square in Georgetown, Texas. There are many companies who use farmers markets as their primary marketing strategy. They may attend as many as they have people and products.

Of the three marketing goals mentions earlier, of finding and developing more customers, making more sales from customers, and making more profit per sale, our sales at the farmers markets help us on all three.

1. To find and develop more customers. We are not particularly looking for new customers in the Wholesale Sales to Distributors or the Wholesale Sales to Retailers markets. However we are, as a goal of our company, looking for new Direct Sales to the Consumer customers. We realize that one of the disadvantages of this market is that we will often be making one-time sales, that there will be a lack of repeat business. How can we make a relationship with this one-time customer? How can we bring this customer back?
    * By producing the very best quality product. A piece of cheese that tastes *so* good, the consumer will *have* to return to get some more.
    * Sign up for our e-mail newsletter.
    * Visit our web site.
    * Visit the farm.
    * Read our educational handout.
    * Buy our products at retail stores.
    * Come to our event, class.
    * Let us deliver to them.
    * A drawing.
    * Offer coupons.
2. To make more sales or bigger sales from customers. Variety and diversification. Besides our goat cheeses, we also offer vegetables (right now washed baby lettuces and spinach), cut culinary herbs, and cut flowers. The more items you have at the farmers market, the more sales per customer you will make.

3. To make more profit per sale. There are two ways to make more profit. One is to cut costs. Be a better buyer. Be more efficient. These savings could come from anywhere. A truck that is more fuel efficient. The other way is to get a better price for your product. If you are consistently selling out at the market, maybe your prices are too low. How should you set your price? When setting the price, remember why you are in business. You are there to make money. Why make less by setting your price lower than customers are willing to pay? It is better to start with the highest price you can get. It is hard to raise (if not impossible) your price as the day goes on, but you can lower your price by degrees as the day goes on. It should not be a goal to sell out. It should be a goal to make as much money that day as you possibly can. Remember, your costs remain constant, so charge more and make more profit. We offer a $1 coupon to be found on our web site. It takes a little off our profit for that sale, but we believe brings someone new in and coming back.

What you will need to sell at a Farmers Market:

* Products to sell.
* Vehicle to carry your products (air conditioned, refrigerated).
* Samples.
* Plates.
* Utensils.
* Crackers.
* Permit.
* Money for booth fee.
* Cash box, change.
* Tent.
* Receipt book, invoice book.
* Pens.
* Calculator.
* Table.
* Tablecloth, cloth or coated.

* Ice Chest/Refrigerator.
* Blue Ice.
* Spray bottle w/ cleaner.
* Napkins/paper towels.
* Plastic bags.
* Paper shopping bags.
* Water.
* Flyers.
* Business cards.
* Banner.
* Scale.
* Check list.
* Notebook to collect names, addresses, phone #s and e-mail addresses.

We'll go over each of the above and discuss how we can best utilize them.

Some helpful hints:

* Have everything you need for the market ready to go so you won't be late.
* Get to the Farmers Market early enough to set up and be ready when the market begins.
* Bring a variety of products. Try to make your booth look full to overflowing. Dress nicely. Clean clothes, shave, shower.
* Smile.
* Have enough help. Kids can package product, make change, look cute.
* Greet everybody who comes into your space.
* Greet people passing by. Some will come in if you say "Hi."
* Call people by name. Make a real effort to remember someone's first name. Write it down.
* Know the selling points of your product.
* Know the answers to any objection and be ready.
* Ask if they would like to try a sample of your product.
* Have a way to collect their names, addresses, phone # and e-mail address. We sign folks up for our e-mail newsletter. Before that we collected names and addresses for direct mail pieces.
* Offer a coupon. We have a *Pure Luck Buck* on our web site that folks can copy and bring to the Farmers Market or the Farm and get $1 off a purchase.
* Make a list of the taxable items you sell so you can pay sales tax. We include it in the price. Our cheese, veggies and herbs are non-taxable, but cut flowers are taxable. We try to keep prices in round numbers, $5 or $6. Not $4.99 plus tax.
* Bring Sales Tax Permit.
* Bring Organic Certification.
* Bring Vendor Permit.
* Keep your stuff within your assigned space, 8x8 or 10x10 or whatever.
* Post your prices. Blackboard, small tent-signs, price tags on products.
* Plan to store any food products off the ground.
* Check with Market Manager or Health Department for local laws and regulations.
* Be careful and accurate when making change.
* Get a driver's license # when taking checks.
* We take Visa/Mastercard at our booth but only a small percentage of the vendors do this.
* Clean up your spot before driving off.

Farm Stands

* Walk-in Cooler/Refrigerator.
* Permanent sign.
* Signs pointing the way to your Farm Stand.
* Permanent building/Tent.
* Everything listed under Farmers Market.

Some helpful hints:

* Have set hours. 9 to 5, etc. We set our hours on Saturday and have someone there at the Farm Stand during those hours, try to watch to see if someone shows up on Sunday, otherwise it is self-serve. We have a cash box for change and stock a small refrigerator with cheeses.
* Post all permits.
  Offer tours of your place for customers.
* We have found that customers coming to our farm will buy something. Our sales are generally bigger at the farm than at the farmers market, however, since we are pretty far off the highway (2-1/2 miles) we don't get the traffic.
* Consider selling other farm's products. We sell yard eggs, jellies.
  Stress how fresh everything is.
* Keep your sales area clean, mowed, neat, have flowers growing, etc.
* We have a two room walk-in cooler. In the front room we have a cheese tasting room set up. There is a small refrigerator in the front room as well. A bulletin board with notices. Newspaper articles on the farm/dairy, are laminated and tacked to inside walls. We can regulate the temperature of the two rooms. The back room is where we keep our wholesale orders and products not for sale. We keep it locked. The back room is kept cold. The front kept cool.
* Folks who come to the farm tend to stay longer and what to make more of an experience out of buying. We have picnic tables, and have recently developed a hiking trail on the back part of our land. Also, the children can play with the kids (goat babies) and walk through the flower fields and see the goats.
* All the things listed in the Farmers Market hints also apply, except you don't have to clean up before you drive off, but you still have to clean up before you go into the house, or just shut the gate.

Hour #3 – Designing and Building a Web Site

A short introduction on Direct Sales to Consumers and our marketing goals at Pure Luck.

Why develop a Web Site for Your Company?

* To open up an additional sales outlet. Open 7 days a week, 24 hours a day.
* To reach a particular demographic. On-line buyers are in upper half of money earners.
* To beat your competition to the line. If you are first, you have the edge.
* To generate customer feedback. Feedback forms let you know what your customer is thinking.
* To serve the local market. Web sites are replacing brochures on sales calls. "Let's look at that on our web site."
* To serve the global market. You now have millions of potential new customers.
* To enhance your image. A nice looking web site (as easy to create as a bad looking

one) can make you look like a bigger player.

* To make audio and video available. No need to lug a/v equipment around. Put it on your web site.
* To reach the media. Put press releases on-line. Link to printed articles about your company. Become an industry expert for quotes.
* To get the word out. Share your knowledge with brochures, white papers, articles. Be accessible, list phone, fax, e-mail, physical addresses.
* To make more money. Developing a web site has become the cheapest, most effective way to find a stranger and turn him into a friend and then into a customer and ultimately into a loyal customer.

Steps for Designing and Building Your Web Site:

* Gather information in the form of text and photos. These can be things you have written about your company, your products, prices, your people, your mission. Articles about your company work well.
* Organize your information into the natural categories or departments that will become your pages. For instance, on our web site, www.purelucktexas.com, we have a Home page, which is the page that shows up, and then have other pages such as History, Flowers, Herbs, Cheese, Cheese Making.
* Enter text onto web pages. We use Microsoft FrontPage which is very easy to use. Text can be put on Microsoft Word.
* Enter photos (images) onto pages. We use Microsoft Image Composer with a Hewlett Packard HP Scanjet 4400c scanner. This allows us to scan a photo, save it to MIC, resize it and fit it into the page.
* Add links within pages and to other sites.
* Publish. What you have created is stored in your computer. To put it on the internet and your web site, you essentially up-load to the site.

What is the monetary and time investment to develop a web site?

* You will need a domain name. These are names that end in a number of things, such as .com, .org, .net, and so on. .com is the most popular for a commercial web site, but being so popular, many names have been taken already. We wanted www.pureluck.com and found out it was already taken. We had to settle on www.purelucktexas.com. Domain names will cost about $35 per year.
* You will need a web host or you can be your own host, but you will need extra equipment to do this. Our web host charges about $20 per month. There are some cheaper and many more expensive.
* If you want to sell your products, as we do our cheeses, on-line, you probably want to become a Visa/Mastercard merchant. You will need a shopping cart, which is a separate company that tabulates your order, adds shipping costs, takes the credit card number. It costs us $5 per month for the shopping cart service and another $20 to $30 per month for the bank processing. There are various costs per transactions as well.
* We use Microsoft FrontPage software to build and maintain our web site. It allows you to type up the text as you would with Microsoft Word, with the freedom to use HTML language as well. This software runs around $100.
* You will need a scanner (ours costs about $100) or a digital camera. Cameras have come down in cost this past year. Still a couple of hundred or more for a good one.
* If you build your own site, you will need to put in the hours. Books, courses and time. If you hire someone to do it, costs will be from a few bucks per hour to

thousands of dollars.

Some helpful hints:

* Describe your target market or audience. Be as specific as possible.
* Make sure that each page can function as a self-contained unit.
* Pick a theme that works for your product.
* Decide the purpose of your site. Is it sales? Information?
* How do you want to get people to your site? Search engines?
* Take it one step at a time and publish when you have something acceptable to you.
* Make sure your host has the features you need. Audio? Video? E-commerce? No extra costs for links?

A Look at how we built the Pure Luck Texas web site.

½ Hour #4 – Relationship Marketing

A short introduction on sales and marketing.

There is a process to take a stranger to a loyal customer.

Here is the process. Make a stranger into a friend, a friend into a customer, and a customer into a loyal customer.

Stranger

Someone who does not know you. Has no reason to trust you. Does not understand you or where you are coming from. Has never tried your products. You are an outsider. Making cold calls on strangers the ratio of calls to sales is a minimum of ten to one. Ten calls to get one sale. This is why cold call selling is not right for our business.

Friend

Someone who knows you. Trusts you. Understands you and where you are coming from. Has tried your products. You are an insider. An ally. You have a relationship.

Customer

A buyer of goods. A purchaser.

Loyal Customer

A faithful buyer of goods.

Relationship. A connection. Affinity. Alliance. Partnership.

How to we turn a stranger into a friend?

* Be trustworthy. Always, always do what you say you are going to do.
* If there is any sort of problem, make it good immediately. It may mess up the profit on an individual sale, but the goal is to have a long time, loyal customer.
* Act friendly. Do things a friend would do.

* Remember his or her name.

In our industry, we have a limited number of potential customers. In our Wholesale Sales to Retailers market, we sell our cheeses to three Central Market stores, three Whole Foods Market stores, a food co-op, one other farm that has a farm stand, and five restaurants. That is thirteen customers. In our Wholesale Sales to Distributors we have one customer. We cannot afford to go charging in making cold calls on these buyers.

There is an expression in sales that 80% of your business will come from 20% of your sales. What we have done is concentrated on the 20%. Our 13 or 14 loyal customers are now 100% of our business.

How have we been able to keep them as a loyal customer?

* We have formed a partnership. Our cheese partnered with their cheese departments and their customers (our customers now).
* Demos – We go to their stores and sample our cheeses every time we are asked. Before holidays, store events.
* We talk to the cheese department staff as we are delivering.
* When we shop at their stores, we make sure we tell them who we are and that we love their store. We tell the checkers who we are and what our cheeses look like. We tell the waiters at the restaurants who we are. Most of the time the chef (who buys for the restaurant) will come out to our table.
* At the farmers markets and at the farm stand we tell folks all the places that carry our cheeses.
* We invite cheese department staff out to the farm, include them in our events at the farm, invite them to have their meetings at our farm.
* We write thank you notes at the end of the season. Winter is when we have our goats freshening and have less milk and less cheese.
* We go to events sponsored by our loyal customers and be sure to tell them who we are.
* We mention our loyal customers in our web site.
* Never talk about one customer with another customer.
* Gaining trust is the most important element. Always do what you say you are going to do. You earn trust by being reliable.

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ADVENTURES IN CHEESE-MAKING

Sara Bolton and Gretchen Stolfo

Pure Luck Grade A Goat Dairy
Dripping Springs, Texas

Welcome to the Langston University Cheese-Making workshop in conjunction with Langston's *Goat Field Days*. This is the second year we at Pure Luck Grade A Goat Dairy have been invited to share our cheese-making adventures. We appreciate the opportunity and thank you for coming.

The most basic requirement of yummy cheese is the best milk available. The best milk is a direct product of your animals' health, i.e., diet, environment and sanitation practices.

Goats are browsers and will be most happy and healthy when allowed to roam and nibble leaves of trees and shrubs, grasses and herbs. Fresh air and exercise make for healthy goats. A diet, rich in natural ingredients, such as whole grains, seeds and fresh legume hay, make for rich, tasty milk. Goats will produce well when provided with plenty of clean fresh water. They also thrive on a consistent rhythm with plenty of love.

Cleanliness cannot be stressed enough. Your goats need a warm, dry, well-ventilated place to bed down. It's very important to thoroughly wash and dry the udder before milking. Always squeeze the first few squirts of milk into a strip cup to insure that your goat's udder is in good health. After milking thoroughly, always use a post milking teat dip to prevent any undesirable organisms from entering through the dilated orifices of the teat.

With this said, we can now proceed to cheese-making.

Always start with clean equipment and fresh supplies. As a licensed dairy, we are required to sanitize all of our equipment before use. We use Clorox brand bleach at a rate of 100 ppm with an exposure time of one minute. To maintain sanitation we drain rather than wipe dry. Clorox is the least expensive sanitizer, literally pennies per day.

To pasteurize or not? Again, as a licensed dairy, we are required to pasteurize any cheese not aged over sixty days. Since most of our cheese is very fresh, we pasteurize. Pasteurization gives you a point at which you know all bacteria has been killed, a point from which you will be able to detect any contamination-based cheese problems. There is a lot to be said for not pasteurizing and of course it is a debatable point. Any of the following cheeses can be made successfully from raw milk given that strict sanitation is practiced from the goat milking process forward.

PURE LUCK'S CHEVRE

* American Cheese Society (A.C.S.) Blue Ribbon Winner in 2000 in the Category of *Fresh Goat Cheese*.

* A.C.S. Blue Ribbon Winner in 2001 in the Category of *Farmstead Produced Cheese.*

Batch: 4 gallons of milk at 72 degrees.

Culture: Mesophyllic.

Rennet: 5 drops liquid rennet diluted in 1/4 cup of water. Stir well.

* Cover and allow to set for 18 to 24 hours.

* Scoop curd into individual molds or larger perforated containers lined with cheesecloth. Cheese will drain to $1/5^{th}$ original volume.

* Allow to drain for 24 hours after which, the curd will be ready to be salted.

* Salt individual cheeses by shaking salt over entire surface. Lay on cheese mat over some kind of rack and allow to drain another 12 to 24 hours. Curd drained in larger containers will have salt blended in at a rate of 1% per total weight of curd. The salt encourages complete draining, flavors the cheese and inhibits growth of undesirable airborne molds.

* Soft fresh goat cheeses can be flavored with chopped fresh or dried herbs or spices. The cheeses can be coated with herbs or blended into curd.

PURE LUCK'S STE. MAURE

* A.C.S. Red Ribbon Winner in 1999 in the Category of *American Made - International Style.*

* A.C.S Red Ribbon Winner in 2001 in the Category of *Soft Ripened Goat Cheese*.

Batch: 4 gallons of milk at 72 degrees.

Culture: Mesophyllic.

Rennet: 5 drops liquid rennet diluted in 1/4 cup of water. Stir well

* Ste. Maure is an A.O.C. cheese; a cheese designated by the Government of France for its region and make process.

* Ste. Maure is made exactly like Chevre until it is scooped. Ste. Maure is scooped into long cylindrical, open-bottomed molds. At Pure Luck, we fit four open bottomed cylindrical molds into a large p.v.c. cylinder to hold them upright. They are placed on a cheese mat over draining trays. We scoop four gallons of curd to 16 molds.

* The Ste. Maure is allowed to drain overnight. In the morning it is flipped (not easy) and allowed to drain another few hours.

* The molds are then removed revealing lovely log shaped cheeses about 5 inches long.

* The logs are thoroughly salted and allowed to drain for another 24 hours. At this time the cheeses are carefully inoculated with pennicillium candidum and placed in a high humidity moderately cool environment to age and develop its thick white mold. The density of the cheese with the white mold gives the cheese its sharp pungent flavor.

* Under proper conditions the cheese will take two weeks to develop.

PURE LUCK'S FETA

* A.C.S. Red Ribbon Winner in 2001 in the Category of *Goat Feta*

Batch: 4 gallons of milk at 90 degrees.

Culture: Mesophillic.

Rennet: 1-1/2 tsp for 4 gallons at 90 degrees. Dilute liquid rennet in ¼ cup cool water. Stir into milk

* Let curd set for one hour or until it passes clean break test.
* Cut curd into ½ cubes.
* Let rest ten minutes.
* Stir every ten minutes for 1-1/2 to 2 hours.
* Scoop into cheesecloth lined container and allow to drain for 12 to 18 hours.
* Cut into Feta sized pieces (approximately 2" to 3") and brine. Brine is made by dissolving 2/3 of a cup of salt in one gallon cold water, and submersing cheese.
* Feta will last a minimum of one month in the salt brine.

PURE LUCK'S HOPELESSLY BLEU

Batch: 10 gallons of milk at 90 degrees.
Culture: Mesophillic. Add at 90 degrees. Allow to ripen one hour.
Rennet: Dilute 6 tsp liquid rennet in ½ cup of cool water and stir thoroughly into cultured milk. Allow to set undisturbed for 45 to 60 minutes until curd breaks clean.

* Cut curd into ½ inch cubes. Allow to rest 10 minutes so cubes form a little "hide."
* After a 10 minutes rest, stir curd gently every 10 minutes for one to 1-1/2 hours until curd feels somewhat 'raspy."
* Let sit 5 minutes so curd settles and whey rises.
* Pre-drain curd through cheesecloth lined container.
* Return curd to tub and mix gently so curd pieces are not matted.
* To the pre-drained curd add ½ to ¾ cup coarse salt.
* Dilute ¼ tsp liquid pennisillium roquefortii in ¼ cup water and add to curd. Mix well.
* Scoop curd into cheesecloth lined perforated container. Turn every ½ hour or so for 3 hours.
* Leave to drain overnight.
* Day 2, morning, salt all surfaces well and leave to drain on opposite side from previous night.
* Day 2, evening, turn cheese again and store on cheese mat in a semi air-tight plastic container. *Sterlite* works well and is available at Target, Wal-mart, etc.
* Store in refrigerator or walk-in cooler. Pennicilium roquefortii will grow at 45 degrees.
* Turn and salt daily for 3 days, shaking off excess salt each time.
* At the end of a week, use an ice pick, wooden shishkabob stick or knitting needle to poke holes through cheese, top to bottom. Pennicilium roquefortii needs oxygen to grow. This will insure nice bleu veining in your cheese.
* Turn weekly. Your cheese will need to age for at least 3 months, during which time it will be necessary to scrape off reddish-brown smear, which will develop on the surface. The scraping of the smear should take place every three weeks.
* Your Bleu may be ready to eat after 3 months, however, if you like a stronger cheese, it can age up to 6 months.
* Continue to turn weekly.

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THE USDA SCRAPIE ERADICATION PROGRAM

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What is Scrapie?

Scrapie is a fatal degenerative disease classified as a transmissible spongiform encephalopathy (TSE) affecting the central nervous system of sheep and goats. It was first recognized as a disease of sheep in Great Britain and Western Europe more than 250 years ago, and has since been reported throughout the world. Only two countries are recognized by the United States as being free of scrapie: Australia and New Zealand. The first case of scrapie in the United States was diagnosed in 1947 in a Michigan flock. The flock owner had imported sheep of British origin through Canada for several years. From this first case through July 2001, scrapie has been diagnosed in more than 1,000 flocks in the United States.

The scrapie agent is currently believed to be an abnormal protein (prion) that acts as the infectious and contagious agent. It is believed to be spread most commonly from infected females to offspring and to other animals through contact, primarily through oral exposure to the placenta and placental fluids.

What Are The Clinical Signs of Scrapie?

Signs of scrapie vary widely between individual animals and develop very slowly. Due to damage to nerve cells, affected animals usually show behavioral changes, tremor (especially of head and neck), itchiness, and incoordination that progresses to inability to get up and to eventual death. There is no cure for this disease.

Early signs include subtle changes in behavior or temperament. These changes may be followed by scratching and rubbing against fixed objects such as fence posts; apparently to relieve itching. Other signs are incoordination, weight loss despite having a normal appetite, biting of feet and legs, lip smacking, head tremors, gait abnormalities, including high-stepping of the front legs, hopping like a rabbit, and swaying of the back end. An affected animal may appear normal if left undisturbed at rest. However, when stimulated by a sudden noise, excessive movement, or the stress of handling, the animal may tremble or fall down in a convulsive like state.

Signs or effects of the disease usually do not appear until 2 to 5 years after the animal is infected. Animals may live 1 to 6 months or longer after the onset of clinical signs, but death is inevitable.

How is Scrapie Diagnosed?

On the farm, veterinarians diagnose scrapie based on the appearance of signs combined with knowledge of the animal's history. Several other disease syndromes can cause clinical signs similar to scrapie in sheep including ovine progressive pneumonia, listeriosis, rabies, the presence of external parasites (lice and mites), pregnancy toxemia and toxins.

There is no officially recognized test for scrapie in live animals, although research is progressing in this area. Currently, a live animal test in sheep using a sample from the third eyelid and DNA testing for susceptibility to scrapie are being used, but these tests have not been validated for goats.

Scrapie can only be confirmed by microscopic examinations of brain tissue and by special staining procedures of tissues samples that detect the presence of the scrapie agent.

What are the Goals of the New USDA Scrapie Eradication Program?

The goals of this program are to eradicate scrapie from the United States in 10 years, and then to be declared scrapie free by the end of 17 years. The program is based on the following key concepts:

* Identification of pre-clinical infected animals through live-animal testing and active slaughter surveillance.

* Effective tracing of infected animals to their herd (which will be referred to as a flock for the purposes of this document) of origin made possible as a result of the new identification requirements.

* Providing effective cleanup strategies that will allow producers to stay in business, preserve breeding stock, and remain economically viable. USDA APHIS will do this by providing the following to exposed and infected flocks that participate in cleanup plans:

    + Indemnity for high risk, suspect, and scrapie positive sheep and goats (which owners agree to destroy)

    + Scrapie live-animal testing in flocks with sheep

    + Genetic testing

    + Testing of exposed animals that have been sold out of infected and source flocks

What Are the Identification Requirements for Sheep and Goats Under the Scrapie Eradication Program?

* In Oklahoma, all sexually intact sheep and goats of any age must be officially identified before being moved for any purpose.

* Producers, licensed livestock dealers, special sale permit holders and approved markets may identify animals.

* Unidentified animals arriving at livestock markets will be identified prior to sale.

* Each of the following is considered official identification for sheep and goats in Oklahoma:

    + An official USDA tag obtained from the Oklahoma State Department of Agriculture

    + **Legible** official goat registry tattoo, only if the animal is accompanied by a registration certificate

    + **Legible** tattoos with a premises number assigned by the Oklahoma State

Department of Agriculture, and an individual animal number

+ Ear tags and **legible** tattoos for animals enrolled in the Scrapie Flock Certification Program

What Are the Recordkeeping Requirements for the Scrapie Eradication Program?

Anyone officially identifying sheep and goats must keep records on the following for 5 years:

* Date that the animal(s) were tagged
* The tag numbers that were applied
* The breed, age and sex of the animals that were identified
* Any other identification on the animal(s)

Anyone selling, buying or leasing sheep and goats must keep records on the following for 5 years:

* The animal(s') ID, and the name, address and phone number of the person involved in the transaction
* The date of the sale, purchase or lease
* The breed, age and sex of the animal(s)
* Any other identification on the animal(s)

Once a sheep or goat has been tagged with an official identification, it must not be tagged with an additional official identification. For instance, if you buy and move animals from "John Doe" that already have his official identification tags, you should not retag these aniamls with your official flock identification tags unless the official identification tag has been lost. These animals should be listed in your records or an owner statement as having "John Doe" (and "John Doe's" official flock identification number) as the flock of origin.

The Federal Scrapie Eradication Rules require that all sexually intact sheep and goats in interstate commerce (for any purposes other than immediate slaughter) must have a health certificate issued by their veterinarian within 30 days.

Scrapie Certification or Identification - What's the Difference?

The USDA rule requiring official identification of sheep and goats crossing state lines went into effect on November 19. "*I'm confused*!" is the mantra being repeated by many producers, veterinarians, and even some USDA employees. Keeping the identification rule "simple" wasn't possible when trying to write a regulation that will apply to someone with four animals and someone else with five thousand animals.

To make matters more confusing, some producers are confusing the sheep and goat identification rule with the Scrapie Flock Certification Program. (SFCP) *"Why are we being forced into the scrapie program?"* they ask. You're not! The SFCP was developed to identify sources of low risk breeding animals. The identification rule was implemented to permit tracing of animals from infected flocks and from flocks whose scrapie risk has not been defined. Still confused? Read on.

The Scrapie Flock Certification Program was implemented in 1992. The SFCP allows producers to make risk based decisions regarding scrapie when purchasing breeding animals. *How?* The SFCP identifies flocks whose animals are at lower risk of spreading scrapie - the longer the status date, the less risk the flock has scrapie. Because of the long incubation period of the disease, flocks who

stick with the program (don't add lower status females) become certified scrapie free after five years. Animals from certified flocks represent the least risk of introducing scrapie when added to a purchasing flock. **SFCP tags** show a **map of the US and a sheep** in addition to premises and animal identification.

The identification rule went into effect November 19, 2001. This rule requires sheep and goats to have official identification (usually ear tags) to cross state lines. For the most part, these are animals from flocks whose scrapie status has not been identified. The rule was put into effect to assist USDA in eradicating scrapie from the U.S. Because the scrapie agent is shed at birth, since January 2002 all offspring must be identified to their flock of birth. This will allow USDA to trace positive animals all the way back to where they became infected - at birth. Identifying animals at birth and keeping good records will assist in developing a scrapie flock cleanup plan should your flock become infected. In Oklahoma, **official ear tags** for sheep and goats NOT in the SFCP have a **shield that says USDA** on them and have a unique serial number on the male part of the tag, and **OK** on the female part of the tag.

What Happens If My Sheep or Goats are Exposed to Scrapie?

A federal or state veterinarian will do an investigation. Based on the exposure risk of the herd, applicable regulations, and the owners situation, the veterinarian will determine the cleanup and monitoring actions to be taken. If your flock is determined to be an infected or source flock some or all of your animals will be restricted to the premises except movements to slaughter until the cleanup plan is completed.

How Do I Enroll in the Certification Program?

For more information about the Scrapie Flock Certification Program, you may contact:

Dr. Nancy Roberts
USDA, APHIS, Veterinary Services
4020 N. Lincoln Boulevard
Suite 101
Oklahoma City, OK 73105 **Telephone (405) 427-9413, Fax (405) 427-9451**

Additionally, current information on enrolled, certified, source, and infected flocks is available online at **http://www.aphis.usda.gov/vs/scrapie/**.

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FORAGE BASED DAIRY GOAT MANAGEMENT

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Pastures have not typically been utilized for milk production with dairy goats. Well, goats have been put on pastures, but for the most part, pastures have not been managed to be the major source of high quality forage for the dairy goats. Often, pastures were not fertilized and allowed to mature. Goats were usually fed hay and they nibbled some pasture as they wanted to. There is little published information about pastures for goats - a little from Mexico on brushy pastures with low levels of milk production and some from France which is in French. Nonetheless, there are a few goat producers in the US who are utilizing pasture for their milking goats.

