Proceedings of the 52nd Biennial Spooner Sheep Day

Saturday, August 26, 2006
Spooner Agricultural Research Station
University of Wisconsin-Madison
Spooner, Wisconsin
Spooner Sheep Day was held annually at the Spooner Agricultural Research Station for 50 years – from 1953 through 2002. We believe that it is the longest running agricultural field day of the several organized each year on the various Agricultural Research Stations of the College of Agricultural and Life Sciences, University of Wisconsin-Madison. After the 2002 Spooner Sheep Day, the decision was made to hold the event every-other year on even-numbered years. This decision was made so that a Spooner Dairy Sheep Day could be held on odd-numbered years with a program that could be better tailored to the focused issues of the dairy sheep industry. Therefore, there is still a sheep field day at the Spooner Agricultural Research Station every year, and even though the 2006 field day is the 52nd Spooner Sheep Day, it is the 54th consecutive sheep field day held at the station, and we hope to host many more.

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2006
PROGRAM

52nd BIENNIAL SPOONER SHEEP DAY
Spooner Agricultural Research Station of the University of Wisconsin-Madison
Spooner, Wisconsin
Saturday, August 26, 2006

8:00 a.m.  Registration - Station Headquarters
8:45 Welcome and Station Update – UW-Madison Campus Administrator and Yves
Berger, Superintendent, Spooner Ag Research Station, UW-Madison
9:00 Value Added Meat Products or Direct Marketing of Lambs/Kids to Increase
Profits – Sheep/Goat Producers: Dan Guertin, Stillwater, MN; Judy Moses,
Downing, WI; and Steve Schotthofer, Cochrane, WI
10:30 Break
10:45 Rules and Regulations Regarding Direct Market Meat Sales – Gary Onan,
Professor of Animal Science, UW-River Falls
11:20 What Works for Electronic Identification of Sheep? – Dave Thomas,
Professor of Animal Sciences, UW-Madison
11:50 Presentation of Sheep Industry Award – Rudy Erickson, Sheep Producer,
Wilson, Wisconsin
Noon Lamb Barbecue Lunch - Purchase tickets at the time of registration
1:15 p.m.  Move to Sheep Farm
1:30 1. Review of pasture research and demonstrations in a year with a summer
drought – Philip Holman, Assistant Superintendent, Spooner Ag Research
Station, UW-Madison
2. Methods to estimate pasture dry matter to improve pasture utilization –
Claire Mikolayunas, Graduate Student and Research Assistant; and Steve
Eckerman, Animal Sciences Student and Spooner Summer Intern, UW-Madison
3. Demonstration and use of body condition scores in ewes – Dave Thomas
3:00 Adjourn

Attendance at the educational sessions of the Spooner Sheep Day is free. There is a charge for
the lamb barbecue lunch and a printed copy of the proceedings if you wish to have either of
these.

Spooner Sheep Day is sponsored by the College of Agricultural and Life Sciences of the
University of Wisconsin-Madison, University of Wisconsin Cooperative Extension, and the
Indianhead Sheep Breeders Association. For more information, contact Lorraine Toman at the
Spooner Agricultural Research Station (phone: 715/635-3735, email:
lttoman@facstaff.wisc.edu).
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Welcome to the 52\textsuperscript{nd} Biennial Spooner Sheep Day. It is always a pleasure to see all of you here. I think the program developed by Dr. Dave Thomas is extremely opportune. Adding value to your products is certainly an excellent way to increase your income.

Concerning the Spooner Ag Research Station, I do not have any big news to announce. Although we have been busy, there has been no fundamental change in research and outreach activities. The big event this year is certainly the terrible lack of water. We have been below average since April with the last significant rain of more than a half an inch on May 9. In June we received only 1.12 in., and in July, we had a grand total of .60 inch. We are drier than last year and drier than in 1988. Out of 300 ewes, we have been able to keep only 100 grazing on the few pastures we can irrigate, and 200 have been fed hay or haylage in dry lot since early June. But of course, you are all experiencing the same thing, and we are all hurt.