Most of the information available for dairy production on pastures comes from dairy cow research. There has been a renaissance in pastures for dairy cows, mostly with the smaller dairies. The chief reason for going to pastures is reduced feed costs and increased profitability of the operation even though milk production levels are reduced. One economic study showed that pasturing dairy cows improved profitability as much as using bovine growth hormone. Another benefit of pasturing has been improved animal health and reduced health expenses. This is probably a consequence of reduced production level and animal stress and the benefit of sunshine and fresh air. However, the level of management required is much higher because the pastures must be managed as intensively as the animals. An additional benefit is less barn cleaning and less time required to take care of animals since the time required for feeding is reduced.

Some international literature has shown that pasture can affect the quality and flavor of cheese made from cow milk. There is virtually no work on this subject in dairy goats. Another potential benefit is that the concentration of conjugated linoleic acid in cow milk is increased by pasture. The less grain used, the greater the concentration of conjugated linoleic acid. Conjugated linoleic acid is a compound in milk that has been identified as being anticarcinogenic (prevents cancer)and antiatheroschlerotic (prevents the clogging of arteries). It is the only animal product that has been identified as an anticarcinogen. Also, since organic grain is very expensive, organic goat milk could be produced cheaper on organic pasture since a minimum of grain would be required.

Pasture management is of paramount importance if milk production from pastures is to succeed. The goal of pasture management is to supply high quality pasture starting at the beginning of lactation and maintain high quality forage in sufficient quantities throughout the lactation. The forage must be high in quality and be available when animals are lactating. Unless you are quite far south, you are unlikely to have any pasture growing between mid-December and mid-March. Therefore, it would be difficult to have pasture for kidding in February. For most of Oklahoma, cool season annuals such as wheat start producing in mid-March and kidding should be timed accordingly. Wheat and other cool season annuals (rye, oats) have the high quality that is necessary for high levels of milk production. Alfalfa is a good high quality pasture, but has the disadvantage of being later in the season (grazing beginning mid-April) and high cost of pasture establishment. Outside of alfalfa, goats like few legumes. In our experience, goats eat little of white, red, crimson, or arrowleaf clover. However, they seem to love Berseem clover, which can be overseeded with wheat. Berseem clover provides high quality forage between wheat and crabgrass. We have multiple pastures of wheat and Berseem clover. In late spring, we disk a pasture every week or two and overseed crabgrass/sudan grass into them. By staggering the planting, we can have an

uninterrupted supply of high quality forage. Crabgrass is one of the highest quality warm season grasses. There are a number of other warm season grasses that are appropriate, including Johnsongrass, millet, and sudangrass. We are planning on including annual lespedeza into our warm season pastures. We have begun using cowpeas for late summer grazing. They grow well in the hot dry summer and provide high quality forage that the goats relish.

One needs to adjust to the grazing behavior of goats. Initially, when goats were put to pasture, they bawled for the barn and alfalfa hay. After 4 or 5 days, they finally decided to accept their fate and put their heads down to graze. We have had to learn which forages dairy goats do well on and which ones are not appropriate. Initially, the goats did not like the cowpeas, but after 4 or 5 days, they decided they loved them. Goats love the Berseem clover. Water is provided in each pasture. It would be good if the water could be shaded in the hot summer to keep the water and goats cooler. Also, a portable shade is provided. It was built on a hay wagon undergear and has a corrugated metal roof about 8' off the ground and is 12 × 24', which provides sufficient shade for 50-60 goats. It was our intent to put a mineral box on the portable shade. We are experimenting with other crops for milking goats such as Puna chicory. Crops meriting investigation include perennials such as orchardgrass, which would improve sustainablility and reduce tillage needs.

We have conducted two years of research grazing dairy goats. This study also involved different levels of grain supplementation. Milk production for these two years are shown in Figure 1. This is averaged over all levels of grain which will be discussed later. The lactation curves look fairly normal, but milk production is much lower for the first year than the second year. This can be attributed to three factors. First, goats were in lower body condition in year 1 and did not have adequate body reserves for the following lactation. Another factor was that we had some gaps in our forage system, i.e., there were some times that we did not have adequate amounts of high quality forage available for grazing. Also, we had problems with internal parasites the first year that surprised us. The problem was that the dewormer that we used did not work. Since animals in the confinement part of our operation are on concrete during lactation, they do not pick up many internal parasites and therefore we did not realize that the dewormer was not working. Does were pastured October through early March when cold weather reduced parasite problems. We did not realize that our dewormer was not working until we grazed goats during the warm, moist spring. We learned from our mistakes the first year and had much better levels of milk production the second year.

Internal parasites are one of the biggest problems in using pastures for dairy goats. The first problem is that you are limited in that which dewormers can be used for lactating animals (Panacur, Valbazen, Eprinex, and Rumatel). We have dewormer resistance to the first two dewormers, but the latter two dewormers are quite effective for us. Ivermectin and Cydectin are secreted in the milk for a long time and should never be used in lactating animals. Fecal egg counts must be done every 3 weeks to stay on top of the parasite problem. Dairy does should be dewormed when fecal egg counts exceed 800 eggs per gram. Pasture rotation and the tillage of pastures helps to reduce pasture contamination. Another practice that would be useful is grazing another animal species (such as horses or cattle) on the pasture following the goats. These animals would consume the larvae and clean up the pastures. Another practice that reduces larva contamination is to make hay after grazing.

Table 1 shows the effect of different levels of grain supplementation on milk production. We calculated that animals should be able to consume enough pasture to produce about 3.3 lb of milk per day and planned on three levels of grain supplementation for milk produced above this amount. One treatment had no supplemental grain such as one may use if organic milk or high CLA milk is to be produced (treatment D). The second grain level was 1/3 lb of grain for every lb of milk over 3.3 lbs (treatment C), and the third level was 2/3 lb of grain for every lb of milk over 3.3 lbs (treatment B). Treatment A is our control where animals are in the barn and fed alfalfa hay and grain

at the same level as treatment B. We fed an additional pound of grain to treatments A, B, and C the first 8 wk of lactation as lead feeding. Does were limited to no more than 4.4 lb of grain per day to prevent acidosis. In the first year, milk yield declined with grazing and grain level, although as discussed previously, prekidding body condition was an important factor. In the second year, milk production of grazing goats with the lower level of grain supplementation was similar to control animals in the barn. It is not known why the higher level of grain supplementation produced lower levels of milk. Also in Table 1, the lactation curve characteristics for each treatment and year are shown. Does in year 1 had lower peak yields, especially with lower levels of grain because the peak yield occurred earlier than in the second year. Milk yields peaked earlier because does exhausted body reserves sooner since they had lower body condition. Persistency (ability to sustain milk production) was also lower for goats fed lower levels of grain. In the second year when does were in better body condition, milk yield peaked at similar levels for all treatments. Peak yield tended to occur earlier in the goats being fed pasture alone, probably a consequence of energy limitation. Persistency of all treatments was similar during the second year. Milk production responded to grain, but not dramatically. Figure 2 shows that milk production increased by 1.7 lb for every added pound of grain supplement fed. Also, it shows that animals were able to produce about 3.3 lb of milk with no grain, although, some animals on the study did much better.

Fat percentage of milk tended to be lower for animals with no grain supplementation (Table 1), probably reflecting the energy restriction of animals on this diet. Protein and lactose followed a similar trend presumably for the same reason. Despite this limitation, cheese made from milk produced on pasture alone or with the low level of grain was shown to have higher flavor scores.

In conclusion, dairy goats on pasture can have acceptable levels of milk production with some minor changes in milk composition, especially where grain supplementation is absent. Grazing dairy goats requires additional management demands, especially for the pasture. In areas with quite dry summers, irrigation may be necessary to insure an uninterrupted supply of forage. Internal parasites need to be monitored and controlled. For the production of organic milk or high milk high in conjugated linoleic acid, goats may produce significant levels of milk from high quality pasture alone. Pasture may offer potential for producing cheese with unique flavors.

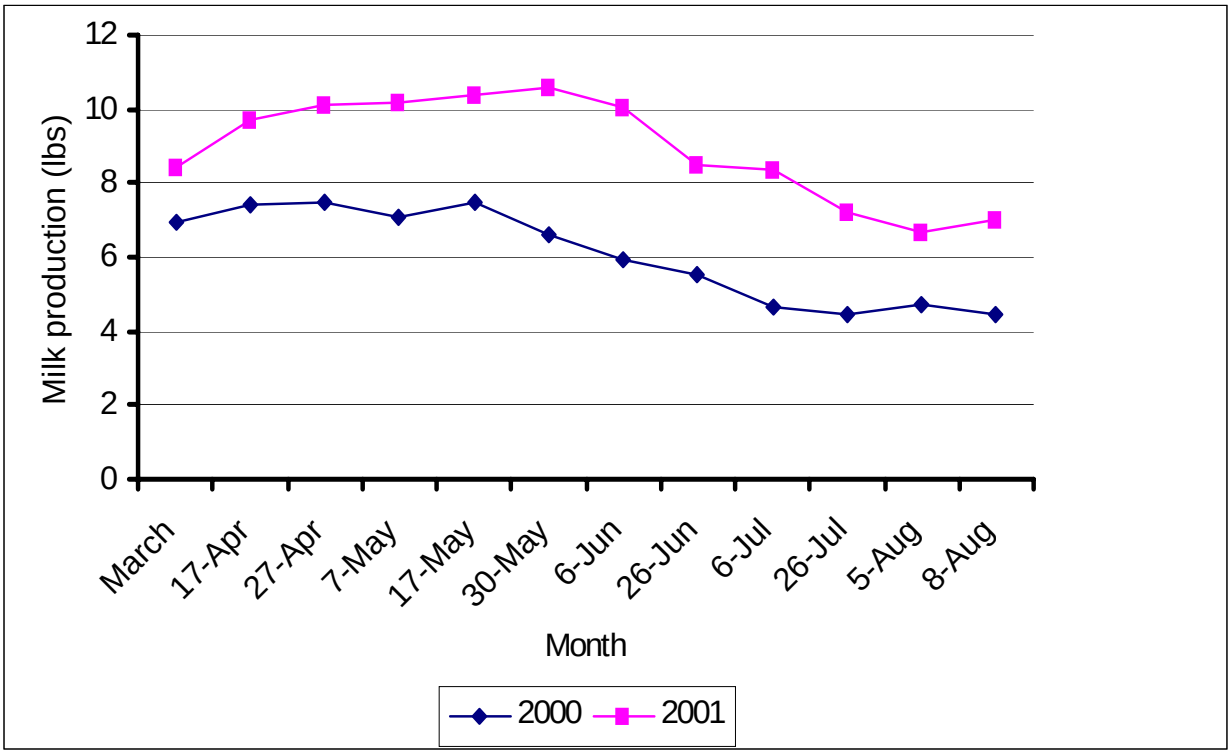

Figure 1. Lactation curve for dairy goats over two years

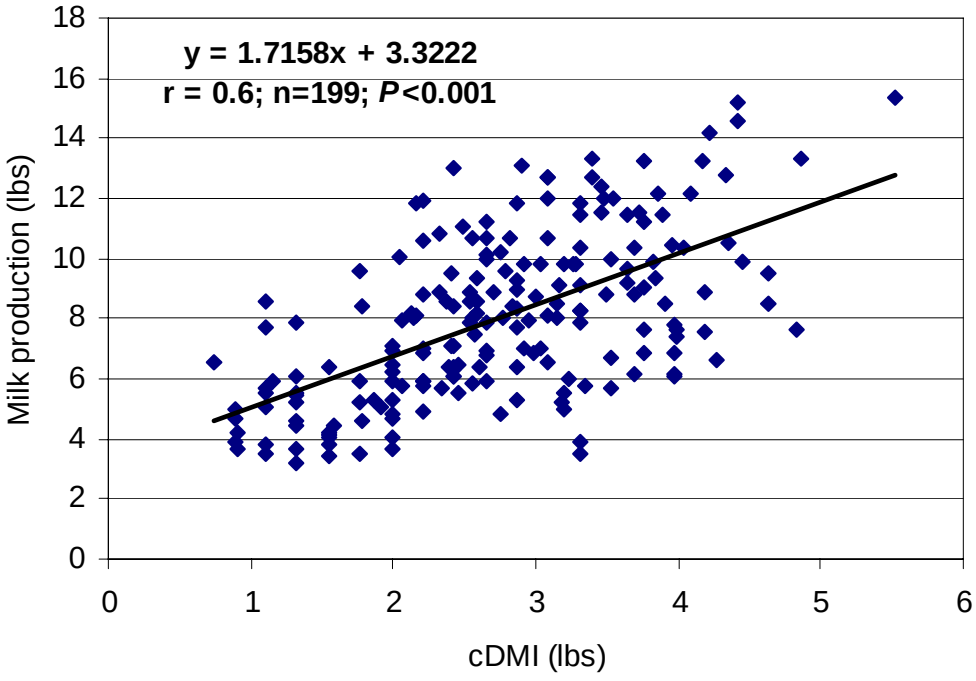

Figure 2. Effect of level of grain supplementation on milk production

Table 1. Milk production of grazing goats with different levels of grain supplementation

Item	Year	Treatment A	B	C	D
Milk production (lb/day)	1	7.55[a]	6.47[b]	5.65[c]	4.73[d]
	2	8.91[a]	8.05[b]	9.17[a]	7.74[b]
Lactation peak (lb/day)	1	8.8[a]	8.1[b]	7.7[b]	7.3[b]
	2	12.1	10.3	11.2	10.1
Days to peak	1	44[a]	32[b]	32[b]	22[c]
	2	41	37	40	36
Persistency	1	6.52[a]	6.18[b]	6.06[b]	5.64[c]
	2	6.34	6.32	6.37	6.22
Composition					
Milkfat (%)	1	3.11	3.16	3.17	3.03
	2	3.23[a]	3.16[a]	3.11[a]	2.99[b]
Protein (%)	1	3.05[a]	3.12[b]	3.19[b]	3.04[a]
	2	3.18[a]	3.07[b]	3.01[b]	2.80[c]
Lactose (%)	1	4.09[a]	4.14[a]	4.10[a]	3.99[b]
	2	4.16[b]	4.24[a]	4.19[b]	4.00c

[*]Treatment A = control group confined in the barn and fed alfalfa hay supplemented with 2/3 lb of grain for each pound of milk over 3.3 lb/day; Treatment B = grazed on pasture and supplemented with 2/3 lb of grain for each pound of milk over 3.3 lb/day; Treatment C = grazed on pasture and supplemented with 1/3 lb of grain for each pound of milk over 3.3 lb/day; Treatment D = grazed on pasture alone, no grain supplementation.

[a,b,c]Means without a common superscript are significantly different ($P < 0.05$).

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PREGNANCY DIAGNOSIS IN GOATS

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Introduction

During recent years, there has been increasing awareness in the need for early diagnosis of pregnancy in goats. Examination of goats for pregnancy may be done as part of a reproductive herd health program or may simply be requested by the pet goat owner who would like to know the pregnancy status of his or her doe. A reliable technique for early detection of pregnancy would allow early culling or rebreeding of barren does. Perhaps the most important reason for pregnancy diagnosis is detection of pseudopregnancy or hydrometra, which may occur in pet and commercial goats, especially in dairy herds where breeding is delayed to adjust milk supplies. Does pronounced open or pseudo pregnant are often culled or given prostaglandin to make them come in estrus. So there is great emphasis placed on a highly accurate pregnancy test.

A variety of examination methods have evolved over the years. *Ultrasonography*, *hormone assay*, and *radiography* have emerged as the most useful methods utilized today. Older described methods of *laparotomy*, *cervical palpation*, *abdominal palpation* or *ballottement*, and *rectal-abdominal palpation* with a rod have limited utility or have been abandoned. Although non-return to estrus following breeding is suggestive of pregnancy, pathologic conditions of the uterus and ovaries, physiologic anestrus late in the breeding season, and out of season breeding may cause postbreeding anestrus in nonpregnant does. Many does also exhibit estrous behavior during pregnancy, making this an unreliable means of pregnancy diagnosis. Choice of the above methods depends on availability of equipment, number of days postbreeding, number of animals to examine, desired accuracy, need for immediate results, cost to the client, and experience of the examiner.

Different Methods of Pregnancy Diagnosis in Goats

1. Non-Return to Estrus

2. Progesterone Assay

Blood
Ewes = 15 to 17 days
Does = 18 to 22 days
Plasma P4 > 1.0 ng/mL
Accuracy = 75 - 86% pregnant
= 90 - 100% non-pregnant

Milk
RIA milk P4: above 10 ng/mL = 86% pregnant
<10 ng/ml = 100% non-pregnant

Plasma concentrations of progesterone tend to be more predictable of the true endocrine status.

3. Radiography: 65-70 days

4. Rectal - Abdominal Palpation

Hulet rod = 1.5 × 50 cm plastic rod

5. Abdominal Palpation: third trimester

The gravid uterus or fetus can sometimes be palpated through the relaxed abdominal wall of the standing doe or ewe by placing a hand on either side of the abdomen and squeezing or lifting upward.

6. Estrone Sulphate Test

Estrone sulphate is produced by the feto-placental unit and can be measured in the blood, milk, and urine by radio-immuno assay. >50 days post breeding this test is close to 100% accurate for the detection of pregnancy and non-pregnancy.

Milk = 82% accurate for pregnant
= 83% accurate for non-pregnant

7. Ultrasonography

a. *A-mode ultrasonography*: Amplitude depth ultrasound for pregnancy diagnosis is detection of the fluid-filled uterus and is thus not pregnancy-specific. A-mode units emit ultrasonic waves from a hand held transducer placed externally against the skin of the abdomen and directed towards the uterus. Ultrasound waves are converted to electrical energy in the form of audible or visual signal. These units detect fluid-filled organs at a depth of 10-20 cm. The transducer is placed low in the right flank near the udder of the standing doe. Clipping a small area of hair in this region will allow optimal contact. A coupling agent such as commercial ultrasonic gel, K-Y jelly, carboxymethylcellulose lubricant, or vegetable oil should be applied to the transducer to eliminate air spaced between the skin and the transducer head. Some units emit a light or audible signal when a fluid-filled structure is detected. Units with an oscilloscope display reflections as peaks or blips on the screen. Nonpregnancy is suggested when the peaks are present only in the left half of the screen. When a fluid-filled structure is detected, peaks will also appear on the right half of the screen. Accuracy = 80-85% if performed between 60 to 120 days of gestation.

b. *Doppler*: The principle of Doppler ultrasound for pregnancy diagnosis is the detection of movements - blood flow in the middle uterine artery, umbilical arteries, fetal heart beat, and fetal movements. Transducer emit ultrasound waves; sound reflected from motionless structures has the same frequency as the transmitted sound, whereas sound reflected from a moving organ or blood has a different frequency. The difference in frequency is converted to audible sound. Audible signals, which may be distinguished by the observer, include the fetal heartbeat, arterial blood flow in the middle uterine artery and umbilical arteries, fetal body movement, and maternal intestinal movement.

The transducer can be applied externally to the skin of the abdomen or intrarectally

using a rectal probe. The transducer, coated with a coupling agent, is applied to the clipped skin low in the right flank in front of the udder and the abdomen systematically searched. In the intrarectal technique, a specially designed rectal probe is inserted in the rectum and slowly rotated. A positive diagnosis of pregnancy is made by listening for the rapid, pounding sound of the fetal heart beat; rapid, swishing sound of the fetal pulse, which is faster than the maternal pulse; sharp, short duration sounds of fetal movement; or the swishing sound of blood flow in the middle uterine artery, which is at the same rate as the maternal pulse.

The external Doppler technique for detection of pregnancy approaches an accuracy of 100% during the last half of gestation but is not as effective in the 50 to 75 day range or earlier. The intrarectal Doppler technique was superior to the external technique when attempted at the beginning of the second trimester and may achieve an accuracy of 90% or better. The intrarectal technique may be attempted as early as 25 to 30 days postbreeding, but false negatives are a problem; it is preferable to wait until day 35 to 40. False negatives may also occur when soft feces around the rectal probe interfere with sound wave transmission; this can be minimized by feeding dry feed 2 to 3 days prior to examination. False positives are unlikely with the Doppler technique when fetal sounds are used as the criteria for pregnancy diagnosis. Hydrometra can cause increased maternal blood flow in the middle uterine arteries, but no fetal sounds will be heard. Doppler units with a frequency of 2.25 MHz may be superior in near term pregnancies, whereas a 5 MHz frequency seems better for detecting earlier pregnancies.

c. *B-Mode Ultrasonography*: Real-time B-mode produces a 2 dimensional image on the screen. For pregnancy examination, it produces a moving image of the uterus, fetal fluids, fetus fetal heartbeat, and placentomes. Ideal time for trans-abdominal scanning is between 40 to 75 days. Prior to 40-45 days the transducer may have to be placed higher in the inguinal region. 25-30 days is best done transrectally.

Diagnosis

Positive diagnosis of pregnancy is assured by imaging the embryo/fetus or placentomes surrounded by fluid.

1. Fetus and fetal heart beat: Intrarectally > 25 days; Transabdominally > 35 days

2. Placentomes: > 40 days (transabdominal)

3. Estimating the fetal age: 40 to 100 days measuring the width of the fetal head or biparietal diameter. A positive diagnosis of pregnancy is assured by imaging the embryo/fetus or placentomes surrounded by fluid. A presumptive diagnosis of pregnancy or Hydrometra can be made by imaging multiple anechoic (fluid-filled) sections of uterine lumen cranial to the bladder from 25 to 40 days of gestation using a transabdominal or transrectal approach. A false positive pregnancy diagnosis during this period may be caused by Hydrometra. This condition occurs commonly enough in goats to advise caution against making a positive diagnosis of pregnancy until the embryo/fetus can be seen. The urinary bladder should not be confused with a fluid-filled uterus. The bladder can be identified transrectally by viewing the characteristic triangular-shaped neck as the transducer is directed causally.

The bladder wall can usually be seen as an echogenic white line separating the anechoic lumen of the bladder from the anechoic uterine luminal sections. The fetus and fetal heart can be seen after day 25. The fetus appears as an echogenic mass within the uterine lumen. Visualizing fetal movement or beating of the fetal heart during real-time imaging can assess fetal viability. As a pregnancy advances to the late second and third trimesters, only portions of the fetus such as the thorax and skull and be imaged on the screen at one time. Placentomes can be seen by 35-40 days, appearing as echogenic densities in the uterine wall. They become cup-shaped or C-shaped by 45-50 days when viewed in cross section with the concave surface directed toward the uterine lumen.

The ability to identify multiple fetuses with real-time ultrasonography is a clear advantage over other ultra-sound techniques. Feeding management can be adjusted for does carrying multiple fetuses or single fetuses. The optimal time for counting a fetal numbers is probably somewhere between 40-70 days. At 70 days and beyond, additional fetuses may lie beyond the depth of a 5 MHz linear-array transducer. Twins can be more accurately diagnosed than triplets and fetal numbers are frequently underestimated. Estimating fetal numbers prolongs the time of examination and the reader should be aware of its limitations. Another advantage of real-time ultrasonography is the ability to distinguish a viable pregnancy from a hydrometra, pyometra, and fetal mummification.

Real-time ultrasonography can also be used to estimate fetal age in the goat at 40 to 100 days of gestation by measuring the width of the fetal head (biparietal diameter). A symmetrical image of the fetal head showing the greatest head width is frozen on the screen and the distance between the uppermost edge of the superficial and deep parietal bone images is measured in millimeters with electronic calipers. Image symmetry is crucial to accurate measurements and can be afforded by viewing both fetal orbits in the same image. Table 1 shows the derived equations from several studies for computing the gestational age in various goat breeds based on biparietal diameter measurement. This technique required practice to fully master but should be helpful in predicting parturition dates when actual breeding dates are unknown.

Table 1.* Relationship of the fetal biparietal diameter (BPD) in millimeters and gestational age (GA) in days for various breeds. Biparietal diameter was measured transabdominally using real-time ultrasound with a 5 MHz linear-array scanhead.

Toggenburg	GA	=	27.9 + 1.64 BPD
Nubian	GA	=	26.8 + 1.74 BPD
Angora	GA	=	28.6 + 1.77 BPD
Pygmy	GA	=	23.2 + 2.08 BPD
Suffolk	GA	=	22.5 + 1.81 BPD
Finn	GA	=	21.4 + 1.85 BPD

*Adapted from Haibel, G. K. et.al.: Real-time ultrasonic measurement of fetal biparietal diameter (BPD) for the prediction of gestational age (GA) in small domestic ungulates. *Society for Theriogenology Newsletter* Vol. 13, No. 5 (1990).

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DRUG USE GUIDE: GOATS

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Introduction

Live animals are considered unprocessed food, if those animals are intended for slaughter or the milk from these animals are intended for human use. Therefore, persons involved in raising, handling, transporting, holding, and marketing food-producing animals are encouraged to establish systems to ensure that animal drugs are used properly and to prevent illegal drug residues.

There is only a handful of drugs approved to be used in goats. Any drug not specifically labeled for use in goats, or any product either prescription or over the counter that is not used as directed on the label, is considered "Extra-label" or "Off label". Veterinarians may use products "Off label" or "Extra-label" provided that have a valid veterinarian – client/ patient - relationship.

This means:

* The veterinarian has examined the animal(s) in question recently and has made a diagnosis and a determination that products with proper labeling will not work in this instance.

* The client has been instructed by the veterinarian in the proper use and administration of the product and a withdrawal period has been determined, and the client is willing to follow the instructions given by the veterinarian.

* The veterinarian is available to respond to any adverse reaction or follow up examination and treatment that may occur to the animal due to the administration of the drug or failure of the drug to work.

Extra-Label Use

Most livestock producers and many veterinarians do not realize that producers do not have "extra-label" drug use privileges. Extra-label use is defined as the administration of a drug in a manner that is different from the drug's labeling. Only veterinarians who have established a veterinarian-client-patient-relationship (VCPR) with a particular client may prescribe or use drugs in an extra-label manner on that client's animals.

The Food and Drug Administration has published three specific conditions that must be met for the establishment of a VCPR.

The first condition requires that the veterinarian assume responsibility for making clinical decisions regarding the health and treatment of the animals and that the client has agreed to follow the veterinarian's recommendation.

The second condition is that the veterinarian must have visited the farm in question, have

knowledge of the particular farm's methods and practices, and have recently examined the animals to be treated.

A veterinarian working with goat owners must stress the need for farm visits to fulfill the first two conditions in establishing a VCPR, as many goat owners would rather call for advice over the phone and eliminate farm visits.

The third condition is that the veterinarian must be readily available for follow-up evaluation in the advent of an adverse reaction or treatment failure.

FDA Criteria

The FDA has also established five criteria that must be met before any drug may be used in a food-producing animal in a manner different from that product's label. The veterinarian must first examine the animal and determine a clinical diagnosis within the guidelines of a VCPR. Often a goat owner will not have the animal examined by a veterinarian, but will telephone a veterinarian, who may never have visited the farm, with a list of symptoms and ask for a recommended treatment.

The second criteria requires the veterinarian to determine that there is no marketed drug specifically labeled to treat the diagnosed condition or that the recommended dosage for that product is clinically ineffective. Because there are so few drugs labeled for use in goats, it is not difficult to determine whether or not there is legally licensed product available.

The third criteria require that individual animals be clearly identified and that accurate records be maintained regarding the treatment of those specific individuals. Many registered goats are uniquely tattooed, but few goats are ear-tagged and the owner must make some effort to mark treated animals with a visible temporary mark, tag, or paint.

The fourth criteria requires that a significantly extended time period be assigned for drug withdrawal prior to marketing meat or milk from treated animals, and the owner must keep accurate records of the treatment and withdrawal period.

Many goat owners casually treat their animals and do not keep records of which animals were treated, what drugs were used or the withdrawal period for that product. If no information is available to establish a withdrawal time, then the treated animal or animals are permanently barred from the human food chain.

The last criteria details the information that must be listed on the drug dispensed for extra-label use and includes: the name and address of the veterinarian; the established name of the drug(s); and specific directions for use - including dose, route of administration, frequency of treatment, duration of therapy, cautionary statements, and the withdrawal time for any food that might be derived from the treated animal.

When following the guidelines established in the Animal Drug Use Clarification Act of 1994, eight drugs cannot be used in food animals. These eight drugs include: chloramphenicol, clenbuterol, diethylstilbestrol, dimetridazole, ipronidazole, other nitroimidazoles, furazolidone, and nitrofurazone.

Administration

Once the decision has been made to use a specific product in a goat, the owner must be informed of the proper storage, use, and administration for that product.

Commercial goat dairies must meet the specific requirements of the Pasteurized Milk Ordinance for storage of drugs used in animals producing milk for human consumption.

Access to drugs should be restricted, and producers should be reminded that animal health products can be human health hazards. Owners should be instructed in the proper methods and location for administration of injectable drugs. Adequately and comfortable sized syringes and sharp, sterile needles of appropriate size and length should be used.

Label directions for oral medications and feed or water additives should be easy to read and understand, and any directions for dilution of drugs should be clearly indicated.

Some products added to feed or water may be harmful to other species and this must be stated on the label. It is extremely important to determine an adequate withdrawal time to prevent illegal drug residues in products for human consumption.

Although there are no drug residue test kits marketed specifically for goats, owners should be aware that drug residue testing is conducted on milk and meat produced for human consumption.

Veterinarians can play a vital role in educating goat producers about quality assurance concepts through these three important avenues:

* Review of management practices with the client
* Establishment of a legal veterinary - client - patient - relationship
* Adherence to FDA guidelines for extra-label drug use.

These practices will aid in the production of wholesome products free of drug residues.

Medications Commonly Used in Goats (Approximate withdrawal times)

I. Antibiotics:	Brand Name	Approval	Dosage	Route	Frequency	Withdrawal Time	
						Meat	Milk
Procaine Pen. G	Crysticillin	extra-label	20,000-40,000 IU/lb	SQ	Once a day	14-20 days	5 days
Benzathine Pen G	Pen BP-48	extra-label	20,000 IU/lb	SQ	Every 48 hours	30 days	??
Amoxicillin	Amoxi-inject	extra-label	5 mg/lb	SQ	Once a day	25 days	96 hrs.
Ampicillin	Polyflex	extra-label	5 mg/lb	SQ	Once a day	10 days	72 hrs.
Oxytetracycline	LA-200	extra-label	9 mg/lb	SQ	Every 48 hours	28 days	6 days
Sulfadimethoxine	Albon	extra-label	25 mg/lb	PO	Once a day	7 days	??
Ceftiofur	Naxcel/Excenel	extra-label	0.5-1 mg/lb	IM	Once a day	0 days	0 days
Erythromycin	Erythro-200	extra-label	1 mg/lb	SQ	Once a day	3 days	72 hrs.
Tylosin	Tylan-200	extra-label	10 mg/lb	IM	Once a day	30 days	96 hrs.
Neomycin	Biosol	approved	5 mg/lb	PO	Once a day	30 days	??
Florfenicol	Nuflor	extra-label	9 mg/lb	IM	Every 48 hours	28 days	??
Gentamicin	Gentocin	DO NOT USE					
Tilmicosin	Micotil	DO NOT USE - TOXIC TO GOATS					
Enroftoxacin	Baytril 100	DO NOT USE {NO EXTRA LABEL USE PERMITTED}					
II. Anti-inflamatory Drugs:	BrandName	Approval	Dosage	Route	Frequency	Withdrawal Time	
						Meat	Milk
Flunixin meglumine	Banamine	extra-label	1.1 mg/kg	IV or IM	Twice a day	14 days	4 days
			2.2 mg/kg	IV or IM	Once a day	14 days	
Dexamethasone	Azium	extra-label	0.44mg/kg	1/m	Once a day	14 days	4 days

Phenylbutazone	Phenylbutazone	extra-label	10-20 mg/kg [loading dose]	PO	First day	14 days	5 days
			5-10 mg/kg	PO	Once a day	14 days	5 days
Aspirin	Aspirin	extra-label	100 mg/kg	PO	Twice a day	1 day	2 days
Dipyrone	Dipyrone	DO NOT USE {NO EXTRA LABEL USE PERMITTED}					
Ketoprofen	Ketoprofen	Extra-label	3mg/kg	I/V or I/M	Once a day	14 days	5 days
II. Prevention of Coccidiosis:	BrandName	Approval	Dosage			Withdrawal Time	
						Meat	Milk
Monensin	Rumensin	approved	15-20 gms/ton of feed			0	?
Lasalocid	Bovatec	extra-label	20-30 gms/ton of feed			?	?
Decoquinate	Deccox	approved	0.5 lb/ton of feed			0	?
Amprolium	Corid	extra-label	25-50 mg/kg BW in feed or water for 5 days - treatment. 5mg/kg PO for 21 days- prevention			?	?
V. Antheimintics:	Brand Name	Approval	Dosage	Route		Withdrawal Time	
						Meat	Milk
1. Avermectins:							
Ivermectin	Ivomec sheep drench	extra-label	0.3 mg/kg	PO		11 days	36-40 days
Ivermectin	Ivomec 1%	extra-label	0.3 mg/kg	SC		56 days	36-40 days
Doramectin	Dectomax	extra-label	0.3 mg/kg	SC		56 days	36-40 days
Eprinomectin	Eprinex	extra-label	0.5 mg/kg	PO		0 days	0 days
Moxidectin	Quest, Cydectin	extra-label	0.5 mg/kg	PO		0 days	?
2. Benzimidazoles:							
Albendazole	Valbazen	extra-label	10 mg/kg	PO		27 days	5 days

Fenbendazole	Panacur/Safeguard	approved	10 mg/kg	PO	14 days	4 days
Oxfendazole	Synanthic	extra-label	10 mg/kg	PO	14 days	5 days
3. Cholinergic Agonists:						
Levamisole	Levasole	extra-label	8 mg/kg	PO	10 days	4 days
Morantel Tartrate	Rumatel	approved	10 mg/kg	PO	30 days	0 days
VI. Hormones:	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
Oxytocin	Oxytocin	extra-label	10-20 IU	1/M	0 days	0 days
Dinoprost	Lutalyse	extra-label	5-10mg	1/M	0 days	0 days
Cloprostenol	Estrumate	extra-label	125 microgram	1/M	0 days	0 days
Dexamethasone	Azium	extra-label	20-25mg	1/M	14 days	4 days
VII. Electrolytes	Brand Name	Approval	Dosage	Route	Withdrawal Time	
					Meat	Milk
Calcium	Calcium borogluconate	extra-label	60 to 100ml of 20 to 25% Solution	1/V	0 days	0 days
Calcium	Calcuim gluconate	extra-label	50 to 100ml 10 to 23% calcium ion solution	1/V	0 days	0 days

NOTE: The drugs listed above are commonly used in goats.There are ony few drugs approved to be used in goats.The above withdrawal times for various drugs is compiled from different sources.Extra-label use of these products is legal if prescribed by your veterinarian.

The proper citation for this article is:

Dawson, L. 2002. Drug Use Guide: Goats. Pages 45-50 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

PRELIMINARY OBSERVATIONS: INBREEDING IN DAIRY GOATS AND ITS EFFECTS ON MILK PRODUCTION

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Introduction

When two related individuals are mated, they produce an inbred offspring. Inbreeding tends to increase homozygosity in the population. In 1922, a geneticist by the name of Sewell Wright developed a method to measure inbreeding using a parameter called the inbreeding coefficient or simply F (Wright, 1922). The inbreeding coefficient is defined as the probability that two identical genes (one from each of the parents) is found at the same locus within the offspring. The inbreeding coefficient varies between 0 (0%) and 1 (100%) - a higher value indicating that the parents of the animal concerned were more closely related. The inbreeding coefficient is a function of the number and location of the common ancestors in a pedigree. It is not a function, except indirectly, of the inbreeding of the parents.

Unfortunately in most cases, inbreeding reduces the productivity and viability of the inbred individual. This reduction in productivity and viability is called inbreeding depression. In dairy cattle, estimates of inbreeding depression were similar for Ayrshire, Brown Swiss, Guernsey, Holstein, Jersey, and Milking Shorthorn (Wiggans et al., 1995). For Holsteins, the most populous breed, estimates were –65.2 lb for milk, -2.38 lb for fat, and -2.14 lb for protein. That is for every increase of 1% level of inbreeding in Holsteins, those animals gave 65.2 less lb of milk, 2.38 less lb of butterfat, and 2.14 less lb of protein.

Numerous studies have examined methods to minimize the effect of inbreeding, and therefore inbreeding depression, in various selection schemes for various livestock species (Bijma et al., 2001; Meszaros et al., 1999; Weigel, 2001). In reality, inbreeding is difficult to avoid in populations that routinely use modern reproductive technologies, such as artificial insemination and embryo transfer, and(or) that routinely use genetic evaluations for the selection of progenitors (Bijma et al., 2001; McDaniel, 2001; Weigel, 2001). Artificial insemination allows for the widespread use of only a few select sires across a breed. Genetic evaluations computed with greater accuracy of prediction of breeding values have increased the likelihood of selection of related individuals. Both of these practices are widely used in dairy goats. However, it is not known to what extent inbreeding depression exists for production traits in dairy goats. The objective of this study was to evaluate rate of inbreeding and inbreeding depression in dairy goats.

Material and Methods

Average standardized milk, fat, and protein yields and calculated inbreeding coefficients were acquired through USDA Animal Improvement Laboratory Program. Standardized yields are yields averaged over all a doe's lactations, are adjusted for age and season, and are projected to 305 day yields. Rate of inbreeding was analyzed using analysis of covariance. The statistical model included inbreeding coefficient as the dependent variable and breed, registry status, year of birth, and all two-way interactions as independent variables. Breed and registry status were categorical variables, year of birth was a covariate, and the two-way interaction involving year of birth were used to test for heterogeneity of slope (Littell et al., 1991). Breeds included in this study were Alpine, LaMancha,

Nubian, Saanen, and Toggenburg. Registry status included American, Grade, and Purebred. An analysis of covariance was also conducted to evaluate rate of inbreeding and inbreeding depression in dairy goats. The statistical model included average standardized milk, fat, and protein yields as dependent variables and the inbreeding coefficients model. Independent variables included inbreeding coefficient, year of birth, breed, registry status, and all two-way interactions. Breed and registry status were categorical variables, inbreeding coefficient and year of birth were covariates, and the two-way interaction involving inbreeding coefficient were used to test for heterogeneity of slope. The regression coefficient for inbreeding coefficient was used as the estimate of inbreeding depression and year of birth was used to account for genetic progress. The data analysis for this study was generated using SAS/STAT software, Version 7 of the SAS System for Windows.

Results and Discussion

Over 132,000 lactation records (individual does) were available for this study and are presented in Table 1. Alpines account for 29% of the records, LaMancha 10%, Nubian 35%, Saanen 13%, and Toggenburg 13%. American registry status accounted for 31% of the total records, Grade 8%, and Purebred 61%.

The range and frequency of inbreeding coefficients are presented in Table 2. Over half of the records had zero inbreeding. Over 89% had an inbreeding coefficient of 10% or less, over 93% had an inbreeding coefficient of 13% or less, and nearly 99% had an inbreeding coefficient of 25% or less. The mating of half-sibs is roughly equivalent to an inbreeding coefficient of 12.5% and the mating of full-sibs is roughly equivalent to an inbreeding coefficient of 25%.

The change in inbreeding coefficient (F) expressed by birth year is presented in Figure 1. As can be seen from Figure 1, the rate of inbreeding is increasing in all breeds. The rate of inbreeding is 0.229 F/year for Alpine, 0.146 for LaMancha, 0.237 for Nubian, 0.247 for Saanen, and 0.232 for Toggenburg. Rates of inbreeding were not significantly different for Alpine, Nubian, Saanen, and Toggenburg; however, the rate of inbreeding was significantly lower for LaMancha than for the other four breeds. For registry status, the rate of inbreeding is 0.193 for American, 0.209 for Grade, and 0.253 for Purebred.

Inbreeding depressions for milk, fat, and protein yield by breed are presented in Table 3. Using Nubian as an example, for every 1% increase in inbreeding there was a corresponding decrease of 2.98 lb in milk production. In all cases, Alpine demonstrated the greatest magnitude of inbreeding depression for milk, fat, and protein yields. For milk, inbreeding depression ranged from -11.28 in Alpine to -2.84 in LaMancha. For fat, inbreeding depression ranged from -0.371 in Alpine to -0.151 in LaMancha. For protein, inbreeding depression ranged from -0.283 in Alpine to -0.103 in Nubian.

Table 4 presents the mean for the standardized yields for milk, fat, and protein yields. Dividing the inbreeding depression in Table 3 by its corresponding production mean in Table 4 gives a percentage reduction in overall production. The high-producing Swiss breeds, Alpine, Saanen, and Toggenburg, have often been compared with Holstein dairy cattle, and the lower producing LaMancha and Nubian have been compared with Jersey dairy cattle. The percentage reduction in overall milk production for each percentage increase in inbreeding was 0.42 and 0.19% for Swiss and lower producing breeds, respectively. In Holsteins, milk production decreased 65.2 lb for every 1% increase in inbreeding (Wiggans and VanRaden, 1995) and decreased 77.1 lb in another study (Thompson et al., 2000). With the current milk production levels of Holsteins, this represents, on average, a 0.28% decrease in overall milk production. This 0.28% reduction for Holstein is b of

the value in the Swiss breeds. For milk production in Jerseys, one study found an inbreeding depression of -46.9 (Wiggans and VanRaden, 1995) and -39 in another study (Thompson et al., 2000). With the current milk production levels in Jerseys, this represents, on average, a 0.24% decrease in overall milk production. The percentage reduction for lower producing goat breeds (LaMancha and Nubian) and Jerseys seems to be comparable.

The percentage reduction in overall fat production for each percentage increase in inbreeding was 0.41 and 0.22% for the Swiss and lower producing breeds, respectively. In Holsteins, fat production decreased 2.38 lb for every 1% increase in inbreeding (Wiggans and VanRaden, 1995) and decreased 3.05 lb in another study (Thompson et al., 2000). With the current fat production levels in Holstein, this represents, on average, a 0.30% decrease in overall fat production. Like milk production, this 0.30% reduction for Holstein is b of the value in the Swiss breeds. For fat production in Jerseys, one study found an inbreeding depression of -2.27 (Wiggans and VanRaden, 1995) and -1.89 in another study (Thompson et al., 2000). With the current fat production levels in Jerseys, this represents, on average, a 0.26% decrease in overall fat production. The percentage reduction for lower producing goat breeds (LaMancha and Nubian) and Jersey seems to be comparable.

The percentage reduction in overall protein production for each percentage increase in inbreeding was 0.39 and 0.18% for the Swiss and lower producing breeds, respectively. In Holstein, protein production decreased 2.14 lb for every 1% increase in inbreeding (Wiggans and VanRaden, 1995) and decreased 2.38 lb in another study (Thompson et al., 2000). With the current protein production levels in Holstein, this represents, on average, a 0.30% decrease in overall protein production. Unlike milk and fat production, this 0.30% reduction for Holstein is similar to the value for the Swiss breeds. For protein production in Jerseys, one study found an inbreeding depression of -1.94 (Wiggans and VanRaden, 1995) and -1.92 in another study (Thompson et al., 2000). With the current protein production levels in Jerseys, this represents, on average, a 0.30% decrease in overall milk production. The percentage reduction for lower producing goat breeds (LaMancha and Nubian) and Jersey seems to be comparable.

Summary and Conclusions

Inbreeding is increasing in all breeds of dairy goats at about the same yearly rate, except for LaMancha, which has a significantly lower rate of increase. The rates of inbreeding for all breeds are approximately half of a threshold value of 0.5% per year, which has been proposed as an acceptable upper value (Nicholas, 1989). However, dairy goat producers should be aware of the level of inbreeding in their herds and take action to minimize it. Over all breeds, producers appear to be selecting more within family lines for Purebred animals than for American or Grade animals. This has lead to an increased rate of inbreeding in this registry status. Higher producing breeds, such as Alpine, Saanen and Toggenburg, had significantly greater inbreeding depression for average standardized milk, fat, and protein yields than did lower producing breeds, such as LaMancha and Nubian. Even when these estimates of inbreeding depression were expressed as a percentage of overall production, these values were greater for higher producing breeds than for the lower producing breeds. These values for overall production were approximately -0.40% for the higher producing breeds and -0.20% for the lower producing breeds. When compared with high producing breeds of dairy cattle, the higher producing goat breeds seemed to be more susceptible to the effects of inbreeding and had a sharper reduction in overall production levels for milk and fat but not for protein. When compared with lower producing breeds of dairy cattle, the lower producing goat breeds seemed to be less susceptible to the effects of inbreeding and had a lesser reduction in overall production levels for protein but overall reductions in milk and fat yield were comparable.

Acknowledgments

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Table 1. Distribution of standardized lactation records by breed and by registry status.

Breed	American	Grade	Purebred	**Total**
Alpine	15,988	3,161	19,745	**38,894**
LaMancha	5,199	951	7,208	**13,358**
Nubian	6,247	3,202	36,704	**46,153**
Saanen	8,785	1,570	6,475	**16,830**
Toggenburg	4,661	1,188	11,182	**17,031**
Total	**40,880**	**10,072**	**81,314**	**132,266**

Table 2. Distribution of inbreeding coefficient (F).

F	**No.**	**Percent**	**F**	**No.**	**Percent**	**F**	**No.**	**Percent**
0	68222	51.579	17	554	0.419	34	32	0.024
1	12323	9.317	18	363	0.274	35	8	0.006
2	9618	7.272	19	645	0.488	36	12	0.009
3	7363	5.567	20	279	0.211	37	12	0.009
4	4820	3.644	21	216	0.163	38	85	0.064
5	3586	2.711	22	175	0.132	39	12	0.009
6	4547	3.438	23	130	0.098	40	8	0.006
7	2558	1.934	24	73	0.055	41	9	0.007
8	2141	1.619	25	1796	1.358	42	4	0.003
9	1893	1.431	26	394	0.298	43	7	0.005
10	1204	0.910	27	294	0.222	44	9	0.007
11	946	0.715	28	237	0.179	45	2	0.002
12	575	0.435	29	148	0.112	47	1	0.001
13	3671	2.775	30	87	0.066	49	6	0.005
14	1229	0.929	31	146	0.110	50	2	0.002
15	763	0.577	32	69	0.052	52	1	0.001
16	951	0.719	33	40	0.030			

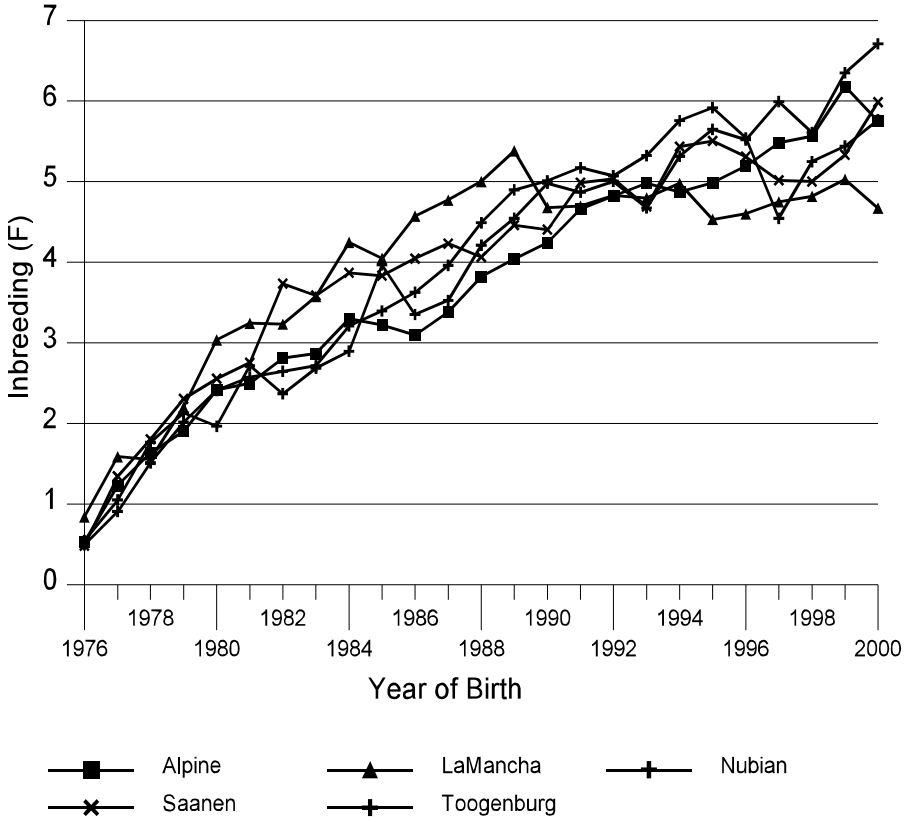

Figure 1. Change in Inbreeding coefficient (F) based upon birth year of the doe.

Table 3. Inbreeding depression for milk, fat and protein yield by breed.

Breed	Δmilk(lb)/%inbreeding	Δfat(lb)/%inbreeding	Δprotein(lb)/%inbreeding
Alpine	-11.28[a]	-0.371[a]	-0.283[a]
LaMancha	-2.84[b]	-0.152[b]	-0.135[bc]
Nubian	-4.37[b]	-0.226[b]	-0.103[b]
Saanen	-7.02[c]	-0.239[bc]	-0.216[ac]
Toggenburg	-10.24[a]	-0.345[ac]	-0.272[a]

Table 4. Means of average standardized milk, fat, and protein by breed.

Breed	Milk (lb)	Fat (lb)	Protein (lb)
Alpine	2,268[a]	79.4[a]	66.3[a]
LaMancha	2,011[b]	77.4[b]	63.8[b]
Nubian	1,891[c]	88.8[c]	69.4[c]
Saanen	2,347[d]	80.9[d]	69.2[c]
Toggenburg	2,233[e]	73.4[e]	62.0[d]

The proper citation for this article is:

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PEDIGREE ANALYSIS

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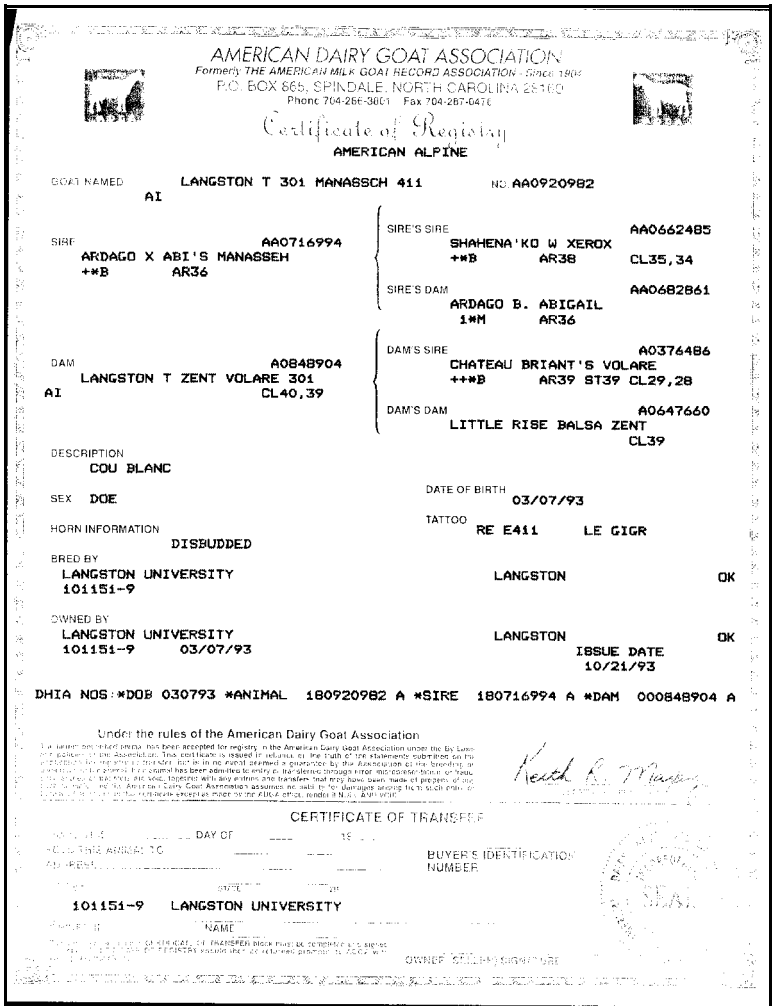
Introduction

The registration certificate from a breed association provides valuable information for the breeder. The certificate usually details an individual's information such as sex, color, breeder, owner, tattoo, or ear tag number. See Figures 1 and 2 for examples of registration certificates. Ancestry information is usually listed back through grandparents or great grandparents. In certain instances, production data or production related data is listed for ancestors.

Production Data

Using two the example registration certificates found in Figures 1 and 2, we will concentrate upon production related data. In Figure 1, a 1*M designation can be seen under the paternal granddam. There are several ways in which a doe can earn a star. One way a doe earn a star is to earn 18 or more points at a recognized official milking competition. Points are calculated based upon quantity of milk, period of time since last kidding, and butterfat content. For each pound of milk, one point calculated to one decimal place is earned. For each complete 10 days, the goat has been in milk since last kidding, one tenth (0.1) of a point, with a maximum of 3.6 points, is earned. For each 0.05 pound of butterfat yielded in the two milkings, one point is earned. Another way a doe can also earn a star is by meeting minimum requirements for production of milk and(or) butterfat for their age while on test under official supervision. These requirements are based on lactations of 305 days or less and begin with a base of 1500 lb of milk and(or) 52.5 lb of butterfat for does freshening at age 2 years or


AMERICAN DAIRY GOAT ASSOCIATION
Formerly THE AMERICAN MILK GOAT RECORD ASSOCIATION - Since 1904
P.O. BOX 865, SPINDALE, NORTH CAROLINA 28160
Phone 704-286-3801 Fax 704-287-0476

Certificate of Registry

AMERICAN ALPINE

GOAT NAMED LANGSTON T 301 MANASSCH 411 AI NO. AA0920982

SIRE AA0716994
ARDAGO X ABI'S MANASSEH
+*B AR36

SIRE'S SIRE AA0662485
SHAHENA'KO W XEROX
+*B AR38 CL35,34

SIRE'S DAM AA0682861
ARDAGO B. ABIGAIL
1*M AR36

DAM A0848904
LANGSTON T ZENT VOLARE 301
AI CL40,39

DAM'S SIRE A0376486
CHATEAU BRIANT'S VOLARE
++*B AR39 ST39 CL29,28

DAM'S DAM A0647660
LITTLE RISE BALSA ZENT
CL39

DESCRIPTION
COU BLANC

SEX DOE

DATE OF BIRTH
03/07/93

TATTOO
RE E411 LE GIGR

HORN INFORMATION
DISBUDDED

BRED BY
LANGSTON UNIVERSITY
101151-9
LANGSTON OK

OWNED BY
LANGSTON UNIVERSITY
101151-9 03/07/93
LANGSTON OK

ISSUE DATE
10/21/93

DHIA NOS: *DOB 030793 *ANIMAL 180920982 A *SIRE 180716994 A *DAM 000848904 A

Under the rules of the American Dairy Goat Association

CERTIFICATE OF TRANSFER

DAY OF

BUYER'S IDENTIFICATION NUMBER

101151-9 LANGSTON UNIVERSITY

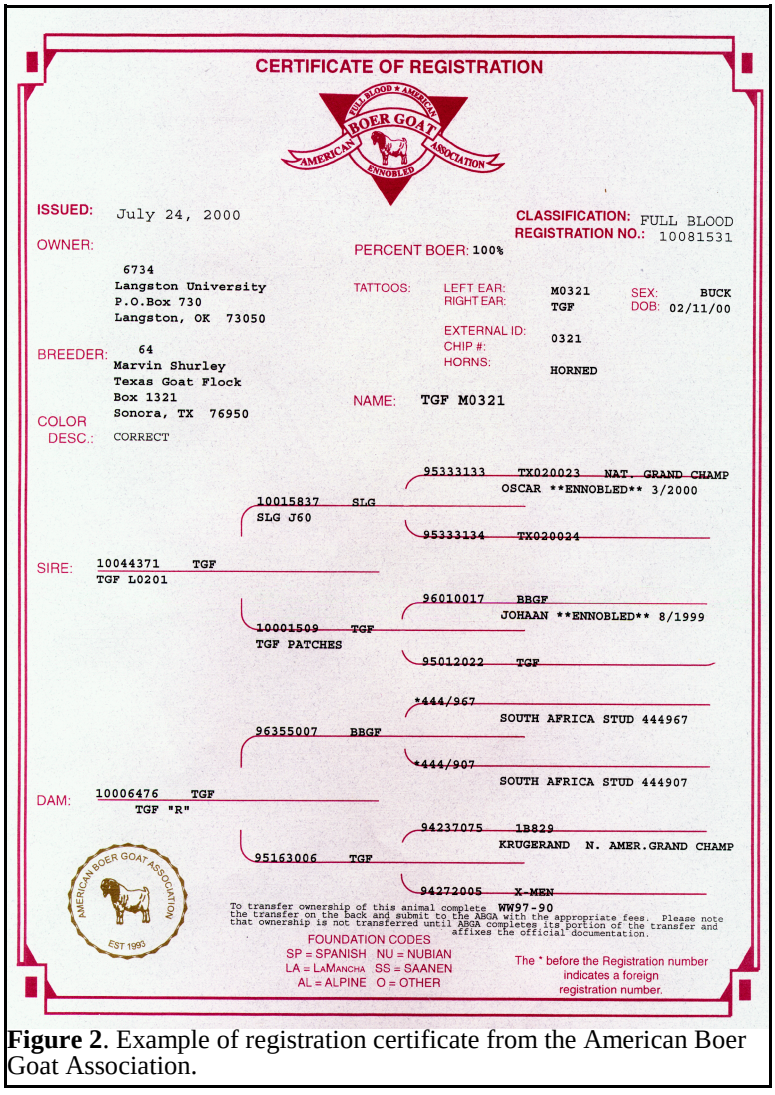
NAME

OWNER SIGNATURE

Figure 1. Example of registration certificate from the American Dairy Goat Association.

less. For every day the doe exceeds 2 years of age at the time of kidding, up to the time she becomes 5 years of age, the requirement is increased by 0.2 lb of milk and 0.007 lb of butterfat. At the age of 5 years or more, a doe must produce 1716 lb of milk and(or) 60 lb of butterfat in the 305 day or less. The number of stars represents the number of generations of tested females in the immediate ancestry. For example, 1*M indicates that a doe has meet the star requirements but that her dam has not, 2*M indicates that a does has meet the star requirements and that her dam was a 1*M, 3*M indicates that a does has meet the star requirements and that her dam was a 2*M and her granddam was a 1*M, etc.

Also in Figure 1, a star designation can be seen under the paternal and maternal grandsires. A +*B for the paternal grandsire and a ++*B for the maternal grandsire. A buck can obtain one star by having a dam who is a star milker and a sire who is a + buck or has a dam who is a star milker and his sire's dam is a star milker. Stars in themselves are never a sufficient indicator of an animal's worth but are extremely useful as a quick guide to those animals with production records on themselves or their ancestry that can be looked up. For a complete description of the star program, please consult the Rules Governing the ADGA Star Program section of the American Dairy Goat Association Guidebook (ADGA, 2001).


CERTIFICATE OF REGISTRATION

FULL BLOOD * AMERICAN BOER GOAT ASSOCIATION AMERICAN ENNOBLED

ISSUED: July 24, 2000

CLASSIFICATION: FULL BLOOD
REGISTRATION NO.: 10081531

OWNER:
6734
Langston University
P.O.Box 730
Langston, OK 73050

PERCENT BOER: 100%

TATTOOS: LEFT EAR: M0321
RIGHT EAR: TGF

SEX: BUCK
DOB: 02/11/00

EXTERNAL ID: 0321
CHIP #:
HORNS: HORNED

BREEDER: 64
Marvin Shurley
Texas Goat Flock
Box 1321
Sonora, TX 76950

NAME: TGF M0321

COLOR DESC.: CORRECT

SIRE: 10044371 TGF
TGF L0201

10015837 SLG
SLG J60

95333133 TX020023 NAT. GRAND CHAMP
OSCAR **ENNOBLED** 3/2000

95333134 TX020024

96010017 BBGF
JOHAAN **ENNOBLED** 8/1999

10001509 TGF
TGF PATCHES

95012022 TGF

*444/967
SOUTH AFRICA STUD 444967

96355007 BBGF

*444/907
SOUTH AFRICA STUD 444907

DAM: 10006476 TGF
TGF "R"

94237075 1B829
KRUGERAND N. AMER.GRAND CHAMP

95163006 TGF

94272005 X-MEN

AMERICAN BOER GOAT ASSOCIATION EST 1993

To transfer ownership of this animal complete WW97-90 the transfer on the back and submit to the ABGA with the appropriate fees. Please note that ownership is not transferred until ABGA completes its portion of the transfer and affixes the official documentation.

FOUNDATION CODES
SP = SPANISH NU = NUBIAN
LA = LAMANCHA SS = SAANEN
AL = ALPINE O = OTHER

The * before the Registration number indicates a foreign registration number.

Figure 2. Example of registration certificate from the American Boer Goat Association.

A buck can receive a star on the basis of his parentage, the plus (+) prefix before his name is always earned by siring worthy offspring. A buck that has sired at least three daughters by three different dams who have qualified as star milkers. He may also earn the +B prefix by having two sons who are Advanced Registry Herdsires. If he qualifies by having both three qualifying daughters and two qualifying sons he is entitled to the + +B designation. A buck may have a total of only one star (*) and two pluses (++) before his name which looks like this: ++*B. There is no such thing as a 5-star buck. If a buck has a prefix of ++*B it means he has at least three daughters (from different dams) who are star milkers, two sons who are AR Herdsires, and parentage with qualifying production records. Since both ancestry and progeny have been proven desirable for production, such a buck can be considered a valuable asset in a breeding program.

In Figure 2, the term Ennobled can be seen under paternal great-grandsire. In 1996, ABGA established the Ennobled

Herdbook. To obtain the title of "Ennobled," a fullblood or purebred Boer goat passes an inspection and earns a total of eighty (80) points, with no less than thirty (30) of these total points having been earned by combining points from at least three (3) of his/her progeny (sons and daughters). Upon attainment of the required points, either through performance testing, show ring, or a combination of both, the Boer will be registered in the "Ennobled Herd Book" (ABGA, 1999). For points earned through performance testing, a Boer buck to be a nominee for "ennoblement" should pass a pre-performance test inspection conducted by one (1) or more ABGA approved breeders. Because of age requirements, the bucks will not have passed an official inspection before the performance test. Ten (10) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the top five percent (5%) of the animals on test. Five (5) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the next fifteen percent (15%) of the animals on test. All bucks must gain at least three-tenths (0.3) lb per day to be awarded any points.

Inbreeding

The ancestry information or pedigree is a useful tool to assess inbreeding. As is seen in Figure 3, the pedigree is divided into upper (sire) and lower (dam) halves. To facilitate the process, animal names are replaced by unique numbers. The sire and and dam are given the letters, S and D, respectively. Usually the animal to whom the pedigree belongs is given the letter X. As can be seen, two animals, #15 and #22, appear twice in the pedigree. The next step is to determine which individuals appear in both the sire and the dam halves of the pedigree. These individuals are called common ancestors. That is they are common to both the sire and dam family lines. In this example, #15 and #22 appeared twice but neither #15 or #22 was in both the sire and dam halves. Therefore, there are no common ancestor(s) and the animal to which this pedigree belongs is not inbred. *The rule is that the parents must be related for the progeny to be inbred.*

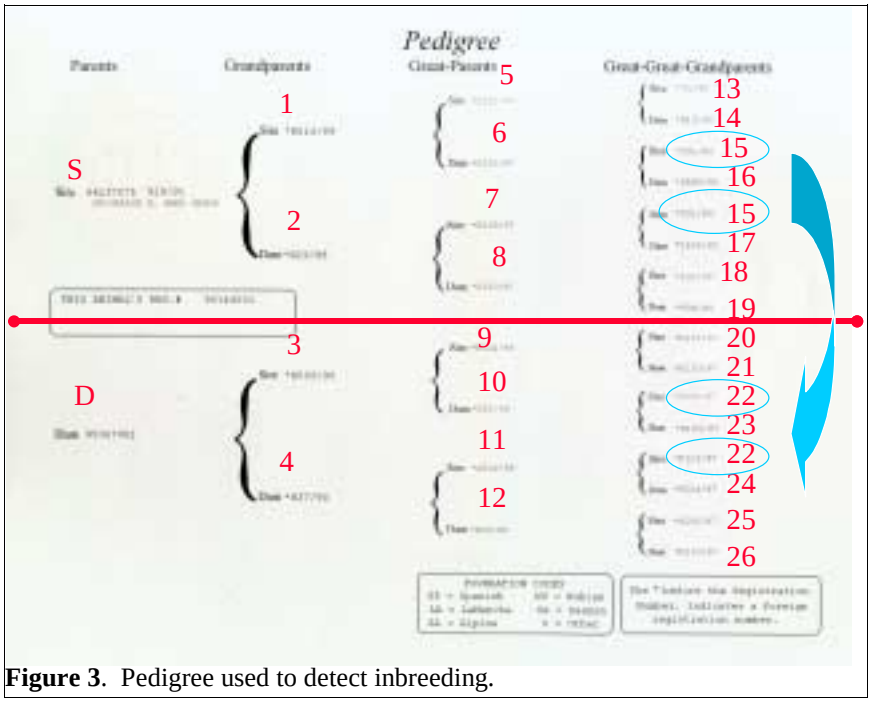


Figure 3. Pedigree used to detect inbreeding.

If we examine the sire's half of the pedigree (Figure 4), we see that #15 appears in both the sire and dam halves. Therefore, #15 is a common ancestor, the sire and dam of S are related, and S is, therefore, inbred. If we were to do the same for the dam half of the pedigree, we would see that #22 appears in both the sire and dam halves. Therefore, #22 is a common ancestor, the sire and dam of D are related, and D is, therefore, inbred. In this example, we have two inbred individuals mated to produce a non-inbred progeny.

As was stated earlier, inbreeding results in the mating of related individuals and increases the homozygosity in a population. *Is inbreeding bad?* In dairy cattle, increased inbreeding decreases

milk, fat, and protein production, lactation length, productive life, and survivability. In beef cattle, increased inbreeding decreases birth weight, preweaning daily gain, and weaning weight. In sheep, increased inbreeding decreases birth weight, litter weight weaned, ewe fertility and prolificacy, % lambs born alive, lamb viability (survivability), and fleece weight.

In goats, no studies have examined the effects of inbreeding. So we can only assume that they would be detrimental in goats as well.

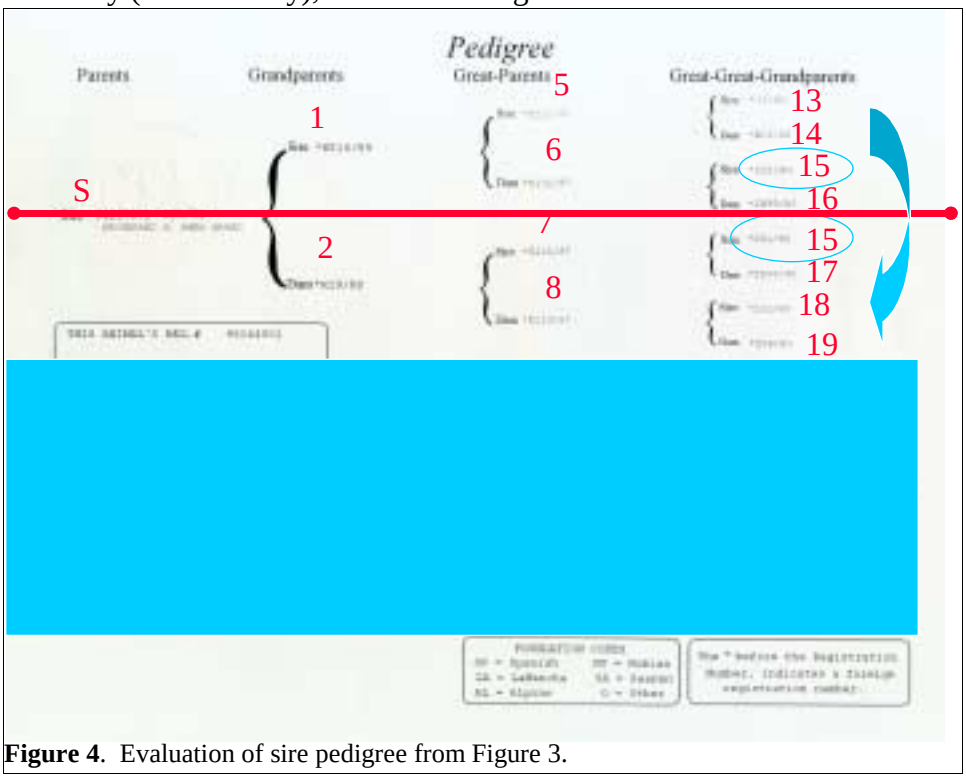


Figure 4. Evaluation of sire pedigree from Figure 3.

References

American Boer Goat Association. 1999. Criteria for the Ennoblement of a Boer Goat. http://www.abga.org/ennobled/criteria1999-03-10.htm

American Dairy Goat Association. 2001. Guidebook, 116pp.

The proper citation for this article is:

Gipson, T. A. 2002. Pedigree Analysis. Pages 57-60 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

EXTENSION OVERVIEW

Dr. Terry A. Gipson

Interim Goat Extension Leader

Introduction

The year 2001 was a busy one for the Langston Goat Extension program. The goat extension specialists have answered innumerable producer requests for goat production and product information via the telephone, letters, and e-mail, have given numerous presentations at several state, regional, national, and international goat conferences for potential, novice, and veteran goat producers, and have produced a quarterly newsletter. They have also been busy with several major extension activities. These activities include the annual Goat Field Day, Langston Goat Dairy Herd Improvement (DHI) Program, grazing demonstrations, the fifth annual meat buck performance test, and various goat workshops on artificial insemination and internal parasite control.

Goat Field Day

Last April 28, Langston held its sixteenth annual Goat Field Day to inform and educate potential, novice, and veteran goat producers. The theme of the Goat Field Day was "Goats in the Twenty-First Century" with nearly 200 participants attending. For the morning session, Dr. Rick Machen of the Texas Agricultural Extension Service and based in Uvalde, TX discussed the future of the meat goat industry, and Dr. Grant Tomita of Langston University discussed the impact of mastitis. Afternoon Workshops included #1: Meat Goat Production - Elements Essential for Long-Term Success by Dr. Rick Machen; #2: Detection and Diagnosis of Mastitis by Dr. Grant Tomita; #3: DHI Overview and Tester Training by Mr. Tim McKinney; #4: Types of Fencing for Goats by Mr. Jerry Hayes; #5: International Goat Activities by Dr. Roger Merkel; #6: Basic Goat Husbandry by Dr. Lionel Dawson; #7: Nutrition for Meat Goat Production by Dr. Steve Hart; #8: Predator Control Measures by Mr. Kevin Grant of USDA-APHIS; and #9: Cheesemaking by Ms. Sara Bolton & Ms. Gretchen Stolfo of PureLuck Texas. Mr. Tim McKinney supervised the youth program in the morning.

Goat DHI Laboratory

The Langston Goat Dairy Herd Improvement (DHI) Program, housed at the dairy farm west of campus, operates under the umbrella of the Texas DHIA. In February 1998, the Langston DHI program became the first DHI program to introduce forms and reports in goat terminology to dairy goat producers in the United States.

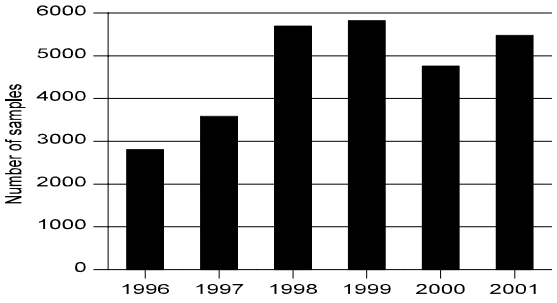


Figure 1. Number of goat milk samples analyzed.

The Langston DHI program has been very popular with dairy goat producers and has grown significantly since its establishment in 1996. Figure 1 shows the growth of the DHI lab in terms of number of samples processed. The slight downturn in 2000 is because one very large herd elected not to performance test last year. Currently we have over 80 herds from 27 states enrolled in the Langston Goat Dairy DHI Program.

For those interested in becoming a Langston goat DHI tester, training is available either in a formal classroom setting or through a 35-minute video tape. Every tester is required to attend the DHI training session or view the tape and take a test. Upon completion of the DHI training, the milk tester can start performing monthly herd tests.

Goat Newsletter

The Goat Extension program published four issues of the Goat Newsletter in 2001. Interest in the newsletter has grown and we currently have over 3000 subscribers to our free quarterly Goat Newsletter.

Grazing Research/Demonstration Activities

In 2001, Langston University was awarded an USDA Sustainable Agriculture Research and Education grant to study the efficacy of using goats to eliminate invasive vegetation on tribal lands. Caddo, Cherokee, Choctaw, Osage, Sac & Fox, and Greater Seminole Nations are collaborators on this project and research/demonstration sites will be established on lands affiliated with the tribes. Treatments differ from site to site. At the Caddo demonstration site we will examine effects of goats and sheep co-grazing; at the Cherokee site we will examine effects of goats versus mechanical and chemical controls; at the Choctaw site we will examine co-grazing of goats and beef cattle; at the Osage site we will examine goats and fire control; at the Sac & Fox site we will examine varying stocking rates; and at the Seminole site we will also examine varying stocking rates. Workshops will be held at each site detailing the progress of the project including basic goat husbandry.

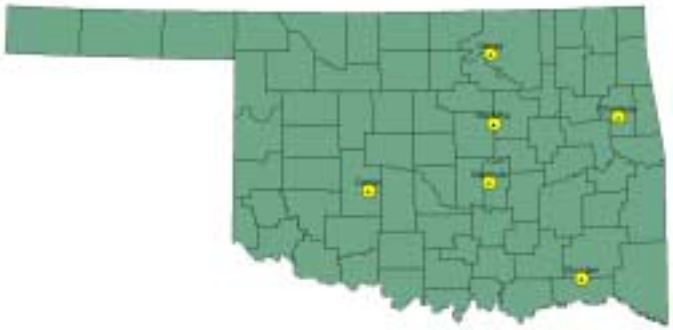


Figure 2. Location of the SARE demonstrations grazing sites.

Artificial Insemination Workshop

On September 8, 2001, an *Artificial Insemination* workshop was held at Langston University. Participants learned how to synchronize and detect estrus and how to artificially inseminate does. They also learned about the collection, processing, care, and storage of semen. Twenty-two participants enrolled for the workshop. In the morning session, Dr. Terry Gipson gave a presentation on basic reproductive anatomy and physiology. Dr. Lionel Dawson of Oklahoma State University then lectured on estrus detection and synchronization. Mr. Les Hutchens of Reproductive Enterprises, Inc. in Stillwater, OK displayed the intact female reproductive tract and the anatomy was re-discussed. Mr. Hutchens also discussed the A.I. equipment, especially the French gun and sheaths. After the morning break, Mr. Hutchens discussed the contents of an A.I. kit. After a lunch of goat sausage, baked beans, potato salad, and goat milk ice cream, the participants were guided through semen handling and liquid nitrogen tank maintenance by Mr. Hutchens. Afterwards, participants were able to inseminate some Alpine does that had been synchronized using Synchromate-B and PG-600. After several hands-on inseminations with the live animals, participants were given the opportunity to ask questions of the presenters.

In an effort to move the university to the producers, Langston University conducted it's second hands-on artificial insemination workshop off-campus in Tahlequah, OK on October 13, 2001. Twenty participants attended the artificial insemination workshop at the Cherokee County Fairgrounds hosted by Ms. Candice Howell, Langston University Youth Specialist. The same format and personnel were involved in the Tahlequah workshop as in the Langston workshop except that Mr. Mark Mouttet replaced Mr. Les Hutchens.

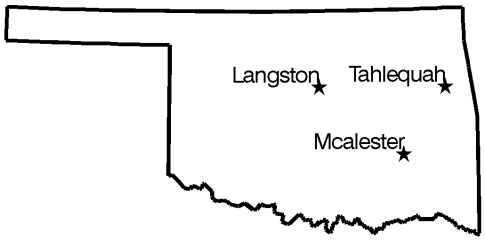


Figure 4. Locations of AI and Internal Parasite workshops.

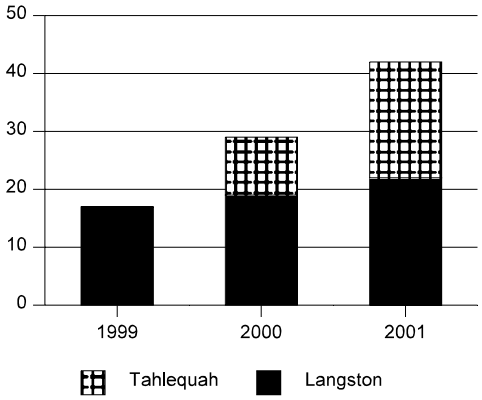


Figure 3. Number of participants enrolled in AI workshops.

Controlling Internal Parasites Workshop

On Saturday, June 2, 2001 a workshop on *Controlling Internal Parasites* was held at Langston University. Six participants attended the hands-on workshop. In the morning session, Dr. Lionel Dawson of Oklahoma State University lectured on the parasites that infect goats, their life cycles, and various anthelmintics that goat producers can use. Dr. Bill Pomroy, Visiting Scholar from Massey University in New Zealand, discussed anthelmintic resistance and the state of anthelmintic research worldwide. After a lunch of goat sausage, baked beans, potato salad, and goat milk ice cream, the participants were guided through the collection of fecal samples and their preparation for counting by Dr. Terry Gipson. The participants then collected fecal samples from Angora does and they conducted fecal egg counts. Eight microscopes were provided for the participants to use in the fecal egg counts. Included in the registration fee was a McMaster counting chamber, which is used to determine fecal egg counts. In an effort to move the university to the producers, Langston University conducted it's first ever hands-on controlling internal parasites workshops off-campus in Tahlequah, OK on June 16, 2001 and in McAlester, OK on June 30, 2001. Eight participants attended the Tahlequah workshop and 4 participants attended the McAlester workshop. The workshop programs were similar to the Langston workshop.

Boer Goat Judging School

On June 12 and 13, 2001, Langston University held a Level II Boer Goat Judging School. Messrs. Louie Van Rensburg and Lucas Burger, South African Boer goat judges, were the instructors for the school. Four participants attended the school that was sponsored by Langston University and American Boer Goat Association. Immediately prior to the Level II Judging School, Langston University provided goat milk ice cream for the ABGA National Show held in Lawton, OK.

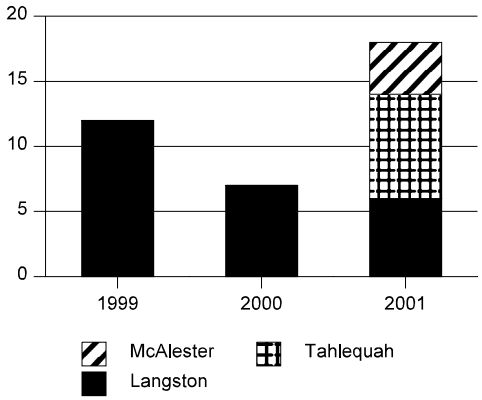


Figure 5. Number of participants enrolled in Internal Parasite workshops.

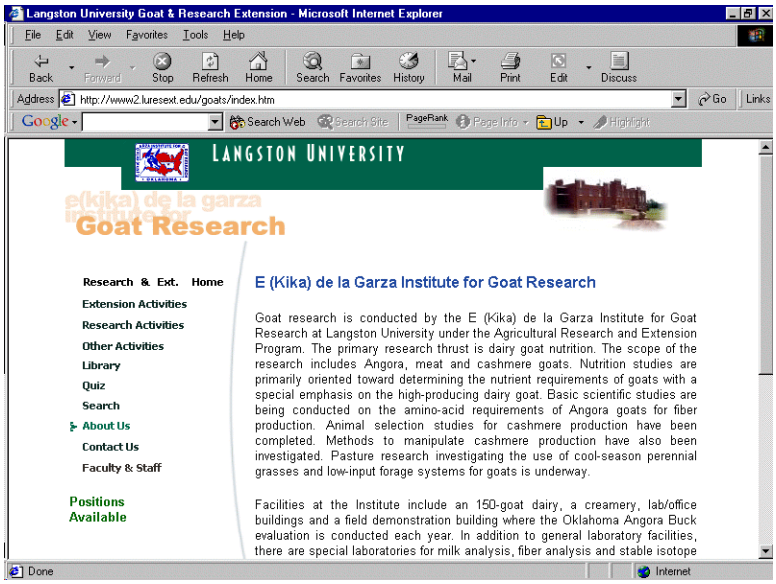
Junior Oklahoma Boer Goat Association Show

Following the midpoint report of the buck performance test, at 12:00 (noon) the Junior Oklahoma Boer Goat Association held their annual fund-raising show at Langston University. There were 72 entries with 28 exhibitors with 4 classes of does, 5 classes of wether market goats, and 2 buck classes. The were also 3 classes of showmanship. The judge for the show was Mr. Marvin Shurley of Sonora, TX. Mr. Shurley is the president of the American Meat Goat Association.. The JOBGA show was a huge success and the JOBGA was very appreciative of the major role that Langston University played in providing the opportunity for the youth of Oklahoma to gain experience in showing and exhibiting livestock.

Internet Website

http://www2.luresext.edu

The Agricultural Research and Cooperative Extension program of Langston University recently unveiled a new and improved Internet web site. The Internet address (URL) of the new web site is http://www2.luresext.edu.



Capabilities of the new web site include a document library with the complete proceedings of the annual Goat Field Day for the past three years and the quarterly newsletter for the past two years. Both the proceedings and newsletters are also available in portable document format (pdf), which allows for the viewing and printing of documents across platform and printer without loss of formatting.

Information, recent abstracts, and summaries of scientific articles of completed and current research activities in dairy, fiber, and meat production are available for online viewing and reading. Visitors will be able to take a Virtual Tour of the research farm and laboratories, complete with digital photos and narrative. Visitors will also be able to browse a digital Photo Album. Visitors will also be able to subscribe to our free quarterly newsletter online. Visitors will be able to test their knowledge of goats with the interactive goat quiz that covers nearly all aspects of dairy, fiber, and meat goat production. For those questions that are lacking in the interactive quiz database, visitors will be able to submit a question to be included in the database. Visitors will be able to read about research interests of faculty and will be able to contact faculty & staff via email.

Tulsa State Fair

At the 2001 Tulsa State Fair, Langston University participated in the Birthing Center program with five pregnant Spanish does. Dr. Carey Floyd of the Oklahoma Department of Agriculture coordinated the birthing center and said that the goats were the highlight of the center. The five does gave birth to three sets of twins and two singles. This was a huge success and plans are underway

to provide pregnant does for 2002.

Oklahoma Black Historical Association

In 2001, Langston University signed a memorandum of understanding with the Oklahoma Black Historical Association to conduct a goat grazing demonstration. The objective of the memorandum was to conduct a vegetation management demonstration and appropriate goat management workshops to complement the demonstration project. In late June, 24 Alpine wethers and doelings were transported to the Oklahoma Black Historical Association site near Nobletown, OK. Goats were returned to Langston University in late August after they had eliminated the brush on the eight-acre parcel and workshops were scheduled in the Wewoka area.

SARE Producer Research

From 1999 through 2001, the Goat Cooperative Extension Program collaborated with Dr. Claud Evans of Okemah, OK. Dr. Evans is the recipient of a USDA Sustainable Agriculture Research and Education Producer grant to study methods of harvesting cashmere. One side of each goat was combed several times and the other side was sheared in the early Spring. Langston collaborated in the initial harvesting (shearing) of each year and in the cashmere fiber analysis.

Meat Buck Performance Test

Meat goat production represents the most rapidly growing animal industry in the US today, and is becoming a mainstream livestock enterprise. To further the genetic progress through the identification of superior sires in the industry, Langston University and the Oklahoma Meat Goat Association established a meat goat performance test in 1997.

Entry

The fifth annual meat buck performance test started May 5, 2001 at the South Barn complex of Langston University with 50 bucks enrolled from 18 different breeders. Forty-eight of the bucks were fullblood or crossbred Boers and two were Kiko. Thirty-one bucks were from Texas, 14 were from Oklahoma, and 5 were from Illinois. The test was open to purebred and crossbred bucks born between December 1, 2000 and March 31, 2001.

Bucks were given a thorough physical examination by Dr. Lionel Dawson, dewormed with Valbazen (albendazole), foot bathed with Nolvasan, deloused with Atroban De-Lice, given a preemptive injection of Nuflor for upper respiratory infections, and for some bucks booster or initial vaccinations for enterotoxemia and caseous lymphandinitis. All bucks were retagged by Extension staff after admission to the performance test. Four weeks after check-in, all bucks were given a booster vaccination for enterotoxemia and caseous lymphandinitis. Bucks are routinely monitored for internal parasites using fecal egg counts.

The entrance weight for the 50 bucks averaged 53.1 lbs with a range of 34.1 to 83.7 lbs. The average age was 92 days with a range from 50 to 158 days.

Adjustment Period

All bucks underwent an adjustment period of 18 days immediately after check-in. During the adjustment period, bucks were acclimated to the test diet and to the Calan feeders. Nine bucks were assigned to each 20' x 20' inside pen equipped with nine Calan feeders. Each pen also had a 20' x 20' outside run. The inside and outside pen spaces are separated by an overhead door that can be

raised or lowered as the weather dictates. Every other pen was also equipped with a fan to circulate air in the barn complex whenever needed. The grass in the outside pens was mowed often, and grazing was negligible. Each buck wore a collar with an electronic "key" encased in hard plastic. The key unlocks the door to only one Calan feeder, thus enabling the buck to eat out of his individual feeder. Each morning, yesterday's feed that remains in the Calan feeder is weighed and removed from the Calan feeder. Fresh feed is weighted and placed into the Calan feeder. The difference in weights between the fresh feed placed in the Calan feeder one morning and the remaining feed the next is the amount consumed. Because only one goat is capable of opening the Calan door and eating, it is possible to calculate the feed intake of the individual bucks. The area immediately around the Calan feeders and waterers is concrete; however, the large majority of the inside pen is earth and is covered by pine shavings. Pine shavings were periodically added as needed to maintain fresh bedding. Bucks had free access to water provided by a float-valve raised waterers.

Weights at the beginning of the test averaged 58.3 lbs with a range of 29.7 to 98.0 lbs.

Diet

The following diet was formulated by a nutritionist at Langston University. In 1999, the amount of salt and ammonium chloride was doubled due to problems with urinary calculi the previous year. Except for the increase in salt and ammonium chloride, the ration is unchanged from that used in the first two meat buck performance tests. The ration was fed free-choice during the adjustment period and during the 12-week test.

Ingredient	**Percentage (as fed)**
Cottonseed hulls	29.07
Alfalfa meal	19.98
Cottonseed meal	15.99
Ground corn	15.99
Wheat midds	9.99
Pellet Partner (binder)	5.00
Ammonium chloride	1.00
Yeast	1.00
Calcium Carbonate	0.95
Salt	0.50
Trace mineral salt	0.50
Vitamin A	0.02
Rumensin	0.01
TOTAL	**100.00**

The crude protein content of the ration is 16% with 2.5% fat, 20.4% fiber, and 60.6% TDN. Calcium phosphorus and sodium levels are 0.74, 0.37, and 1.07%, respectively. Zinc concentration is 33.04 ppm, copper is 17.15 ppm, and selenium is 0.21 ppm.

ABGA Approved Performance Test

In 1999, the American Boer Goat Association approached Langston University and the Oklahoma Meat Goat Association with the desire to designate the Oklahoma meat buck performance test as an ABGA Approved Performance Test. To qualify, the Oklahoma meat buck performance test needed to lengthen the time on test from 10 to 12 weeks. Langston University and the Oklahoma Meat Goat Association agreed to lengthen the performance test to 12 weeks.

In early 2000, the Oklahoma performance test was designated by the American Boer Goat

Association Board of Directors as an ABGA Approved Performance Test. Qualified fullblood or purebred Boer bucks will be eligible to earn points towards entry into the "Ennobled Herd Book." Candidate bucks must pass a pre-performance test inspection conducted by one (1) or more ABGA approved breeders.

Ten (10) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the top five percent (5%) of the animals on test. Five (5) points will be awarded a Boer buck who shows an average daily weight gain (ADG) in the next fifteen percent (15%) of the animals on test. All bucks must gain at least three-tenths (0.3) lbs per day to be awarded any points.

The Oklahoma performance test continues to grow and to serve the meat goat industry.

Gain

Average weight at the end of the test was 108.4 lbs with a range of 68.3 to 152.0 lbs. Average gain for the test was 50.1 lbs with a range of 24.2 to 74.9 lbs.

Average Daily Gain (ADG)

For the test, the bucks gained on averaged 0.60 lbs/day with a range from 0.29 to 0.89 lbs/day.

Feed Efficiency

For the test, the bucks consumed an average of 308.1 lbs of feed with a range of 143.7 to 470.7 lbs. For the test, the bucks averaged a feed efficiency of 6.30 (feed efficiency is defined as the number of lbs of feed needed for one lb of gain), with a range of 3.98 to 11.71.

Muscling

The average loin eye area as determined by ultrasonography was 1.98 square inches with a range of 0.97 to 3.02 square inches and the average right rear leg circumference was 17.6 inches with a range of 13.0 to 22.5 inches.

Index

For 2001, the index was calculated using the following parameters:

30% on efficiency (units of feed per units of gain)

30% on average daily gain

20% on area of longissimus muscle (loin) at the first lumbar site as measured by real time ultrasound adjusted by the goat's metabolic body weight:

$$\frac{\text{area of longissimus muscle (loin)}}{BW^{0.75}}$$

20% circumference around the widest part of the hind left leg as measured with a tailor's tape adjusted by the goat's metabolic body weight:

$$\frac{\text{circumference of hind left leg}}{BW^{0.75}}$$

The adjustment to metabolic body weight gives lighter weight goats a fair comparison of muscling to heavier goats.

The deviation from the average of the parameters measured from the goats in the performance test was used in the index calculation. Thus, the average index score for bucks on-test was 100%. Bucks that are above average have indexes above 100% and those below average have index scores below 100%.

Congratulations

The Oklahoma Meat Goat Association and the Agricultural Research and Extension Program at Langston University congratulate

* Mr. Marvin Shurley of Sonora, TX
  for having the Top-Indexing buck
  in the 2001 Oklahoma Meat Buck Performance Test

Also, deserving congratulations are:

* Mr. Tommy Morriss of Sonora, TX
  for having the #1 Fastest-Gaining buck

* Mr. Richard Williams of Stillwater, OK
  for having the #2 Fastest-Gaining buck

* Mr. Marvin Shurley of Sonora, TX
  for having the #3 Fastest-Gaining buck

* Mr. Marvin Shurley of Sonora, TX
  for having the #4 (tie) Fastest-Gaining buck

* Mr. Jim Rosenbaum of Gainesville, TX
  for having the #4 (tie) Fastest-Gaining buck

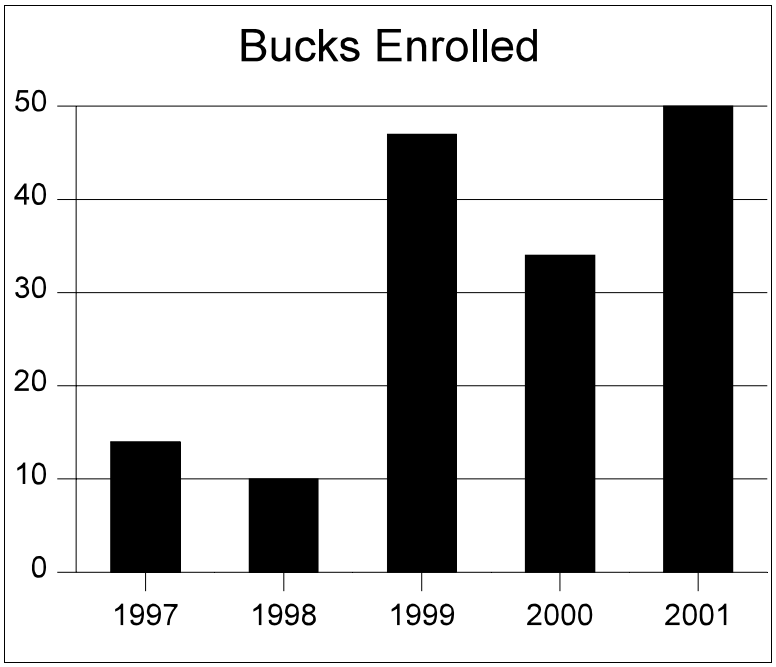
* Ms. Judy Hollis of Sonora, TX
  for having the Most-Feed-Efficient buck

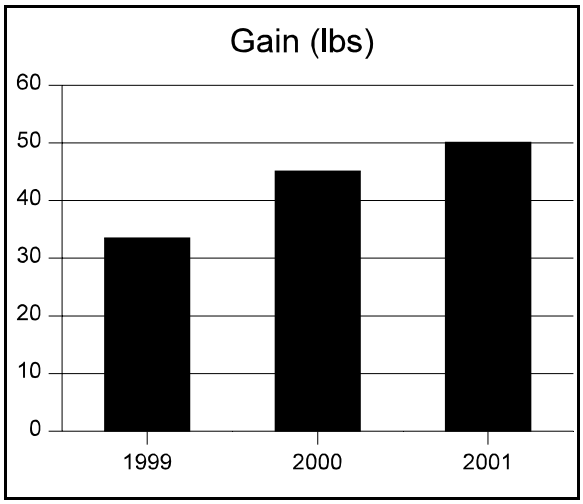
* Mr. Marvin Shurley of Sonora, TX
  for having the Most-Heavily-Muscled buck

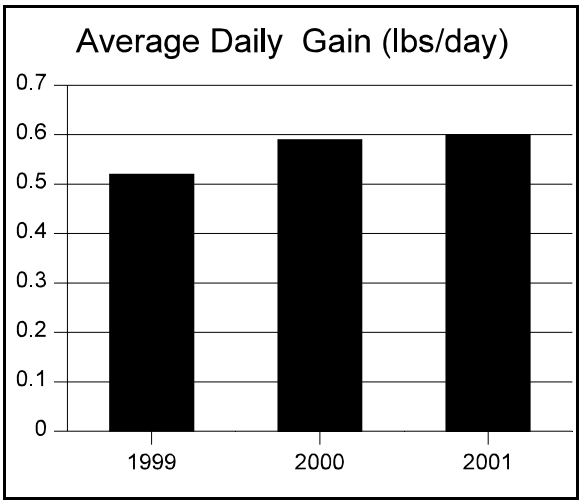
* Dr. Fred Homeyer of Robert Lee, TX
  for having the Best-Conformation-Boer buck.

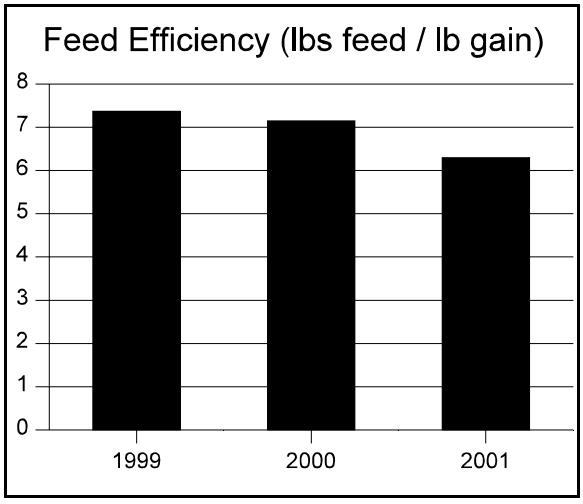
Acknowledgments

The Buck Test supervisor wishes to acknowledge Dr. Lionel Dawson of Oklahoma State University for his contributions as the admitting and on-call veterinarian, Messrs. Jerry Hayes and Bill Snelling of Langston University for their management and oversight of the day-to-day activities, Dr. Fred Ray of Oklahoma State University for conducting the ultrasound measurements for the loin eye area, Mr. Les Hutchens and his associates at Reproductive Enterprises, Inc. for conducting the breeding soundness exams, and Stillwater Milling for custom mixing the diet.


Bucks Enrolled
50
40
30
20
10
0
1997
1998
1999
2000
2001


Gain (lbs)
60
50
40
30
20
10
0
1999
2000
2001


Average Daily Gain (lbs/day)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1999
2000
2001


Feed Efficiency (lbs feed / lb gain)
8
7
6
5
4
3
2
1
0
1999
2000
2001

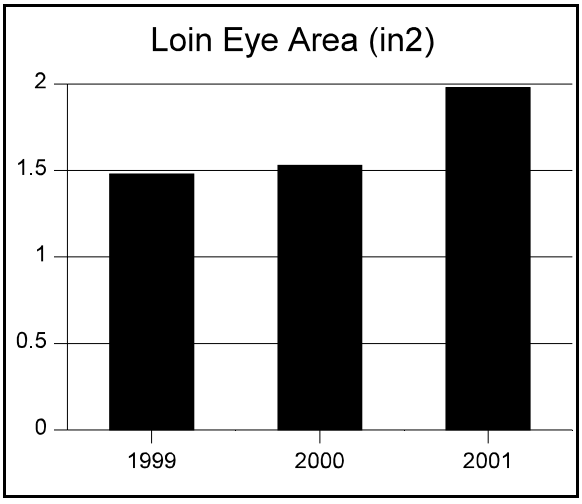

Loin Eye Area (in2)
2
1.5
1
0.5
0
1999
2000
2001

Table 1. Bucks sorted by Index score.

LU ID	Breed	Beg Wt (lbs)	End Wt (lbs)	Gain (lbs)	ADG (lbs/day)	Intake (lbs)	FE*	LEA (in^2)	Rear Leg (in)	index
585	Boer	63.9	135.5	71.6	0.85	378.7	5.29	2.44	16.5	100.83
608	Boer	66.1	139.9	73.8	0.88	470.7	6.38	1.78	19.5	100.77
598	Boer	49.6	124.4	74.9	0.89	370.7	4.95	1.95	15.5	100.68
580	Boer	54.0	114.5	60.6	0.72	338.5	5.59	2.46	18	100.66
592	Boer	61.7	118.9	57.3	0.68	309.8	5.41	2.53	18	100.63
605	Boer	65.0	122.2	57.3	0.68	392.8	6.86	2.34	21	100.62
610	Boer	37.4	93.6	56.2	0.67	251.8	4.48	2.35	17	100.59
613	Boer	46.3	100.2	54.0	0.64	294.1	5.45	2.07	20	100.58
604	Boer	55.1	106.8	51.8	0.62	254.3	4.91	2.52	18	100.57
594	Boer	69.4	130.0	60.6	0.72	377.8	6.24	2.49	18	100.55
596	Boer	87.0	146.5	59.5	0.71	426.0	7.16	2.46	19	100.44
581	Boer	67.2	122.2	55.1	0.66	355.8	6.46	2.08	19.5	100.37
593	Boer	61.7	116.7	55.1	0.66	321.1	5.83	2.18	18	100.36
614	Boer	98.0	147.6	49.6	0.59	424.8	8.57	2.61	22.5	100.35
582	Boer	47.4	102.4	55.1	0.66	321.1	5.83	2.31	17	100.29
588	Boer	65.0	122.2	57.3	0.68	363.2	6.34	1.66	19.5	100.28
597	Boer	60.6	118.9	58.4	0.69	334.3	5.73	2.12	16.5	100.27
577	Boer	52.9	106.8	54.0	0.64	318.9	5.91	2.35	17	100.26
584	Boer	66.1	117.8	51.8	0.62	329.5	6.37	2.41	18	100.25
623	Boer	54.0	104.6	50.7	0.60	260.9	5.15	1.83	18	100.23
587	Boer	43.0	91.4	48.5	0.58	193.0	3.98	1.69	17	100.22
579	Boer	73.8	132.2	58.4	0.69	363.9	6.23	1.65	18.5	100.22
619	Boer	46.3	104.6	58.4	0.69	367.1	6.29	2.07	17	100.20
576	Boer	56.2	98.0	41.9	0.50	291.1	6.96	2.84	19	100.15
599	Boer	94.7	152.0	57.3	0.68	450.5	7.87	2.27	18.5	100.12
617	Kiko	29.7	84.8	55.1	0.66	235.4	4.28	1.63	15	100.09
624	Boer	35.2	87.0	51.8	0.62	216.6	4.18	1.57	15.5	100.05
618	Boer	48.5	107.9	59.5	0.71	366.5	6.16	1.96	15.5	100.04
601	Boer	36.3	89.2	52.9	0.63	245.9	4.65	1.32	16.5	100.00
595	Boer	63.9	122.2	58.4	0.69	330.3	5.66	1.03	18	100.00
620	Boer	76.0	115.6	39.6	0.47	333.0	8.40	3.02	20	99.99
625	Boer	41.9	90.3	48.5	0.58	209.8	4.33	1.29	17	99.99
578	Boer	59.5	101.3	41.9	0.50	215.8	5.16	2.24	16.5	99.98
602	Boer	55.1	99.1	44.1	0.52	225.0	5.11	1.63	17.5	99.92
589	Boer	59.5	105.7	46.3	0.55	271.4	5.87	2.20	16	99.89
586	Boer	41.9	94.7	52.9	0.63	318.1	6.02	1.78	16	99.88
609	Boer	92.5	133.3	40.7	0.49	385.7	9.47	2.77	20	99.73
591	Boer	62.8	105.7	43.0	0.51	293.5	6.83	2.14	17	99.71
607	Boer	76.0	122.2	46.3	0.55	387.8	8.38	2.36	18	99.71
615	GeneMaster	57.3	102.4	45.2	0.54	319.2	7.07	1.46	18.5	99.62
606	Boer	31.9	83.7	51.8	0.62	211.3	4.08	1.13	13	99.58
590	Boer	46.3	88.1	41.9	0.50	236.7	5.65	1.46	16.5	99.57
622	Boer	63.9	104.6	40.7	0.49	316.3	7.76	2.24	17	99.52
612	Boer	79.3	118.9	39.6	0.47	355.3	8.96	2.00	20	99.50
621	Boer	37.4	70.5	33.0	0.39	159.2	4.82	1.11	15.5	99.23
611	Boer	60.6	84.8	24.2	0.29	197.3	8.14	1.83	17.5	98.90
603	Boer	41.9	68.3	26.4	0.31	143.7	5.44	0.97	15.5	98.87
583	Boer	60.6	91.4	30.8	0.37	246.6	8.00	1.19	17.5	98.83
616	Kiko	37.4	77.1	39.6	0.47	338.1	8.53	1.46	14.5	98.74
600	Boer	77.1	101.3	24.2	0.29	283.6	11.71	1.61	18	98.19
Average		**58.3**	**108.4**	**50.1**	**0.60**	**308.0**	**6.30**	**1.98**	**17.6**	**100.00**

* lbs of feed for one lb of gain.

Table 2. Bucks sorted by Gain (ADG).

LU ID	Beg Wt (lbs)	End Wt (lbs)	Gain (lbs)	ADG (lbs/day)	Intake (lbs)	FE*	LEA (in^2)	Rear Leg (in)	index
598	49.6	124.4	74.9	0.89	370.7	4.95	1.95	15.5	100.68
608	66.1	139.9	73.8	0.88	470.7	6.38	1.78	19.5	100.77
585	63.9	135.5	71.6	0.85	378.7	5.29	2.44	16.5	100.83
580	54.0	114.5	60.6	0.72	338.5	5.59	2.46	18	100.66
594	69.4	130.0	60.6	0.72	377.8	6.24	2.49	18	100.55
596	87.0	146.5	59.5	0.71	426.0	7.16	2.46	19	100.44
618	48.5	107.9	59.5	0.71	366.5	6.16	1.96	15.5	100.04
597	60.6	118.9	58.4	0.69	334.3	5.73	2.12	16.5	100.27
579	73.8	132.2	58.4	0.69	363.9	6.23	1.65	18.5	100.22
619	46.3	104.6	58.4	0.69	367.1	6.29	2.07	17	100.20
595	63.9	122.2	58.4	0.69	330.3	5.66	1.03	18	100.00
592	61.7	118.9	57.3	0.68	309.8	5.41	2.53	18	100.63
605	65.0	122.2	57.3	0.68	392.8	6.86	2.34	21	100.62
588	65.0	122.2	57.3	0.68	363.2	6.34	1.66	19.5	100.28
599	94.7	152.0	57.3	0.68	450.5	7.87	2.27	18.5	100.12
610	37.4	93.6	56.2	0.67	251.8	4.48	2.35	17	100.59
581	67.2	122.2	55.1	0.66	355.8	6.46	2.08	19.5	100.37
593	61.7	116.7	55.1	0.66	321.1	5.83	2.18	18	100.36
582	47.4	102.4	55.1	0.66	321.1	5.83	2.31	17	100.29
617	29.7	84.8	55.1	0.66	235.4	4.28	1.63	15	100.09
613	46.3	100.2	54.0	0.64	294.1	5.45	2.07	20	100.58
577	52.9	106.8	54.0	0.64	318.9	5.91	2.35	17	100.26
601	36.3	89.2	52.9	0.63	245.9	4.65	1.32	16.5	100.00
586	41.9	94.7	52.9	0.63	318.1	6.02	1.78	16	99.88
604	55.1	106.8	51.8	0.62	254.3	4.91	2.52	18	100.57
584	66.1	117.8	51.8	0.62	329.5	6.37	2.41	18	100.25
624	35.2	87.0	51.8	0.62	216.6	4.18	1.57	15.5	100.05
606	31.9	83.7	51.8	0.62	211.3	4.08	1.13	13	99.58
623	54.0	104.6	50.7	0.60	260.9	5.15	1.83	18	100.23
614	98.0	147.6	49.6	0.59	424.8	8.57	2.61	22.5	100.35
587	43.0	91.4	48.5	0.58	193.0	3.98	1.69	17	100.22
625	41.9	90.3	48.5	0.58	209.8	4.33	1.29	17	99.99
589	59.5	105.7	46.3	0.55	271.4	5.87	2.20	16	99.89
607	76.0	122.2	46.3	0.55	387.8	8.38	2.36	18	99.71
615	57.3	102.4	45.2	0.54	319.2	7.07	1.46	18.5	99.62
602	55.1	99.1	44.1	0.52	225.0	5.11	1.63	17.5	99.92
591	62.8	105.7	43.0	0.51	293.5	6.83	2.14	17	99.71
576	56.2	98.0	41.9	0.50	291.1	6.96	2.84	19	100.15
578	59.5	101.3	41.9	0.50	215.8	5.16	2.24	16.5	99.98
590	46.3	88.1	41.9	0.50	236.7	5.65	1.46	16.5	99.57
609	92.5	133.3	40.7	0.49	385.7	9.47	2.77	20	99.73
622	63.9	104.6	40.7	0.49	316.3	7.76	2.24	17	99.52
620	76.0	115.6	39.6	0.47	333.0	8.40	3.02	20	99.99
612	79.3	118.9	39.6	0.47	355.3	8.96	2.00	20	99.50
616	37.4	77.1	39.6	0.47	338.1	8.53	1.46	14.5	98.74
621	37.4	70.5	33.0	0.39	159.2	4.82	1.11	15.5	99.23
583	60.6	91.4	30.8	0.37	246.6	8.00	1.19	17.5	98.83
603	41.9	68.3	26.4	0.31	143.7	5.44	0.97	15.5	98.87
611	60.6	84.8	24.2	0.29	197.3	8.14	1.83	17.5	98.90
600	77.1	101.3	24.2	0.29	283.6	11.71	1.61	18	98.19
Average	**58.3**	**108.4**	**50.1**	**0.60**	**308.0**	**6.30**	**1.98**	**17.6**	**100.00**

* lbs of feed for one lb of gain.

Table 3. Bucks sorted by Feed Efficiency.

LU ID	Beg Wt (lbs)	End Wt (lbs)	Gain (lbs)	ADG (lbs/day)	Intake (lbs)	FE*	LEA (in^2)	Rear Leg (in)	index
587	43.0	91.4	48.5	0.58	193.0	3.98	1.69	17	100.22
606	31.9	83.7	51.8	0.62	211.3	4.08	1.13	13	99.58
624	35.2	87.0	51.8	0.62	216.6	4.18	1.57	15.5	100.05
617	29.7	84.8	55.1	0.66	235.4	4.28	1.63	15	100.09
625	41.9	90.3	48.5	0.58	209.8	4.33	1.29	17	99.99
610	37.4	93.6	56.2	0.67	251.8	4.48	2.35	17	100.59
601	36.3	89.2	52.9	0.63	245.9	4.65	1.32	16.5	100.00
621	37.4	70.5	33.0	0.39	159.2	4.82	1.11	15.5	99.23
604	55.1	106.8	51.8	0.62	254.3	4.91	2.52	18	100.57
598	49.6	124.4	74.9	0.89	370.7	4.95	1.95	15.5	100.68
602	55.1	99.1	44.1	0.52	225.0	5.11	1.63	17.5	99.92
623	54.0	104.6	50.7	0.60	260.9	5.15	1.83	18	100.23
578	59.5	101.3	41.9	0.50	215.8	5.16	2.24	16.5	99.98
585	63.9	135.5	71.6	0.85	378.7	5.29	2.44	16.5	100.83
592	61.7	118.9	57.3	0.68	309.8	5.41	2.53	18	100.63
603	41.9	68.3	26.4	0.31	143.7	5.44	0.97	15.5	98.87
613	46.3	100.2	54.0	0.64	294.1	5.45	2.07	20	100.58
580	54.0	114.5	60.6	0.72	338.5	5.59	2.46	18	100.66
590	46.3	88.1	41.9	0.50	236.7	5.65	1.46	16.5	99.57
595	63.9	122.2	58.4	0.69	330.3	5.66	1.03	18	100.00
597	60.6	118.9	58.4	0.69	334.3	5.73	2.12	16.5	100.27
593	61.7	116.7	55.1	0.66	321.1	5.83	2.18	18	100.36
582	47.4	102.4	55.1	0.66	321.1	5.83	2.31	17	100.29
589	59.5	105.7	46.3	0.55	271.4	5.87	2.20	16	99.89
577	52.9	106.8	54.0	0.64	318.9	5.91	2.35	17	100.26
586	41.9	94.7	52.9	0.63	318.1	6.02	1.78	16	99.88
618	48.5	107.9	59.5	0.71	366.5	6.16	1.96	15.5	100.04
579	73.8	132.2	58.4	0.69	363.9	6.23	1.65	18.5	100.22
594	69.4	130.0	60.6	0.72	377.8	6.24	2.49	18	100.55
619	46.3	104.6	58.4	0.69	367.1	6.29	2.07	17	100.20
588	65.0	122.2	57.3	0.68	363.2	6.34	1.66	19.5	100.28
584	66.1	117.8	51.8	0.62	329.5	6.37	2.41	18	100.25
608	66.1	139.9	73.8	0.88	470.7	6.38	1.78	19.5	100.77
581	67.2	122.2	55.1	0.66	355.8	6.46	2.08	19.5	100.37
591	62.8	105.7	43.0	0.51	293.5	6.83	2.14	17	99.71
605	65.0	122.2	57.3	0.68	392.8	6.86	2.34	21	100.62
576	56.2	98.0	41.9	0.50	291.1	6.96	2.84	19	100.15
615	57.3	102.4	45.2	0.54	319.2	7.07	1.46	18.5	99.62
596	87.0	146.5	59.5	0.71	426.0	7.16	2.46	19	100.44
622	63.9	104.6	40.7	0.49	316.3	7.76	2.24	17	99.52
599	94.7	152.0	57.3	0.68	450.5	7.87	2.27	18.5	100.12
583	60.6	91.4	30.8	0.37	246.6	8.00	1.19	17.5	98.83
611	60.6	84.8	24.2	0.29	197.3	8.14	1.83	17.5	98.90
607	76.0	122.2	46.3	0.55	387.8	8.38	2.36	18	99.71
620	76.0	115.6	39.6	0.47	333.0	8.40	3.02	20	99.99
616	37.4	77.1	39.6	0.47	338.1	8.53	1.46	14.5	98.74
614	98.0	147.6	49.6	0.59	424.8	8.57	2.61	22.5	100.35
612	79.3	118.9	39.6	0.47	355.3	8.96	2.00	20	99.50
609	92.5	133.3	40.7	0.49	385.7	9.47	2.77	20	99.73
600	77.1	101.3	24.2	0.29	283.6	11.71	1.61	18	98.19
Average	**58.3**	**108.4**	**50.1**	**0.60**	**308.0**	**6.30**	**1.98**	**17.6**	**100.00**

* lbs of feed for one lb of gain.

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RESEARCH OVERVIEW

A general overview of recent research activities can be derived by viewing of the following sections on USDA/CSREES RESEARCH PROJECTS, INTERNATIONAL PROJECTS, ABSTRACTS, and ARTICLE SUMMARIES.

Research activities of the E (Kika) de la Garza Institute for Goat Research in the last year have been considerable, as is the case for previous years. This is the product of many factors, probably the most important of which is the people involved. The number of permanent faculty in the Institute involved in research is not large in comparison with animal science departments in many other Land Grant universities. Hence, to achieve a strong research program, research faculty of the Institute aggressively seek extramural support. Grants obtained provide funds for equipment and supplies to conduct research, and very importantly support for Graduate Students, Postdoctoral Research Associates, and established scientists on sabbaticals, who all are often termed "Visiting Scholars." These Visiting Scholars have made a large contribution to the high-quality research that has been realized and hopefully will also be achieved in the future.

There has been a wide array of areas of research addressed in recent years, which can be evidenced by the list of projects and publications subsequent to this overview. All major types of goats raised in the US are considered, i.e., ones raised for meat, milk, and(or) fiber, both cashmere and mohair. The increasing demand for goat meat and decline in the mohair industry in recent years has caused corresponding shifts in emphasis, but because the future is unknown, all goat industries will continue to receive attention. The Institute has and will in the future conduct research to increase levels and efficiencies of goat production, enhance utilization of goat products, and improve use of goats for specific purposes such as vegetation management. There is intent to increase economic returns to those raising goats or processing their products, as well as providing other benefits like enhanced sustainability of livestock production systems.

One of the factors influencing specific research topics is obviously the expertise and knowledge of permanent research faculty of the Institute. A major focal point is nutrition and feeding practices, although certainly the research program has not been limited to this area. Numerous physiology, reproduction, management, breeding, parasitology, milk and milk product quality, udder health or mastitis, and fiber quality studies have been performed, facilitated by broad fields of knowledge of the permanent faculty. In this regard, frequently grant proposals are submitted which, if approved, include funds to support a Visiting Scholar with unique expertise required for completion of the project. For research in the foreseeable future, it will continue to pertain to areas of importance to the various goat industries in the US. The close link and coordinated, complementary research and extension programs of the Institute allow identification of researchable areas of potential practical importance to present and future goat producers and product users.

The Institute currently has herds of Alpine, Angora, Spanish, and Boer goats, along with crossbreeds and a small number of Tennessee Stiff Leg. Sometimes we are asked why other breeds are not used. In part this is because of the considerable resources required for maintaining adequate numbers of the difference types of goats necessary for planned experiments. There is great care taken to maintain balance, to have on-hand enough animals for the large number and wide array of experiments conducted, but yet not to expend limited resources on animals not being used in research. Relatedly, another consideration is the types of animals within the different breeds or breed types. The intent is to have animals typical of those of clientele so that research findings are relevant and of value to the majority of farms, rather than to have the most elite herds. And, in fact, in the

future there might very well be different sub-herds, since production potential can interact with specific management practices.

As noted before, a unique aspect of the Institute's research program is that a large proportion is made possible by grants, many of which are through USDA programs. Hence, although the broad or general direction of the research program is known, specific topics of investigation in 2- to 4-year periods partially depend on the faculty's ability to prepare grant proposals dealing with novel, unique, and sellable ideas, and naturally on the opinions of specific proposal reviewers and review panels. Faculty are strongly encouraged to seek extramural support funds, but there is care taken to ensure that proposed activities fit with the general direction of the program.

Research previously and in the future conducted at the Institute is applied in nature, which is felt most appropriate considering the needs and states of the various goat industries in the US. However, there is cognizance that in order to realize most rapid long-term progress, underlying physiological mechanisms or processes must be thoroughly understood, rather than merely noting whether or not a production response to a particular treatment occurs. Therefore, our research by design in most cases entails many somewhat basic or fundamental measures. Another research consideration to be mentioned is that some activities yield findings of immediate potential use by clientele. On the other hand, other topics are quite complex and not presently well understood, requiring much study before field application. If important enough, then a stepwise approach is taken to address such issues.

Permanent faculty and Visiting Scholars have been mentioned. Though their efforts are integral, it is important to recognize the equally essential contributions of other research personnel of the Institute, notably those of the Research Farm and Laboratory. Only with the hard work of these dedicated people can a highly productive research program be realized. Farm and laboratory personnel work closely with the researchers. In fact, for the purpose of proper training of Visiting Scholars and most appropriate research conduct, as well as because of periodic high labor demands, researchers participate in many laboratory and farm activities. Relatedly, with so many people involved in specific experiments, often from different parts of the world with various previous experiences and training in research, vehicles to maintain organization such as detailed research protocols are employed.

In a subsequent section, research projects are listed. Although dissemination of information generated from all of these projects occurs, some entail strong extension components, examples being "Use of goats for sustainable vegetation management in US grazing lands" and "Enhanced goat production systems for the southern United States." Likewise, there are projects listed in the section about our international activities that entail significant research components. For instance, most of the collaborative projects with Ethiopian universities have included training of their faculty members at the Institute, a large part derived via conduct of an experiment.

Information obtained through research is of value only if transferred to people who can derive benefit from it. In the publication section, it should be apparent that a key mode of disseminating research findings of the Institute is in peer-reviewed articles in scientific journals. Journals felt most appropriate for the studies are chosen. It follows then that since goats are important in many countries throughout the world, the official journal of the International Goat Association, "Small Ruminant Research," has been heavily relied upon. We strive to publish as quickly as possible after experimentation is complete. However, with the large amount of research always underway, and moreover because of the involvement of many Visiting Scholars from other countries here from a few months to 3 years, occasionally the publication process might not be realized in as timely of a fashion as desired. Presentations are made at scientific meetings, such as of the American Society of Animal Science, with accompanying abstracts. Also, our research findings are transferred in

numerous other ways, such as fact sheets, the Goat Newsletter, Proceedings of the Annual Goat Field Day, meetings of producer groups, farm visits, phone calls, emails, etc.

In summary, the research program of the E (Kika) de la Garza Institute for Goat Research continues to thrive. This is a result of many factors, among which are fine efforts of earlier personnel, and in particular of those of the Institute now. And, based on the current conditions at the Institute, we have even higher expectations for future excellence.

Standard Abbreviations Used

ADG = average daily gain
BW = body weight
cm = centimeters
CP = crude protein
d = day
dL = decaliter
DM = dry matter
DMI = dry matter intake
g = gram
kg = kilogram
L = liter
M = mole
mL = milliliter
mm = millimeters
mo = month
ng = nanogram
N = nitrogen
NDF = neutral detergent fiber
OM = organic matter
P = probability
SE = standard error
TDN = total digestible nutrients
wt = weight
vol = volume
vs = versus
µ = micro

The proper citation for this article is:

Goetsch, A. 2002. Research Overview. Pages 74-77 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

USDA/CSREES RESEARCH PROJECTS

Title: **Goat Nutrient Requirements, Management Practices, and Production Systems**

Support: Evans-Allen

Period: 2001-2006

Objective: Study goat nutrient requirements, management practices, and production systems in order to increase the level and efficiency of goat productivity for increased profitability from goat production and lower costs to consumers of goat products

Title: **Postruminal Nitrogen Supply for Fast Growing Meat Goats**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1998-2002

Objectives: Determine the level of dietary crude protein required for fast growth of goat kids differing in growth potential

Determine the influence of both level and source of supplemental protein on ruminal fermentation, postruminal nitrogen supply, and performance of young meat goat kids

Determine the influence of dietary level of ruminally undegraded protein on ruminal fermentation and postruminal nitrogen supply, as well as performance of kids differing in growth potential

Determine the complementary nature of different sources of ruminally undegraded protein on postruminal amino acid supply, as well as performance of kids differing in growth potential

Title: **Nutrient Requirements of Goats: An Update and Reevaluation**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1998-2002

Objective: Compile data from goat feeding and nutrition experiments for use in determining nutrient requirements of goats.

Title: **Metabolic Changes Affecting Utilization of Poor Quality Diets by Goats**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1999-2002

Objective: Determine influences of supplementation of poor-quality forage diets with rumen-protected betaine on energy and nitrogen metabolism in goats

Title: **Sustainable Dairy Goat Milk Production from Forages**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1999-2002

Objectives: Study milk production, composition, animal health, and inputs for a grass-based dairy system as compared with a conventional confinement dairy.

Determine the response in milk production of grass-based dairy goats to different levels of concentrate supplementation.

Model the effect of pasture intake and concentrate supplementation on milk production and change in body weight.

Title: **Quality Characteristics and Yield Predictive Models of Goat Cheeses**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1999-2002

Objectives: Determine the effects of milk composition and somatic cell counts on the quality and yield of goat cheese and develop yield predictive models for goat cheeses (French soft, Colby, and Mozzarella).

Characterize Colby or Mozzarella cheeses in terms of composition, microstructure, rheological properties, protein profiles, and sensory characteristics as affected by seasonal variations of milk composition and property changes during cheese storage.

Title: **Energy for the Productive Caprine**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 2000-2003

Objectives: Quantify energy requirements of goats for maintenance, growth, gestation, lactation, and mohair fiber growth

Title: **Diet Selection and Performance by Sheep and Goats Grazing Mixed Pastures**

Support: USDA 1890 Institution Capacity Building Grant Program

Period: 1997-2001

Objectives: Measure growth of kids and lambs grazing pastures containing a complex mixture of grasses and forbs, and pastures alley cropped with mimosa

Determine the quality and productivity of mimosa as browse in pastures co-grazed with goats and sheep

Study the interaction between stocking rate and time in affecting quantity and quality of the major botanical components, animal weight gain, and diet selectivity

Determine the most suitable stocking rate that provides the highest total gain per unit land area with the least amount of change in botanical composition

Title: **The Detection of Mastitis in Dairy Goats**

Support: Oklahoma Applied Research Support (OARS) Program/Oklahoma Center for the Advancement of Science and Technology (OCAST)

Period: 2001-2003

Objectives: Extensively test various mastitis detection assays that were developed for the bvine dairy industry to determine the applicability of those methods to detect mastitis in dairy goats

Determine the suitability of mastitis detection methods for use as a regulatory standard to monitor milk quality and goat udder health under field conditions

Title: **Use of Goats for Sustainable Vegetation Management in Grazing Lands**

Support: USDA Sustainable Agriculture Research and Education Grant Program

Period: 2001-2004

Objectives: Investigate effects of various goat management methods for vegetation rehabilitation or control in different grazing land settings in the south-central U.S.

Demonstrate and display appropriate means of vegetation management with goats, as well as to provide education in other related management areas

Develop an information package on optimal use of goats for grazing land vegetation management to ensure long-term, sustainable, and widespread project impact

Title: **Enhanced Goat Production Systems for the Southern United States**

Support: USDA Initiative for Future Agriculture and Food Systems

Period: 2001-2005

Objectives: Develop a vehicle to appraise compatibility of available resources and production conditions with goat production systems.

Project most appropriate goat production systems based on compatibility with presently available resources and production conditions, and evaluate changes in resources or production conditions necessary for employment of alternative, preferred systems.

Disseminate and provide training in use of the developed decision-support vehicle.

The proper citation for this article is:

Goetsch, A. 2002. USDA/CSREES Research Projects. Pages 78-81 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

INTERNATIONAL PROJECTS

Title: **An Institutional Partnership to Enhance Food Security and Income Generating Potential of Families in Southern Ethiopia Through Improved Goat Production and Extension**

Support: ALO-USAID, Partnering with Higher Education for International Development

Collaborator: Awassa College of Agriculture (ACA) of Debub University in southern Ethiopia

Objectives: Establish ties between Langston University and ACA

Increase the research and extension capabilities of ACA staff

Establish women's groups for goat production

Enhance the internationalization, culture diversity, and gender relevance at ACA and Langston University

Title: **Enhancing Institutional Research and Extension Capabilities for Increased Food Security Through Improved Goat Production**

Support: UNCF- USAID International Development Partnership Activity

Collaborator: Alemaya University (AU) in eastern Ethiopia

Objectives: Improve the research, teaching, and extension capabilities of AU staff, allowing it to better serve the developmental needs of the surrounding region

Establish a development project to enhance household food production, income and health status through targeting increased goat productivity and women in development by providing goats and appropriate technology to women's groups for goat production

Increase Langston University's international involvement and development impact

Internationalization of Langston University staff to increase awareness of foreign countries, cultures, gender relevance, and development issues

Title: **Multinational Approaches to Enhance Goat Production in the Middle East**

Support: USAID Middle East Regional Cooperation Program

Collaborator:

Egypt	Desert Research Center Animal Production Research Institute Ain Shams University
Israel	Volcani Center
Palestinian National Authority	Agriculture Extension Department
Jordan	Jordan University of Science and Technology

Objectives:

Overall:	Revitalize and develop the Middle East goat industry via cooperative research and technology transfer to increase income and improve the standard of living of the indigenous people
Specific:	Characterize goat production systems of the Middle East region and distribute improve goat genotypes
	Increase knowledge of goat milk properties and develop new technologies for production of goat milk products in the Middle East
	Transfer appropriate available and developed technologies for goats to Middle Eastern farms/households, in particular proper milk hygiene and processing

Title: **Enhanced Education and Computer Capabilities: The Foundation for Sustained Collaboration**

Support: ALO-USAID, Partnering with Higher Education for International Development

Collaborator: Awassa College of Agriculture of Debub University in southern Ethiopia

Objectives: Upgrade the extension skills of ACA staff through training at Oklahoma State University and through practical presentations in Ethiopia

Upgrade ACA computer capabilities through training in networking and establishment of a student computer laboratory/campus network on the Awassa campus

Title: **Fostering Future Collaboration Between US Institutions and the Armenian Agricultural Academy Through Training and Information Exchange**

Support: USDA Cooperative State Research, Education, and Extension Service Innovation Fund.

Collaborator: USDA Marketing Assistance Project in Armenia, Armenian Agricultural Academy in Yerevan, Armenia

Objectives: Train Armenian nationals in the establishment and conduct of a Dairy-Herd-Improvement-like organization for Armenian dairy goat producers

Further train Armenian nationals in artificial insemination (AI) techniques for dairy goats

Train Armenian nationals in general dairy goat husbandry

Allow LU staff to learn more about Armenian goat production and formulate future plans for collaboration with the USDA project through visits to Armenia

Title: **Strengthening Collaboration Between the E (Kika) de la Garza Institute for Goat Research of Langston University and the USDA MAP Project in Armenia**

Support: USDA Cooperative State Research, Education, and Extension

Collaborator: USDA Marketing Assistance Project in Armenia

Objectives: Develop and refine short- and long-term goals and objectives for the USDA-sponsored Dairy Goat Industry Development (GIDP) project in Armenia and the Armenian Dairy Goat Improvement Center (ARID) that will result in enhanced sustainability

Provide programmatic leadership for ARID and GIDP through close communication with and mentoring of the GIDP advisor

Provide technical expertise and training in the following areas: General Farm Management; Breeding Program Establishment and Evaluation; Dairy Goat Nutrition; Quality Assurance Program for Dairy Products; and Herd Health Programs

Provide training to the ARID Goat Advisor and Armenian ARID staff at GIGR

Title: **Improving Ethiopian Household Food Security and Enhancing the Teaching, Research and Extension Ability of Awassa College of Agriculture, Debub University, Ethiopia**

Support: UNCF- USAID International Development Partnership Activity

Collaborator: Fort Valley State University, Fort Valley, GA
Awassa College of Agriculture of Debub University in southern Ethiopia

Objectives: Provide training to ACA staff in research methodology, parasitology, animal breeding, semen collection and freezing and artificial insemination

Transport Boer goat semen to ACA for a crossbreeding program

Strengthen ACA's current extension program and expand its impact on village goat production through formation of new women's groups for goat production and providing more training to existing women's groups

Increase Langston University and GIGR's involvement in and impact on international development

The proper citation for this article is:

Merkel, R. 2002. International Projects. Pages 82-85 in Proc. 17th Ann. Goat Field Day, Langston University, Langston, OK.

ABSTRACTS

2002 Southern and National Meetings of the American Society of Animal Science

(Journal of Animal Science, Volume 80, Supplements 1 and 2;
Journal of Dairy Science, Volume 85, Supplement 1)

Effect of feeding systems on composition and organoleptic quality of goat milk cheese

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This study investigated effects of different feeding systems on chemical and biochemical composition and organoleptic scores of a goat milk soft cheese. Three groups of lactating Alpine goats (BW = 54 ± 10 kg) grazed with different levels of concentrate supplementation on pasture (A: no concentrate; B: 0.33 kg concentrate; C: 0.66 kg concentrate) and the fourth group (D) was confined and fed 0.66 kg concentrate and alfalfa hay ad libitum. Ten kg of milk from each group was collected and made into a soft cheese twice monthly from April through September 2001. Cheese samples were analyzed for fatty acid, fat, and protein contents, and were evaluated for sensory quality when fresh and 1 and 2 mo later. Results indicated that feeding system did not affect fat or protein content in cheese on dry basis at any age ($P > 0.05$). However, there were significant differences in total fatty acid concentrations and sensory scores ($P < 0.05$), especially when fresh and at 1 mo of age. Significant differences were also found in fat, protein, and total fatty acid concentrations and in sensory scores of soft cheese at different stages of lactation. The cheeses showed higher fat content and higher total fatty acid concentration in early and late lactation compared with mid-lactation ($P < 0.01$). The total organoleptic score (body, texture, and flavor) increased linearly ($P < 0.01$) as lactation progressed. Cheese from A had more abundant short-chain (C_6 to C_{10}) fatty acids than cheese from D ($P > 0.05$). Negative correlations were found between total fatty acid concentration and sensory scores ($r = -0.20$ to -0.28) at all ages. In conclusion, milk from grazing goats supplemented with a high level of concentrate resulted in cheese with a higher total fatty acid content, lower short-chain fatty acid concentration, and lower sensory score of cheese compared with milk from goats without or with a low level of supplemental concentrate.

Effect of ruminally degraded nitrogen source and level in a high concentrate diet on site of digestion in Boer x Spanish wethers

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Eight yearling Boer x Spanish goat wethers (35.3 ± 6.6 kg average initial BW) with ruminal and duodenal cannulas were used in an experiment with two simultaneous 4 x 4 Latin squares to study effects of supplemental ruminally degraded N (DIP) source and level on sites of digestion. Diets were (DM basis) 9.2% CP, without inclusion of urea (U0) or soybean meal (S0); 11.3% CP achieved with 0.73% urea (U1) or 4.48% soybean meal (SBM; S1); 13.3% CP via use of 1.46% urea (U2) or 8.90% SBM (S2); or 15.2% CP derived through use of 2.16% urea (U3) or 13.2% SBM (S3). The ratio of DIP:TDN was 0.073, 0.104, 0.136, 0.167, 0.073, 0.093, 0.113, and 0.132 for U0, U1, U2, U3, S0, S1, S2, and S3, respectively. Diets contained 30% cottonseed hulls and were corn-based and fed at 2% BW (DM basis). Microbial OM and N flows to the duodenum linearly decreased as ($P < 0.05$) CP level increased (N: 8.8, 7.6, 7.8, 6.7, 7.4, 6.0, 6.7, and 6.7 g/d for U0, U1, U2, U3, S0, S1, S2, and S3, respectively). Apparent ruminal OM digestibility increased linearly as CP level increased, and there was an interaction between the quadratic effect of CP level and source in total tract OM digestibility ($P < 0.05$). With urea diets, total tract OM digestibility plateued at U1, while the peak with SBM was at S2 (71.3, 78.0, 77.7, 77.8, 71.5, 73.1, 74.7, and 75.0% for U0, U1, U2, U3, S0, S1, S2, and S3, respectively; SE = 0.14). There were interactions between linear and

quadratic effects of CP level and source in true ruminal and postruminal N digestibilities ($P < 0.08$). With urea diets, true ruminal N digestibility linearly increased and postruminal N digestibility linearly decreased as CP level rose, whereas there were marked effects of SBM inclusion but no differences among S1, S2, and S3. Ruminal and total tract NDF digestibilities (total tract: 51.3, 57.6, 57.7, 57.4, 49.7, 52.3, 53.2, and 53.2% for U0, U1, U2, U3, S0, S1, S2, and S3, respectively) increased linearly ($P < 0.05$) with increasing CP level, although differences tended to be greater for urea or SBM inclusion than among U1, U2, and U3 or S1, S2, and S3 (quadratic, $P < 0.13$). In conclusion, N recycling in yearling goats appears adequate to support high microbial growth with a high concentrate diet, although OM and NDF digestion may be enhanced by additional DIP for a DIP:TDN ratio of 0.10 to 0.11. Supported by USDA project No. 98-38814-6240.

Effect of clinical *Staphylococcus aureus* mastitis on early lactation dairy goats

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A study was conducted to characterize the effect of induced *Staphylococcus aureus* mastitis on physical parameters and milk constituents of first lactation Alpine dairy goats in early lactation (22 d in milk). The right udder half of seven goats was challenged with approximately 120 colony-forming units of *S. aureus*. Seven additional goats were not challenged and served as control animals. All goats were free of mastitis at the start of the experiment. Milk samples from each half of all goats were collected immediately prior to challenge (0 h) and at 24, 48, and 72 h postchallenge for somatic cell count (SCC) and composition analysis (fat and protein). Rectal temperature and milk yield were also monitored at the time interval above. Acute clinical mastitis occurred within 24 h postchallenge, and clinical symptoms and the infection persisted through 72 h. The logarithm of milk SCC from challenged halves was higher (6.75, $P < 0.05$, right half) than adjacent halves (6.01, left half) and the SCC of adjacent halves was higher than that of control animals (5.82, $P < 0.05$) at 24 h postchallenge. At 48 h and 72 h, SCC of milk from challenged halves remained elevated (6.86 and 6.96) above those of adjacent halves (5.89 and 5.88, $P < 0.05$) and control animals (5.79 and 5.88, $P < 0.05$). The percentage of milk fat from challenged halves was depressed only at 24 h postchallenge when compared with milk from adjacent halves and control group goats (3.55 versus 3.92 and 4.23, $P < 0.05$). However, the percentage of proteins in milk was higher ($P < 0.05$) in both infected and adjacent halves when compared with milk from control goats at 24 h (3.60 and 3.16 versus 2.76), 48 h (3.86 and 3.54 versus 2.72), and 72 h (3.57 and 3.66 versus 2.66). The rectal temperature of challenged goats peaked at 24 h (40.6°C, $P < 0.05$) and returned to normal values by 48 h and 72 h (39.7°C and 39.2°C). Milk yields of infected goats were depressed at 24 and 48 h postchallenge when compared with control goats ($P < 0.05$) and recovered to prechallenge levels by 72 h. Results indicate that clinical mastitis in one udder half can influence physiological parameters in the adjacent half. Therefore, consideration must be given to both udder halves when evaluating the mammary gland health status of dairy goats.

Variation in browse nutrient content in western Oklahoma throughout the growing season

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Leaves of browse species were sampled from May to September in west central (WC) and western OK (W) to determine changes in chemical composition throughout a growing season. Shinnery oak (SH, *Quercus havardi*) and sumac (SU, *Rhus copallina*) were sampled at each site. Blackjack oak (BK, *Q. marilandica*) and post oak (PK, *Q. stellata*) were sampled in WC and locust (LC, *Gleditsia triacanthos*), sand plum (SP, *Prunus angustifolia*), and skunkbush (SK, *R. aromatica*) in W. Sites were divided into three areas for sampling with three replications taken of each species in each area, frozen, and freeze dried. Samples were analyzed for DM, ash, N, NDF, ADF, ADL, and true IVDMD (NDF as end-point measure). The DM percentage tended to increase throughout the growing season ($P < 0.01$). There was a species by date interaction (S x D) in ash concentration ($P < 0.01$), with level increasing through mid-summer and then stabilizing or declining slightly. There was no difference in N level among WC species ($P > 0.05$), and N level was lowest in August (S x D; $P < 0.01$). In W, LC had higher N ($P < 0.01$) compared with other species. In WC, oak species had higher NDF, ADF, and ADL throughout the growing season compared with SU ($P < 0.05$), while in W NDF concentrations ranked SH > LC > SU, SK, and SP ($P < 0.05$). NDF in WC was highest in July and decreased thereafter, whereas in W, NDF concentration tended to increase throughout the growing season (S x D; $P < 0.01$). IVDMD of oak species in WC was lower ($P < 0.05$) than in SU throughout the collection period. Exceptionally high IVDMD, over 90%, was recorded for SU in both WC and W. Trends in nutrient content found over a 5- month sampling period indicate that, in general, tree leaves decrease in N concentration and increase in fiber and lignin contents.
Browse, oak, sumac, locust, skunkbush, plum

Prediction of energy requirements for maintenance and gain of growing goats

J. Luo, A. L. Goetsch, and T. Sahlu

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Literature data were compiled and a database was constructed to estimate ME requirements for maintenance (ME_m) and BW gain (ME_g) for three different biotypes of growing goats (i.e., > 50% Boer or meat, dairy, and indigenous) by regressing ME intake (MEI, kJ/kg $BW^{0.75}$) against ADG (g/kg $BW^{0.75}$). Because of differences among biotypes in intercepts and slopes ($P < 0.05$), data subsets for the different biotypes were used. The meat subset included 60 observations from 11 publications, representing 548 goats; there were 116 observations from 25 publications with 1,851 goats in the dairy subset; and the indigenous subset had 157 observations from 34 publications and 1,024 goats. Dairy and indigenous subsets were split into two groups-one for equation development and a second for evaluation. Observations with residuals greater than 1.5 times the residual SD from initial regressions were deleted. Equations were meat: MEI = 457.0 (SE = 22.3) + (25.23 (SE = 1.74) x ADG) (n = 57; $R^2 = 0.79$); dairy goats (development subset, n = 63): MEI = 573.7 (SE = 46.2) + (23.56 (SE = 3.10) x ADG) (n = 56; $R^2 = 0.52$); and indigenous (development subset, n = 87): MEI = 500.0 (SE = 11.9) + (18.59 (SE = 1.64) x ADG) (n = 76; $R^2 = 0.63$). Intercepts and slopes from regressions of observed against predicted MEI with evaluation subsets based on dairy and indigenous equations were not different from 0 and 1, respectively. Prediction equations for the

three biotypes had similar slopes, but the intercept for dairy differed ($P < 0.05$) from those for meat and indigenous. A common slope equation with a dummy variable (D; dairy = 1 and others = 0) was: MEI = 480.0 (SE = 13.5) + (103.2 (SE = 17.4) x D1) + (22.85 (SE = 1.23) x ADG) (n = 189; $R^2 = 0.74$). In conclusion, based on a compiled database from publications with growing goats, ME_m was 583.2 kJ/$BW^{0.75}$ (139 kcal/kg $BW^{0.75}$) for dairy goats and 480.0 kJ/$BW^{0.75}$ (115 kcal/kg $BW^{0.75}$) for meat and indigenous goats, and ME_g was 22.85 kJ/g (5.46 kcal/g). Supported by USDA project No. 9803092.

A comparison of two heart rate monitoring systems for goats

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Heart rate (HR) holds promise as an indirect means of estimating energy expenditure by ruminants. Therefore, two monitoring systems were compared with different goat breeds, diets, and levels of intake. The CP-402 stationary biosignal preamplifier method (BA) of Sable Systems (Henderson, NV) was compared with the human S610 monitor (HM) of Polar (Woodbury, NY). Electrode signals for BA were adjusted and filtered, with less dependence on signal quality relative to HM, whereas measurement with HM was more frequent (1- vs 10.5-min intervals). Heart rate was measured over 48-h periods while goats consumed alfalfa hay or a high concentrate diet for BW maintenance and on d 3 and 4 of fasting. Six Spanish (36 ± 1.3 kg), 7/8 Boer (39 ± 4.4 kg), Angora (23 ± 4.0 kg), and Alpine (41 ± 6.3 kg) wethers, > 1.5 yr of age, were employed. Stick-on ECG electrodes, used for both methods, were attached to the chest just behind and slightly below the left elbow and at the base of the jugular groove on the right side of the neck. Overall HR means were similar between methods (50.5 ± 11.75 and 50.1 ± 11.81 for BA and HM, respectively). Intercepts and slopes of equations for regressions of mean observations with BA against those with HM were similar among breeds and between diets and levels of intake. Therefore, all observations for BA were regressed against those for HM: BA HR = 1.784 (SE = 1.626) + 0.972 (SE = 0.032) x HM HR (SE = 0.032) (n = 48; $R^2 = 0.954$). Because the intercept was not different from zero, a final no-intercept regression was fitted: BA HR = 1.005 (SE = 0.007) x HM HR (n = 48; $R^2 = 0.998$), with the slope not different from one. In conclusion, BA and HM appear equally effective for measuring HR of goats in confinement, but the small size and light weight of HM may be appropriate for use in grazing goats.

Metabolizable protein requirements of lactating goats

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Data from 31 studies with 174 treatment mean observations from goats in different stages of lactation were used to determine the metabolizable protein (MP) requirement for lactation (MP_l). Milk protein yield (MkP) was calculated from milk yield and protein concentration. The MP supply, the sum of digestible ruminally undegraded dietary and microbial true protein, was estimated from ingredient composition and a database of CP degradability properties and ruminal fermentable energy concentration derived from literature values when not provided in the original publication. MP_l was estimated from MP by subtracting MP used for maintenance functions (scurf (g CP), 0.2 x kg $BW^{0.6}$; endogenous urinary (g CP), 1.031 x kg $BW^{0.75}$; metabolic fecal (CP), 2.67% DM intake;

67% efficiency of use) and adjusting for BW change (14.3% protein). MP_l was regressed against MkP, and after removing observations with residuals greater than 1.5 times the residual SD, the refitted equation was: MP_l = 10.2 (SE = 8.13) + 1.18 (SE = 0.095) x MkP (n = 149, adjusted R^2 = 0.51); the intercept was not different from zero (P > 0.05). Based on a no-intercept equation, 1.30 (SE = 0.034) g of MP_l were required for 1 g of MkP, corresponding to milk protein efficiency of 0.77. In conclusion, these results suggest an MP_l requirement for goats of 1.30 g/g of MkP. Although this approach and estimate of the MP_l requirement should have utility in expressing needs for protein and(or) predicting milk production by lactating goats, improvements in accuracy from refined assumptions are desirable and will likely occur with future research. Supported by USDA project No. 9803092.

Effects of ad libitum consumption of concentrate and forage offered separately or mixed on growth of Alpine doelings

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Forty-four weaned Alpine doelings (16 ± 0.19 kg initial BW) were used in a 16-wk experiment to determine how separate free-choice offering of concentrate (C) and forage (F; wheat hay, 14.2% CP and 34.1% ADF) affect performance compared with consumption of mixed diets of different proportions of C and F. Treatments (two groups/treatment) were A-25C: 25% C mixed diet consumed ad libitum; A-50C: 50% C mixed diet consumed ad libitum; A-75C: 75% C mixed diet consumed ad libitum; A-C:A-F: ad libitum consumption of C and F, offered separately; and L-C:A-F: restricted intake of C (approximately 1.5% BW) and ad libitum intake of F. Orts averaged 6.7 ± 0.58% of diet offered. Intake of DM was similar among treatments (625, 641, 623, 704, and 653 g/d; SE = 38.6); dietary concentrate was 26, 53, 80, 84, and 61% of DM intake for A-25C, A-50C, A-75C, A-C:A-F, and L-C:A-F, respectively; SE = 1.51). Average daily gain was greatest (P < 0.05) for A-C:A-F and lowest (P < 0.05) for A-25C (53, 71, 81, 105, and 73 g; SE = 5.2), and ADG:DM intake ranked (P < 0.05) A-25C < A-50C and L-C:A-F < A-75C < A-C:A-F (85, 110, 130, 149, and 111 g/kg for A-25C, A-50C, A-75C, A-C:A-F, and L-C:A-F, respectively; SE = 5.2). In conclusion, separate free-choice offering of C and F for Alpine doelings appears promising as a simple means of achieving high ADG and efficient feed utilization, and restricted offering of C with separate free access to F can yield ADG and ADG:DM intake similar to ad libitum consumption of a mixed diet providing a comparable dietary concentrate level.

Effects of method of offering broiler litter and level of prairie hay intake on growth of Boer x Spanish wethers

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Thirty-four Boer x Spanish wethers (18 ± 0.3 kg initial BW) were used in a 12-wk experiment (2 x 2 + 1 factorial arrangement of treatments) to determine effects of ad libitum consumption of broiler litter (B) alone or mixed with corn (60% B; BC) and of ad libitum vs restricted (R) prairie hay (H) intake on feed intake and growth performance. Treatments were ad libitum H + an average of 22 g/d of mineral/vitamin supplement (Control, C); ad libitum H and B (AH-B); ad libitum H and BC (AH-BC); intake of 1% BW (DM) of H + ad libitum B (RH-B); and 1% BW of H + ad libitum BC (RH-BC). Hay DM intake averaged 494, 442, 336, 175, and 160 g/d (SE = 16.7), and total DM

intake was 516, 700, 782, 474, and 585 g/d (SE = 26.2) for C, AH-B, AH-BC, RH-B, and RH-BC, respectively. Overall ADG ranked ($P < 0.05$) AH-BC > AH-B and RH-BC > C and RH-B (-6, 34, 79, 3, and 50 g); the ratio of ADG:DM intake ranked ($P < 0.05$) AH-BC and RH-BC > AH-B > C and RH-B (-13, 49, 97, 5, and 85 g/kg) for C, AH-B, AH-BC, RH-B, and RH-BC, respectively. In summary, offering B alone free-choice increased ADG by Boer cross goats when consuming H ad libitum but not with H intake restricted to 1% BW. The lower ADG:DM intake ratio for AH-B vs RH-BC indicates less efficient utilization of H than corn, although similar ADG reflects compensation via greater H intake. Mixing corn with B increased ADG similarly with both ad libitum and restricted H intake. In conclusion, depending on production goals and availability of high-quality feedstuffs such as cereal grains, free-choice consumption of B may be a simple and useful method of supplementing low-quality forage.

Prediction of endogenous urinary nitrogen of goats

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Three databases were constructed to estimate endogenous urinary nitrogen (EUN) in nonlactating and lactating goats. The first database consisted of 22 observations of direct measurement of EUN with low-N diets. A log-log weighted linear regression of EUN (g) on BW (kg) indicated that 0.75 was the most appropriate power of BW on which to express EUN. The second database, with 186 treatment mean observations for nonlactating goats, was split into a development set (n = 121) and a set for evaluation (n = 65). With the development set, urinary N (UN; g/kg $BW^{0.75}$) was regressed on total N intake (TNI; g/kg $BW^{0.75}$) and apparent digestible N intake (DNI; g/kg $BW^{0.75}$). After removing outliers from the development set, equations validated with the evaluation set were: UN = 0.092 + (0.288 x TNI) [n = 79; R^2 = 0.59] and UN = 0.165 + (0.340 x DNI) [n = 79; R^2 = 0.59]. At 0 DNI, truly digestible N intake should equal metabolic fecal N; thus, the DNI estimate of EUN may be most appropriate for nonlactating goats with above maintenance feed intake. Prediction equations for lactating goats with above maintenance feed intake were: UN = 0.182 + (0.235 x TNI) [n = 33; R^2 = 0.65] and UN = 0.160 + (0.354 x DNI) [n = 52; R^2 = 0.72]. In summary, based on databases constructed from publications on goat feeding and nutrition, EUN of nonlactating goats with feed intake above maintenance was 0.165 g/kg $BW^{0.75}$; EUN of lactating goats appeared similar to that for nonlactating goats.

Maintenance energy needs of goats: predictions based on observations of heat and recovered energy

J. Luo[1], A. L. Goetsch[1], I.V. Nsahlai[1,2], Z. B. Johnson[3], T. Sahlu[1], J. E. Moore[4], C. L. Ferrell[5], M. L. Galyean[6], and F. N. Owens[7]

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A database including 80 treatment means based on energy balance publications was constructed and analyzed to estimate fasting heat production (FHP) and ME required for maintenance (ME_m) of goats. Experiments entailed comparative slaughter, respiration calorimetry, or CO_2 entry rate techniques. Goats were of eight breeds and five physiological states (preweaning, growing, mature and nonlactating, early and mid-pregnancy, and lactating). Assuming that heat increment was 40% of total heat energy, unweighted and weighted (number of observations per treatment mean) log-log regressions (n = 74 following removal of outliers) of FHP against BW resulted in FHP (kJ) = 299 x $BW^{0.762}$ (R^2 = 0.82) and 244 x $BW^{0.826}$ (R^2 = 0.75), respectively. The 0.762 and 0.826 BW scaling factors did not differ (P > 0.17) from 0.75. Consequently, equivalent expressions based on mean BW were 311 to 314 kJ/kg $BW^{0.75}$ and from regressions with a fixed BW exponent of 0.75 were 330 - 332 kJ/kg $BW^{0.75}$. The slope and intercept of a regression of recovered energy (RE) against ME intake (MEI) for preweaning goats differed (P < 0.01) from those for other physiological states. A linear regression analysis of RE on MEI (both kJ/kg $BW^{0.75}$) was conducted for the remaining 71 observations, after removing two observations with greater than 2.5 residual SD. The resultant equation was: RE = -298.0 (SE = 22.38) + (0.691 (SE = 0.028) x MEI) [n = 69; R^2 = 0.90]. These estimates of FHP and efficiency of ME use yielded an estimate of ME_m of 431 kJ/kg $BW^{0.75}$. In summary, $BW^{0.75}$ appeared acceptable as a scaler for expressing goat energy requirements, and FHP and ME_m of 298 and 431 kJ/kg $BW^{0.75}$, respectively, appear appropriate as general descriptors of the maintenance energy need of goats.

Metabolizable energy requirements of lactating goats

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Data from 44 studies with 243 treatment mean observations, representing 2,476 goats in various stages of lactation, were used to estimate the requirement and efficiency of use of ME for milk production. Development and evaluation data subsets comprised, respectively, 68 and 32% of observations. Intake of ME was adjusted for level of feed intake, as 1 - [0.018 x (L - 1)], with L =

multiple of the ME requirement for maintenance. ME intake was also adjusted for energy lost in excretion of excess nitrogenous compounds in urine (ExUN), as 33.01 kJ/g of N intake above endogenous urinary N (0.165 g/kg $BW^{0.75}$). Adjusted ME intake was partitioned into that used for maintenance [315 kJ/(kg $BW^{0.75}$ k_m), where k_m or efficiency of ME use for maintenance = 0.503 + (0.019 x ME, MJ/kg DM)], ME secreted in milk, and ME gained as BW. When BW increased, ME intake was adjusted for tissue accretion (efficiency = 0.75) to derive dietary ME used in milk secretion. Milk yield was corrected to 4% fat [4%FCM; MJ/kg = 1.4694 + (0.4025 x % milk fat)]. For does decreasing in BW, FCM and milk energy from the diet were obtained by adjusting for use of mobilized tissue energy (23.9 kJ/kg; efficiency = 0.84). Based on no-intercept regressions, the dietary ME requirement for lactation was 5,493 (SE = 95.7) and 5,318 (SE = 106.0) kJ/kg FCM and efficiency of dietary ME utilization for lactation (ME regressed against milk energy) was 0.59 and 0.61 without and with correction for ExUN, respectively. Scatter plots of residuals with the development data subset, and intercepts and slopes that were not different from 0 and 1, respectively, from regressions with the evaluation data subset of observed against predicted FCM and milk energy from the diet, indicated acceptable accuracy and no obvious bias. Therefore, these estimates and this factorial approach seem useful to predict energy requirements of lactating goats, with potential for future enhancements based on research concerning assumptions used in deriving these values.

Rotational grazing as a parasite management tool for goats

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This study investigated the use of a short-duration, long-rest-period rotational grazing system as a method for controlling internal parasites in goats. Pastures (in central Oklahoma) were blocked by presence (15% cover) or absence of trees with two 2.0-ha pastures of degraded tallgrass native prairie per block. Two pastures were each divided with electric fence into 14 strips for rotational grazing beginning in May. Goats grazed each strip for 5 d and were moved to the next strip for two rotations, resulting in a 65-d rest period. Two pastures were set-stocked. Non-lactating, mature goats were used, six Angora and six Spanish does per pasture. Does were dewormed at the start of the study and fecal egg counts were used to confirm the efficacy of deworming. Initial and final weights of goats were taken. Tracer animals were dewormed effectively (confirmed by fecal egg counts) and allowed to graze with animals in each pasture (three tracers per pasture) for 17 d near the end of the study to measure pasture contamination. Tracers were euthanized after an additional 11 d and worms in the abomasum and small intestine were identified and counted. Goats were sampled every 3 wk for fecal egg counts (modified McMaster procedure) and hematocrit. Fecal egg counts were log transformed prior to statistical analysis. Fecal egg counts were reduced by rotational grazing ($P < 0.05$; 309 vs 121 eggs/g). There was a significant treatment by block effect ($P < 0.005$) in that pastures with trees had higher fecal egg counts, presumably due to animals congregating under trees and feces being shaded from the sun. Hematocrit and BW gain were not affected by treatment ($P > 0.10$). Pasture contamination with *Haemonchus contortus* larvae, (74.4% of worms identified) as determined by tracer animals, was lower ($P < 0.001$; 630 vs 40 worms per animal) for rotationally grazed animals than for set-stocked animals with a block by pasture interaction ($P < 0.001$) due to trees as previously discussed. Contamination by other species (*Ostertagia circumcinta*, 8.2% and *Trichostrongylus colubriformis*, 17.4%) of larvae followed a similar pattern. A short-duration, long-rest-period, rotational grazing system on tallgrass native range can effectively control internal parasites in goats, but the presence of trees in pastures can increase parasite infestation.

Titration of efficacy of ivermectin and moxidectin against an ivermectin-resistant *Haemonchus contortus* derived from goats in the field

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The objective of this study was to titrate the efficacy of ivermectin (IVM) and moxidectin (MOX) dewormers using variable dose rates of both anthelmintics against an IVM-resistant isolate of *Haemonchus contortus*. Yearling wether goats (45 kg BW, mean fecal strongylid egg count >1000 eggs/g) were randomly allocated to groups of 6 animals. Each group was treated as follows: I1 (IVM 0.1 mg/kg), I2 (IVM 0.2 mg/kg), I3 (IVM 0.4 mg/kg), I4 (IVM 0.8 mg/kg), M1 (MOX 0.05 mg/kg), M2 (MOX 0.1 mg/kg), M3 (MOX 0.2 mg/kg), M4 (MOX 0.5 mg/kg) and an untreated control group. The injectable cattle formulation of IVM and the pour on cattle formulation of MOX were both administered orally. Fecal egg counts (FEC) were estimated by a modified McMaster technique on the day of treatment (d 0) and d 7 and d 15 after treatment. Feces from each treatment group were cultured to determine the genera of larvae. Data were analyzed non-parametrically using a Kruskal-Wallis test. *Haemonchus* was the dominant genus found in pretreatment and control larval cultures but both *Trichostrongylus* and *Ostertagia* were also present in low numbers. Control group mean FEC varied by < 2% over the 3 sampling days. The percent reduction in FEC from pretreatment numbers was <80% for all dose rates of IVM, whereas the efficacy for M2, M3 and M4 were > 98% but the reduction for M1 was 93% on d 7 and 82% on d 15. On d 7 and 15 only the FEC of the 3 higher dose rates of MOX were significantly (P<.05) lower than the control group. *Trichostrongylus* were found to comprise 19% of control cultures, and 10%, 16%, 4%, and 22% of I1, I2, I3, and M1 cultures, respectively on d 7. Results indicate that IVM-resistance is present in *H. contortus* at IVM doses as high as 0.8 mg/kg but a dose as low as 0.1 mg/kg of the formulation of MOX used was effective. The survival of *Trichostrongylus* at 0.4 mg IVM/kg suggests the emergence of IVM resistance in this parasite as well.

Adjustment factors for fat, protein, and somatic cell count for goat milk using different species-specific calibration standards

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Currently, test-day samples of dairy goat milk are analyzed for fat, protein, and somatic cell count with laboratory equipment calibrated for cow milk, even though research has demonstrated that these measures are biased. The objective of this research was to examine breed, parity, and stage of lactation effects on this bias and to develop appropriate adjustment factors. Langston Dairy Herd Improvement (DHI) laboratory equipment was calibrated using both cow and goat milk standards. During 2001, 3,110 test-day samples from 875 does of six different breeds and 84 herds were analyzed for milk fat, protein, and somatic cell count with both calibrations. Of the 875 doe records, 373 were first parity, 181 second parity, 140 third parity, and 174 fourth or greater parity; and 196 were Alpine, 161 LaMancha, 284 Nubian, 45 Oberhasli, 124 Saanen, and 65 Toggenburg. Lactation was divided into 6 stages of 50 days according to days in milk (DIM). Differences (DIFF) in standards (cow vs goat) were analyzed as a repeated measures design using mixed model analysis. The statistical model included doe identity, breed, parity and stage of lactation with doe identity nested within breed as a random effect. There was no effect (P > 0.10) of breed or parity, on DIFF for fat, protein or somatic cell count. Stage of lactation affected (P < 0.01) DIFF for protein but not

for fat or somatic cell count. Test-day samples analyzed with goat standards were regressed on test-day samples analyzed with cow standards to obtain adjustment factors. Multiplicative adjustments factors (cow standards adjusted to goat standards) were 1.027 for fat (R^2 = 0.85), 1.164 for protein with DIM less than or equal to 100 d (R^2 = 0.94), 1.125 for protein with DIM greater than 100 d (R^2 = 0.99), and 0.937 for somatic cell count (R^2 = 0.96). It appears that the bias in goat test-day samples analyzed under conventional DHI laboratory procedures can easily be alleviated using simple adjustment factors.

The effect of diet on milk production, lactation curve, composition, and processing characteristics in dairy goats

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This study investigated effects of different levels of concentrate supplementation on milk production (MP), composition, and processing characteristics (PC) with dairy goats grazing from April 2000 to September 2001. Forty-four Alpine goats (54 ± 10 kg BW) were randomly allocated to four treatments and supplemented with 0.66 (A and B), 0.33 (C), or 0 kg concentrate (D) per kg of milk over 1.5 kg/d. Mixed vegetative forages were rotationally grazed except for A (confined and fed alfalfa hay). The MP was recorded daily and milk samples were collected twice monthly and analyzed for fat (F), protein (P), lactose (L), solids-not-fat (SNF), total solids (TS), and PC (Year 2001 only). Egyptian Domiati cheese yield and organoleptic PC were analyzed fresh or after 1 or 2 mo pickling in whey solution. The lactation curve was calculated by Wood's incomplete gamma function. Average MP (kg/d) increased (R^2 = 0.59; y = 1.72 x + 1.51; $P < 0.001$) with increasing level of concentrate supplementation. Average MP during both years was 3.7, 3.3, 3.3, and 2.8 kg/d for A, B, C, and D, respectively ($P < 0.01$). Initial MP and the rate of increase to the peak were similar among treatments, but the mean date of peak MP for D (29 d) was earlier ($P < 0.05$) than for A, B, and C (43, 35, and 36 d, respectively). Persistency was not affected (6.2) by treatment in 2001, but for D (5.6) was lower than for A, B, and C in 2000 (6.5, 6.2, and 6.1, respectively). Milk F concentration was similar among treatments; however, milk P and L concentrations for D were lower than for A, B, and C ($P < 0.01$). Average milk concentrations of F, SNF, TS, P, and L decreased linearly ($P < 0.01$) as lactation progressed. Cheese yield was 17% higher ($P < 0.01$) for B at the beginning and end of lactation than for other groups. Greatest cheese flavor was for D during summer (June-July; $P < 0.01$). In conclusion, MP, composition, and PC, as well as the lactation curve, were affected by the feeding treatment and stage of lactation.

Effect of forage condensed tannins on gastro-intestinal parasite infection in grazing wether goats

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The objective of this study was to evaluate effects of dietary condensed tannins (CT) in Sericea lespedeza (SL; *Lespedeza cuneata*; 4.6% extractable CT/kg DM) on total fecal egg output (TFEO; eggs/d) and stage of larvae development compared with non-CT-containing forage (rye/crabgrass (RC); 0.6 g extractable CT/kg DM) in grazing wether goats. A grazing trial (cross over) involving 11 naturally parasite-infected (>1,200 eggs/g) goats (47 ± 3.3 BW) were randomly selected 1 mo

after Ivermectin treatment (0.2 mg/kg BW) failure. Larval culture of pre-treatment feces showed that 86-97% of larvae were *Haemoncus*, with the remainder being *Trichostrognylus* and *Ostertagia*. Periods lasted 15 d, with fecal samples taken on d 0, 5, and 15. The number of eggs/g feces were determined by a modification of the McMaster technique. Larvae were cultured for 10 d at 27°C by placing 20 g of fresh feces inside a small glass container within a larger container holding free water (20 ml) to maximize humidity. Larvae were collected using a modified Baermann's procedure and counted. Mean fecal egg counts (2,722 vs 1,162 eggs/g) and TFEO (173 vs 45 x 10^4 eggs/d) were lower ($P < 0.01$) for RC vs SL. Larvae development from eggs to infective stage of larvae (L3) by 15 d was 88% (3,432 vs 421 larvael/20 g feces; $P < 0.001$) lower for RC vs SL. In conclusion, CT in forages such as SL may reduce pasture contamination with infective larvae and be a valuable tool for parasite control.

Tannins for suppression of internal parasites

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Condensed tannins (CT) have biological effects that may aid in the control of dewormer-resistant internal parasites (IP). It is increasingly evident that control programs based on dewormers are failing to control IP as dewormer resistance has become more prevalent. Thus, alternative IP control strategies are necessary. The CT in forages have potential to be a component of IP control programs. The CT bind proteins and other molecules tightly at near neutral pH, such as occurs in the rumen, with dissociation in the acidic pH of the abomasum, freeing them for digestion. Effects of CT on parasitism can be assessed by grazing ruminants on forages that contain different levels of CT but otherwise are of similar nutritive value. Plant CT may have direct or indirect effects on IP. Direct effects might be mediated through CT-nematode interactions affecting physiological functioning of IP. Recently, in vitro and in vivo studies have shown that CT in several temperate and tropical forages (*Hedysarum coronarium*, *Onobrychis viciifolia*, *Lotus pedunculatus*, *L. corniculatus*, *Lespedeza cuneata*, and Quebracho CT) can inhibit infective gut worm larvae of sheep and goats and both gut and lung worms in farmed deer, with effects influenced by both concentration and structure of CT. Furthermore, preliminary research showed a 57% reduction in fecal egg counts (2,722 vs 1,162 eggs/g) and a 74% reduction in total fecal egg output (173 vs 45 x 10^4 eggs/d) in goats consuming forage Sericea lespedeza (4.6% extractable CT/kg DM) compared with rye/crabgrass. Indirectly, CT can improve protein nutrition by binding to plant proteins in the rumen and preventing microbial degradation, thereby increasing amino acid flow to the duodenum. Several ovine studies have shown that improved protein nutrition reduces parasite infestation. This is assumed to be mediated by enhanced host immunity, which may be especially important with selection for immunity to IP. In conclusion, CT in forages may have potential to aid in the control of IP.

The effect of diet on somatic cell count, mastitis and gastro-intestinal parasite infestation in dairy goats.

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A study was conducted to investigate effects of concentrate level on milk somatic cell counts (SCC), incidence of intramammary infection (IMI) in udder halves, and gastro-intestinal parasite infestation in pastured dairy goats during mid- and late lactation (June-Sept., 2001; 90-200 days in milk). Twenty-four Alpine goats (55 ± 11 kg BW) were randomly allocated to four treatments and were supplemented with 0.66 (treatments A and B), 0.33 (treatment C), or 0 kg concentrate (treatment D) per kg of milk over 1.5 kg/d. Mixed vegetative forages (wheat/berseem clover, sudan grass, and cowpeas) were rotationally grazed except for A (confined and fed alfalfa hay). Milk samples for bacteriology and SCC were collected monthly from both halves. Fecal and blood samples were collected monthly for strongyloid fecal egg count (FEC) and packed cell volume (PCV) analysis, respectively. Prior to analysis, FEC and SCC were log transformed and PCV were transformed to their arcsin value. Coagulase negative *Staphylococcus* (52.4%), *S. aureus* (14.3%), and *Pseudomonas aeruginosa* (14.3%) were the most prevalent isolates. Infected glands had higher SCC (3.1×10^6 vs 1.0×10^6; $P < 0.001$) than uninfected glands. Mastitis was positively correlated with SCC in A ($R^2 = 0.41$; $P < 0.01$) and B ($R^2 = 0.35$; $P < 0.05$), but was not correlated with C ($R^2 = 0.18$) or D ($R^2 = 0.29$; $P = 0.07$). Infection increased SCC, but the degree of increase in SCC varied with pathogen. The FEC was lower in A (102 eggs/g; $P < 0.01$) than in B (972 eggs/g), C (972 eggs/g), and D (1,171 eggs/g), but there were no differences among levels of supplementation in pastured goats. Treatment D tended ($P = 0.09$) to have lowest PCV. High levels of concentrate supplementation did not reduce parasitism in pastured does. In addition, effective mastitis screening requires bacteriological culture since SCC were not highly correlated with IMI.

Effect of pasture feeding and lactation stage on the biochemical composition of goat milk and cheese flavor

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This study was to examine the effect of pasture feeding with different levels of concentrate and lactation stage on milk fatty acids and cheese characteristics. Twenty lactating Alpine goats were randomly assigned into four groups. Group A was confined, fed alfalfa hay and supplemented with 0.66 kg concentrate (per 1 kg of milk over 1.5 kg/day) (Control). The three pasture groups with different levels of concentrate were B (0.66 kg/d), C (0.33 kg/d), and D (no supplementation). Two batches of milk (10 kg) were collected monthly for processing into a soft cheese, Egyptian Domiati, from April through September 2001. Milk samples were analyzed for fat, protein, lactose, and TS, and cheese samples were organoleptically scored. Results indicated that the overall mean values of short chain (C6, C8, C10; SCFA) and long chain (C12, C14, C16, C18, C18:1, C18:2, and C18:3; LCFA) fatty acids in milk were 0.98 and 6.79 mg/g, respectively. Both SCFA and LCFA contents in goat milk were affected ($P < 0.001$) by stage of lactation. SCFA concentration for D was lower, 0.83 mg/g than for A, B, and C (1.04, 1.02, and 1.04 mg/g, respectively). However, LCFA content in B (7.34 mg/g) was higher ($P < 0.05$) than in D (6.28 mg/g). SCFA (1.7 mg/g) and LCFA (9.2 mg/g) in the early lactation were greater ($P < 0.001$) than in mid- to late lactation (0.7-1.2 and 6.0-8.1

mg/g, respectively). Milk fat content was positively correlated with milk protein ($r = 0.42$, $P < 0.01$), TS ($r = 0.87$, $P < 0.001$), and cheese yield ($r = 0.60$; $P < 0.001$) but was negatively correlated with flavor score ($r = -0.33$; $P < 0.01$). Milk protein was positively correlated with TS ($r = 0.68$, $P < 0.001$) and cheese yield ($r = 0.38$; $P < 0.05$). SCFA and LCFA concentrations in milk were positively correlated ($r = 0.7$; $P < 0.001$). In conclusion, the best cheese flavor was obtained with milk from groups receiving little or no supplemented concentrate (C and D) in mid-lactation when LCFA and TS contents in milk were low.

Goat milk constituents and processing characteristics with different feeding systems

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Pasture production of goat milk is being studied to reduce production cost and improve production viability of small family farms. The present work focused on effect of some feeding treatments on milk composition and processing characteristics during a whole lactation. This study included four feeding treatments: 1) conventional confinement system with alfalfa hay feeding and 0.66 kg concentrate / kg milk/d; 2) high level of concentrate (0.66 kg/kg milk) with grazing; 3) medium level of concentrate (0.33 kg/kg milk) with grazing; and 4) no concentrate supplementation, pasture alone. Milk samples of 5 Alpine goats from each treatment group were collected twice monthly from April to September 2001 and analyzed for major and minor constituents. Two batches of milk from each treatment group were collected at the same times for processing into soft cheese, Egyptian Domiati. Cheese samples were organoleptically scored and chemically analyzed for major and minor constituents, when fresh or after 1 or 2 months of pickling in whey solution. Fat, protein, and total solids of milk were higher ($P < 0.01$) for treatment 2 (3.46, 3.07, and 11.22%, respectively) compared with other treatments (3.11, 3.00, and 10.82%; 3.20, 3.05, and 10.93%; 3.22, 2.83, and10.56% for treatments 1, 3, and 4, respectively). Fat and total solids showed higher values at the last month of lactation (3.78 and 11.45, respectively) than those of other months ($P < 0.10$). Somatic cell counts was highest ($P < 0.05$) among goats in treatment group 2 and 3 (3.06 and 3.04 million/mL, respectively) and did not differ during lactation. Total organoleptic score of fresh cheese was not affected by treatment. The highest cheese flavor was detected for treatment 4 during June and July ($P < 0.01$), whereas body and texture of cheese was not influenced by feeding treatment at any time. Cheese yield was highest ($P < 0.01$) for treatment 2 at the beginning and end of lactation 16.97 and 16.61%, respectively). In conclusion, the composition of goat milk and the quality of Domiati cheese were affected by the feeding treatment and stage of lactation.

Effect of supplemental protein source on performance of Spanish x Boer wethers

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Fifty weaned Spanish x Boer wethers goats (27 ± 4.0 kg initial BW and 6.5 to 7.5 mo of age) were used in an experiment with 5 x 2 factorial arrangement of treatments to determine effects on growth of five sources (blood, corn gluten, feather, fish, and soybean meals) of ruminally undegraded intake protein (UIP) in 70% concentrate diets. Diets were formulated to be 13 or 19% CP and similar in UIP and the ratio of ruminally degraded intake protein to TDN within protein level. Ad libitum DM intake in the 27-wk experiment (1,043, 1,089, 1,153, 1,086, and 1,112 g/day; SE = 74.4) and ADG (136, 134, 143, 145, and 138 g for blood , corn gluten, feather, fish, and soybean meals, respectively;

SE = 9.8) were similar between CP levels and among UIP sources. The ADG:DM intake ratio over the entire 27-wk period was similar among treatments. However, in the first 18 wk the ratio was greater ($P < 0.05$) for fish meal than for corn gluten, feather, and soybean meals (138, 1216, 124, 154, and 127 g/kg for blood, corn gluten, feather, fish, and soybean meals, respectively; SE = 8.3). In summary, with a dietary concentrate level of 70% and at least 13% CP, differences in amino acid profiles among blood, corn gluten, feather, fish, and soybean meals did not impact the rate or efficiency of growth by weaned Boer x Spanish wethers in a 27-wk period. However, fish meal improved efficiency of growth in the first 18 wk relatively to corn gluten, feather, and soybean meals.

Effects of ruminally protected betaine and choline on performance of lactating Alpine goats

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Twenty-four Alpine does and 24 doelings were used to evaluate effects of dietary supplementing a 50% concentrate diet with protein or ruminally protected betaine or choline on milk yield and composition. Diets containing 15% CP (DM basis) were supplemented with 3% ruminally protected betaine (B), 3% ruminally protected choline (C), no added methyl donors (N), or feedstuffs high in ruminally undegradable protein to increase CP to 18% (H). Six animals, 3 doelings and 3 does, were allocated to each treatment and fed for ad libitum consumption. Doelings gained more weight ($P < 0.05$; 80 vs 15 g/d) but produced less milk ($P < 0.05$; 2.11 vs 3.24 kg/d) than does. Treatments had no effect on body weight gain by does or doelings ($P > 0.10$). Does fed H and B diets had higher DM intake than does fed N or C ($P < 0.05$; 2.13, 2.51, 2.24, and 2.49 kg/d); whereas, doelings consumed greater amounts of B and C ($P < 0.05$; 2.15, 2.68, 2.46, and 1.98 kg/d for N, B, C, and H, respectively). Treatments had no effect on milk production by doelings (2.08, 2.01, 2.18, and 2.15 kg/d) but B decreased milk production by does ($P < 0.05$; 3.45, 2.68, 3.27, and 3.54 kg/d for N, B, C, and H, respectively). Betaine decreased milk protein yield ($P < 0.05$; 82.7, 68.6, 80.1, and 83.8 g/d) and supplements decreased milk fat yield ($P < 0.05$; 83.5, 70.4, 71.8, and 72.1 g/d). Treatments had no effect on plasma NEFA or insulin in does, although B and C increased ($P < 0.05$) plasma NEFA and insulin in doelings. In summary, the lack of effect of additional protein in the diet indicates that protein status with 15% dietary CP was adequate. Betaine and choline altered plasma concentrations of some blood metabolites but did not improve milk production or body weight gain.

Influence of dietary protein level on plasma insulin concentration, subcutaneous adipose tissue lipid content and composition in Boer cross and Spanish goats

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Effects of CP level on plasma insulin concentration and s.c. adipose tissue lipid content and composition were examined in Boer cross (BC) and Spanish (SP) goats. Twenty-three BC and 22 SP wethers (4 - 4.5 mo of age; 17.6 and 19.4 kg BW, respectively) were allocated to four dietary treatments. Consumed DM averaged 10, 14, 18, and 23% CP (T1, T2, T3, and T4, respectively). Feed intake was ad libitum and the experiment was 12 wk in length. In wk 11, blood samples were collected 4 h post-feeding for insulin determination. In wk 12, s.c. adipose tissue was biopsied

between the ribs 12 and 13 for the determination of lipid content and composition. Diets did not influence DMI or ADG; ADG was 76, 86, 82, and 96 g for T1, T2, T3, and T4, respectively. However, ADG was greater ($P < 0.01$) for BC than for SP (97 vs 74 g). Dietary protein level did not alter plasma insulin (47.7, 40.2, 39.2, and 39.8 μU/mL, respectively), although BC had a lower ($P < 0.05$) level than SP (36.2 vs 47.3 μU/mL, respectively). Total s.c. tissue lipid content was highest ($P < 0.01$) among treatments for T1 (82.9, 72.5, 71.1, and 70.9%, respectively). Boer cross goats tended ($P < 0.08$) to have a lower total tissue lipid level (72.6 vs 76.0%) and a higher ($P < 0.06$) concentration of tissue phospholipids (2.8 vs 1.6%) than SP goats. Goats fed T2 and T4 tended to have a higher ($P < 0.08$) tissue phospholipid content than those fed T1 and T3 (3.3, 2.8, 1.3, and 1.5%, respectively). Even though T3 and T4 had more CP than recommended for a fast growth rate, they reduced s.c. adipose fat content without increasing ADG. The greater tissue phospholipid content for BC vs SP goats may be associated with increased growth rate, reduced s.c. tissue lipid content, and altered energy metabolism, as phospholipids play a major role in cellular metabolism and functions of membrane proteins.

SUMMARIES OF RECENT JOURNAL ARTICLES

(2001 and In Press)

Effects of dietary tallow level on performance of Alpine does in early lactation

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Dietary inclusion of fat in diets of lactating dairy cattle increases energy density and can enhance milk production without necessitating an increase in the level of cereal grains in the diet. There also have been experiments with dairy goats investigating influences of dietary addition of various fat sources. Fat supplementation has increased milk production and(or) fat concentration in many studies, although there are some reports in which effects did not occur possibly due to factors such as the particular fat source used. Stage of lactation has impact, with greatest potential for positive effects early than late in lactation. Although there has been research with added dietary fat for dairy goats, in many instances the number of dietary fat levels used was low, and there is a variety of commercial fat products presently available. Therefore, 60 Alpine does (47 ± 1.3 kg initial body weight) were used to determine effects of dietary inclusion of different levels of partially hydrogenated tallow on performance in early lactation (weeks 3-11). Treatments entailed a 30% concentrate, negative control diet and diets higher in concentrate (42-46%) with 0, 1.5, 3.0, 4.5 or 6.0% dry matter of partially hydrogenated tallow. Early lactation milk yield increased as dietary tallow level increased up to 3 or 4.5% of the diet, then decreased as the level increased to 6.0%. Milk fat concentration increased linearly as dietary tallow level increased, with no change in milk protein. However, efficiency of energy use for milk production appeared greater with 1.5 and 3.0% tallow compared with higher levels, possibly because of limited ruminal fiber digestion and(or) fatty acid absorption with high dietary tallow levels. Further research is necessary with diets higher in concentrate level to address practical and economical considerations for use of fat sources in diets of confined, high-producing dairy goats, and dietary ingredient costs must be considered in design of most profitable lactating dairy goat diets.

Growth and harvest traits of Boer x Spanish, Boer x Angora, and Spanish goats consuming a concentrate-based diet

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The number of Boer crossbred meat goats has been increasing rapidly, although how their growth and harvest traits compare with those of Spanish goats and influences of maternal genotype have not been thoroughly evaluated. This information would be useful to achieve optimal meat goat production systems and yield of goat products desired by consumers. Therefore, postweaning growth (9 to 24 weeks of age) and harvest traits (212 ± 5.0 days of age) of Boer x Spanish, Spanish, and Boer x Angora wethers consuming a concentrate-based diet were compared. Live weight gain was greater for Boer crossbreds than for Spanish wether goats, with little or no difference between Boer x Spanish and Boer x Angora goats. Because of more rapid growth of Boer crossbreds than of Spanish goats, weights of the carcass and primal cuts were greater or tended to be greater for Boer crossbreds. However, relative to carcass or empty body weight, under production conditions similar to this experiment, slaughter and carcass variables should be similar for Boer x Spanish, Boer x Angora, and Spanish goats.

Effects of gender and age on performance and slaughter and carcass characteristics of Boer x Spanish goats

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Goats in the U.S. are not marketed for meat at a standard age or weight. Previously, all types of goats in the U.S. were used for meat, including cull dairy goats and Angoras, as well as the Spanish goat. Presently, the number of crossbred Boer goats is increasing rapidly. Growth rate and mature size are greater for Boer goats and their crosses compared with Spanish goats and Angoras. There has been very little experimentation concerning factors influencing growth performance and harvest traits of meat goats. Thus, an experiment was conducted to determine influences of gender and age on growth performance and harvest traits of Boer crossbred meat goats. Wether, female, and male Boer x Spanish goats (17, 16, and 17 kg initial BW, respectively) consumed a high concentrate diet from 116 to 340 d of age, with harvest at 56-d intervals. Average DM intake for the entire experiment was lowest among genders for females (674, 534, and 682 g/d), and ADG was greater for males and wethers than for females (119, 89, and 138 g/d for wethers, females, and males, respectively). Dressing percentage was similar among genders and lowest among ages at 116 days (42, 49, 50, 51, and 51% for 116, 172, 228, 284, and 340 d, respectively). Internal fat mass was lower for males vs wethers and females (6.9, 7.0, and 5.1% empty BW for wethers, females, and males, respectively) and increased with increasing age (2.3, 5.4, 6.3, 7.7, and 9.9% empty BW; 0.32, 1.08, 1.60, 2.77, and 4.08 kg at 116, 172, 228 and 340 d of age, respectively). Carcass scores and grades were similar among genders. Among genders, males had the greatest carcass percentages of separable bone (27, 27, and 29%) and lean (50, 50, and 54%) and were lowest in fat (18, 20, and 13% for wethers, females, and males, respectively). Carcasses were 39, 30, 27, 23, and 21% bone; 7, 18, 15, 21, and 22% fat; and 49, 49, 51, 54, and 54% lean at 116, 172, 228, 284, and 340 d, respectively. In summary, with moderate ADG, differences among genders of Boer x Spanish goats in performance and harvest traits were not affected by age from approximately 4 to 11 mo. Carcass composition changed appreciably from 4 to 6 mo but varied much less thereafter. Internal fat mass as a % of BW increased steadily as age increased, with weight at each age being nearly as great as that of carcass fat.

Dairy goat performance with different dietary concentrate levels in late lactation

A. L. Goetsch, G. Detweiler, T. Sahlu, R. Puchala, and L. J. Dawson

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Optimal feeding programs for dairy goats in late lactation and when dry are not well established. Dietary characteristics influence milk yield and body condition of dairy goats, as well as growth of primiparous goats. Hence, objectives of this experiment were to determine effects of dietary concentrate and energy levels in late lactation and the dry phase on performance of Alpine yearling doelings and mature does in late lactation and the subsequent early lactation phase. The experiment consisted of 16 weeks in late lactation, 8 to 13 weeks dry, and 12 weeks in the subsequent lactation. Diets of 20, 35, 50, or 65% concentrate (2.18, 2.34, 2.49 and 2.62 Mcal/kg metabolizable energy [ME], respectively) were consumed free-choice in late lactation, with a 35% concentrate diet (2.18 Mcal/kg ME) in the first 4 weeks of the dry phase and 50% concentrate (2.65 Mcal/kg ME) until kidding. All goats consumed a 50% concentrate diet (2.42 Mcal/kg ME) in the subsequent early lactation. Yearling doelings and mature does differed in milk yield response to dietary concentrate and energy levels in late lactation, with no effect for doelings and increased milk yield for does as

the concentrate level increased to 50% (2.49 Mcal/kg ME). Conversely, a 65% concentrate diet depressed milk yield in late lactation by does compared with 50% concentrate. Dietary concentrate level may have little effect on subsequent lactational performance with adequate nutritional planes in subsequent dry and early lactation phases, for both mature does and yearling doelings incurring significant growth.

Effects of different management practices on preweaning and early postweaning growth of Alpine kids

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Small Ruminant Research 41:109-116. 2001

A concern of many goat producers is feeding management in the first few months of life for kids removed from does soon after birth. A number of factors may influence performance of kids artificially reared on milk or milk replacer. To study these factors, two sets of 40 Alpine kids (3 to 9 days of age) were used to determine effects of group versus individual pens, preweaning access to forage, and different milk feeding restriction regimens on preweaning and early postweaning growth. Treatments in the first experiment were: individual pens, 91 x 91 cm; two kids (one in the experiment and another older) per pen, 182 x 91 cm; group pen (with at least two older kids present), 2.43 x 1.22 m; and group pen plus free access to alfalfa hay. Treatments in the second experiment were: ad libitum milk intake with two meals in weeks 3-8, then 50% of intake on the preceding few days with one meal in week 9 to 10; 75% of intake on the last few days of week 2 with two meals in weeks 3-8, then 50% intake (67% of intake in weeks 3-8) with one meal in weeks 9-10; 75% intake with one meal in week 3-8, then 50% intake with one meal in weeks 9-10; and 75% intake with two meals in weeks 3-6, then 37.5% intake with one meal in weeks 7-10. In the first experiment, neither group pens nor providing access to forage preweaning enhanced growth of Alpine kids. Results of the second experiment indicate that milk consumption can be moderately restricted without impairment of growth in preweaning and early postweaning periods compared with ad libitum milk consumption. Furthermore, there appears potential for effective employment of regimens with only one daily meal of milk, although most appropriate restriction levels deserve further study. Lastly, a second step reduction in milk intake in the latter few weeks of the preweaning phase may be useful in further stimulating dry feed consumption.

Digestibility, nitrogen balance and blood metabolite levels in Alpine goat wethers fed either water oak or shining sumac leaves

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Many rangeland/grazing areas possess forage and shrub species that are considered poor quality due to the presence of antinutritive factors such as phenolic compounds and tannins. Goats are known for their ability to consume tannin-containing brush and can utilize forage and shrub species containing tannins and phenolic compounds at levels that prohibit their use as feeds for sheep or cattle. Water oak (*Quercus nigra*) and shining sumac (*Rhus copallina*) are two examples of shrub species present in grazing or woodland areas that may contain antinutritive factors. Therefore eight Alpine wethers 8-9 months of age were fed diets consisting solely of dried leaves of water oak or shining sumac. Feed intake was similar between the two types of leaves, averaging 616 grams or 2.24% of body weight. However, based on higher digestibilities for water shining sumac than for

water oak (for example, 64 versus 42% apparent organic matter digestibility), nutritive value may be greater for shining sumac. This ability of goats to consume and derive nutrients from such plants is one of the reasons why goats are often used to control or eliminate brush and other undesirable forage species from pasture lands and to rehabilitate pastures.

Effects of small peptides or amino acids infused to a perfused area of the skin of Angora goats on mohair growth

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Until recently it was commonly believed that gastrointestinal digestion of proteins is complete and that only free amino acids enter circulation. But, a considerable body of evidence for absorption of peptides from the gastrointestinal tract has accumulated. There are also indications of peptide clearance from the blood, and many tissues appear to utilize peptides as donors of amino acids for protein synthesis. Therefore, the effect of infusing dipeptides or their amino acids on mohair growth of Angora goats was investigated using a skin perfusion technique. Seven Angora wethers were implanted bilaterally with silicon catheters into the superficial branches of the deep circumflex iliac artery and vein and carotid artery. The experiment consisted of three 28-d phases. In the first 14 d of Phases 1 and 3, saline was infused into deep circumflex iliac arteries supplying skin and in Phase 2 a mixture of dipeptides [methionine-leucine (Met-Leu), lysine-leucine (Lys-Leu)] was infused into the artery on one side, while free amino acids were administered on the other side. The studied small dipetides and amino acids similarly increased mohair fiber growth presumably through supplying limiting amino acids directly to the fiber follicle. Similar blood concentrations of various hormones and metabolites suggest that small peptides were utilized by skin for mohair fiber growth via supplying free amino acids for protein synthesis; however the exact mechanism of stimulation is unclear. In this regard, significant amounts of cysteine used in mohair fiber production may have arisen from transulfuration of infused methionine. Future research should consider different types of peptides.

Effects of Bovine Somatotropin and Thyroid Hormone Status on Hormone Levels, Body Weight Gain, and Mohair Fiber Growth of Angora Goats

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Thyroidectomy has depressed wool growth and thyroxine administration has had positive effects; however, the exact mode of action of thyroid hormones is unknown and comparable effects on mohair fiber growth by Angora goats have not been established. Growth hormone (GH) and bovine somatotropin (bST) have had variable effects on wool growth. Therefore, 48 Angora goats (24 wethers and 24 doelings; 5 mo old; 16 ± 0.5 kg initial BW) were used to evaluate effects of recombinant bST administration and thyroid hormone status (euthyroid, hypothyroid, and hyperthyroid) on hormone levels, ADG, and mohair fiber growth. The bST was a slow release zinc-based suspension with sustained delivery (100 µg/[kg BW * d]) over a 14-d period. Hyperthyroidism was maintained by daily treatment with thyroxine (150 µg/[kg BW * d]), and hypothyroidism was achieved by feeding 6 mg/(kg BW * d) of propylthiouracil. This experiment

demonstrated a complex interaction between exogenous growth hormone administration and thyroid hormone status in Angora goats. Treatment with bST blocked effects of propylthiouracyl, allowing maintenance of normal concentrations of thyroid hormones. Also, treatment with thyroxine prevented an increase in insulin-like growth factor-I plasma concentration due to bST. Exogenous GH administration does not appear to influence mohair fiber growth, regardless of thyroid hormone status, and, thus, its effects may differ from those on other tissues/organs. The substantial effect of thyroxine administration on mohair fiber growth, despite decreased feed intake and live weight gain, implies a major role of thyroid hormone status.

Effects of level of broiler litter in diets containing wheat straw on performance of Alpine doelings

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Residues from cereal grain production are important feedstuffs for ruminants throughout the world. They are, however, low in protein and high in fiber, which limit voluntary intake and digestibility. The nutritive value of cereal crop residues can be improved by various processing methods, such as treatment with alkalis such as sodium hydroxide or ammonia. Another means of improving nutritive value of cereal crop residues is supplementation with other feedstuffs, particularly ones high in crude protein. Broiler litter is a low-cost agricultural byproduct available in many areas of the world. The N concentration in broiler litter is usually between 2.4 and 5.6% of DM, and the available energy concentration in broiler litter is moderate. Thus, objectives of this experiment were to compare feed intake, ADG, and efficiency of feed conversion of growing Alpine doelings (32; 15 wk of age; 12 kg initial BW) consuming diets based on wheat straw supplemented with different levels of broiler litter to wheat straw supplemented with a conventional protein source or ammoniated through urea treatment. Treatments were feeding of a corn-based concentrate at 1.5% of BW (DM basis) with treated wheat straw and this supplement plus approximately 0.4% BW of soybean meal or 0.8 or 1.6% BW of broiler litter with untreated wheat straw. Soybean meal supplementation of wheat straw supported ADG as great as urea-treated wheat straw, and with less total feed consumption. Dietary inclusion of broiler litter also resulted in ADG similar to that with urea treatment of wheat straw and soybean meal supplementation of untreated straw, but with greater feed input particularly for the highest level of litter. Availabilities and costs of urea for ammoniation and N supplements such as soybean meal and broiler litter, along with practical considerations including labor and facilities, would dictate the choice among urea treatment and different supplemental N sources.

Performance effects of preweaning concentrate supplementation of meat goats

A. L. Goetsch, G. Detweiler, and T. Sahlu

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The market weight for meat goats in the US is quite variable; however, sale weights near those typical of weaning time are common, possibly relating to the amount of disposable family income and yield of a quantity of meat suitable for consumption in a convenient period of time such as 1 or 2 wk. Also, some consumers may prefer meat from young animals. Thus, means of enhancing growth of meat goat kids preweaning and in the early postweaning period is of interest to increase income for meat goat producers. Sixty-four Spanish does with 104 Boer x Spanish or Spanish kids were used to determine effects of preweaning feeding of concentrate-based supplement on

preweaning and early postweaning growth. In mid-April, from approximately 6 to 14 wk after birth, animals grazed wheat forage (Phase 1), followed by 5 wk on native grass pasture (Phase 2) and an 8-wk postweaning period with a moderate level of supplemental concentrate (Phase 3). Treatments were no supplementation in Phases 1 and 2 (C), ad libitum consumption of a concentrate-based supplement in Phases 1 and 2 (A), no supplementation in Phase 1 and ad libitum consumption of supplement in Phase 2 (A-2), and limit feeding of supplement (approximately 1% of BW, DM; L). Supplement intake averaged 30, 74, 90, 157, and 158 g/d for L and 36, 87, 192, 240, and 229 g/d for A in wk 2-4, 5-6, and 7-8 of Phase 1 and wk 1-2 and 3-5 of Phase 2, respectively; supplement intake averaged 171 and 249 g/d for A-2 in wk 1-2 and 3-5 of Phase 2, respectively. Kid live weight gain was similar among treatments in Phases 1 (108, 133, 118, and 113 g/d) and 2 (82, 40, 43, and 78 g/d), and lower ($P < 0.05$) for C than for A and A-2 in Phase 3 (44, 59, 90, and 83 g/d for C, L, A, and A-2, respectively). In summary, preweaning supplementation of meat goat kids of Spanish does with a concentrate-based diet did not enhance preweaning growth while grazing wheat forage or later when on warm-season grass pasture, regardless of growth potential as influenced by Spanish and Boer sires. However, preweaning supplementation generally did improve growth in the early postweaning phase with a greater level of supplementation than previously. Nonetheless, within genotype preweaning supplementation did not impact overall pre- and postweaning live weight gain. Future research should consider other types of preweaning supplemental feedstuffs with which kids might more quickly achieve high levels of consumption, as well as influences of litter size on response to preweaning supplementation.

Effects of different feeding methods on growth and harvest traits of young Alpine kids

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Compared with beef, lamb and pork, chevon, particularly from young dairy kids, is quite lean, with little subcutaneous or intramuscular fat. Prior to the introduction of Boer goats, male kids from dairy goats harvested at a very young age provided much of the goat meat consumed in the U.S. In addition to feeding for early age slaughter, effective and economical feeding systems for dairy kids are needed for development of replacement doelings and with slaughter for meat at heavier weights and greater ages. Therefore, objectives of this experiment were to compare effects of ad libitum milk intake and limited milk consumption, with or without supplemental concentrate, on growth and carcass traits of Alpine kids at two harvest ages (10 and 13 wk). Thirty wether kids (2 wk of age) were given ad libitum (A) or limited (1 kg/d) access to milk, with (LC) or without (L) ad libitum supplemental concentrate. ADG was lowest among dietary treatments for L and similar between A and LC at 10 wk but greater for LC at 13 wk (151, 55, and 149 g at 10 wk and 110, 49, and 144 g at 13 wk for A, L, and LC, respectively). Similar differences were observed in carcass weight (7.0, 3.7, and 6.1 kg at 10 wk, and 6.8, 4.4, and 7.9 kg at 13 wk for A, L, and LC, respectively). The ratio of kidney and pelvic fat to bone-free muscle was lowest among dietary treatments for L, similar between A and LC at 10 wk, and lower for LC vs A at 13 wk (2.1, 0.5, and 2.0 at 10 wk and 2.7, 0.5, and 1.8 at 13 wk for A, L and LC, respectively). In summary, up to 10 wk of age, either ad libitum consumption of milk or restricted milk intake with supplemental concentrate can be used to raise Alpine kids. However, with slaughter at ages greater than 10 wk, BW and carcass weight may be greater when concentrate is supplemented compared with ad libitum milk intake alone. Likewise, internal fat deposition can be elevated with extended ad libitum milk intake without supplemental concentrate.

Recent perspectives in using goats for vegetation management in the USA

S. P. Hart

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Although considerable research has demonstrated the usefulness of goats in controlling undesirable plant species like shinnery, blackjack, and post oak, sericea lespedeza, and many others, this method still is not widely employed. Environmental concerns and increasing costs of chemical and mechanical means of vegetation management, however, are providing impetus for greater utilization of such biological management techniques for removal of unwanted vegetation. Goats have an advantage over other biological controls in that a saleable product results from their consumption of brush and weeds, and they can be co-grazed with cattle. Moreover, goats increase cycling of plant nutrients in undesirable vegetation, typically increasing prevalence of grasses. A significant limitation to use of goats for vegetation management is the social stigma attached to goats by cattle producers. However, constraints of a small number of animal markets, few sources of large numbers of adapted animals, and little producer experience and knowledge of production practices are gradually being overcome as the goat industry grows. Most appropriate production systems need to be developed for specific environments, which entails proper kidding date, parasite management, predator control, fencing, and marketing strategy. In summary, there appears a bright future in use of goats for vegetation management because environmental conditions have become more conducive to growth of weedy plant species and, in most cases, goats are the most cost-effective, notoxic, and nonpolluting solution available.