In regards to sheep, we have been experiencing a lower conception rate than usual, mostly on ewe lambs and a higher mortality of young lambs than usual. I am not quite sure of the reasons since we did not make any significant change of management. Because of the low conception rate, 40 ewes were put back at breeding on March 15 for an August lambing. This might be the beginning of all year around milking. Research has been mostly directed toward nutrition of ewes in lactation: restricted or \textit{ad libitum} feeding of ewe lambs before puberty, supplementation or no supplementation of lactating ewes grazing kura clover-orchard grass pastures, and amount of supplementation to lactating grazing ewes. We also have a small preliminary trial on the effect of the photoperiod on milk production.

The overall milk production has been good and most of the ewes are still at milking. The market for milk seems expanding. The Wisconsin Sheep Dairy Cooperative will market close to 1 million pounds of milk this year and is making more and more of its own cheeses with the creation of a third cheese this year, a delicious feta. The flagship cheese, the Dante, a pure sheep milk aged cheese, took second place in its class at the last American Cheese Society competition in which a record of more than 900 cheeses were entered.

Enjoy the program!
DIRECT SALE OF LAMB TO THE ETHNIC MARKET AND NON-ETHNIC MARKET

Dan Guertin
Stillwater, Minnesota

My wife, Alice, and I own and operate a 30 acre farm near Stillwater, MN. We have been raising sheep for 12 years and milking our sheep for the past 10 years. We currently have 110 breeding ewes and raise 200+ lambs per year. The original goal of our farm was to focus on the dairy portion of our operation by selling our milk through the Wisconsin Sheep Dairy Cooperative and to add supplemental income from the sale of wool to our shearer and feeder and/or finished lambs to our local auction barn in South Saint Paul, MN.

Initially, we also sold 3-10 whole freezer lambs/year and for the last 7 years we have sold 5-10 lambs/year as individual cuts of lambs through direct on farm sales to customers. All meat processing was done at a local USDA processing facility. Over the years, we were not very successful at increasing the sale of lamb meat directly to consumers because most people, even if they enjoy eating lamb, don’t know how to prepare it and are reluctant to learn. We also explored sales to restaurants and retailers but were unable to supply the quantity of specific cuts of lamb needed on a year round basis.

About 5 years ago, I received a phone call from a Palestinian man who was living in Minnesota. He asked if he and his father, who was visiting from Palestine, could visit the farm. His father had milked sheep for many years in Palestine and wanted to see how sheep were milked in the United States. At the end of their visit, the son asked if he could come back and buy a lamb to slaughter. He came back several days later and bought and slaughtered a lamb on our farm. (Note: Unlike Wisconsin, on farm slaughter is allowed in Minnesota.) He was very happy with the quality of the lamb and brought several friends to also buy lambs during his next visit. This chance encounter has grown into a significant part of our farm business with approximately 120 lambs being processed on our farm in 2005. The growth of this business has been exclusively through word of mouth, and we have many repeat customers who frequently bring new customers with them on their return visits. During each visit, I spend time with these customers learning about their cultures and the things that are important to them when they purchase lambs.

The most important things they look for in a lamb are:
- intact male lambs that are lean, well muscled, and disease free
- animals that are 6 to 18 months old that weigh between 90 and 110 lbs
- animals that are raised on pasture without the use of antibiotics or hormones

I have also asked them why they return to buy lamb from us and continue to tell their friends about us:
- staff is always friendly and respectful of their traditions
- facility is always clean and well organized
- consistent quality (lean, healthy animals with no disease)
- consistent price, i.e. doesn’t fluctuate from week to week or month to month
- honesty and willingness to back up the quality of our animals
Some customers, depending on their culture and traditions, are also willing to purchase ewe lambs. All of the same criteria listed above regarding age, size, and health apply to ewe lambs as well as the absolute criteria that the ewe lamb has never been pregnant.

The above criteria apply to our current profile of customers which are primarily of Arab background and from either the northern African countries of Morocco, Tunisia, Algeria, and Sudan or from the Middle Eastern countries of Iraq, Palestine, and Turkey.

We have a number of barriers that currently keep us from expanding this portion of our farm business. The most significant is that we are only open for business on weekends since Alice and I both work full-time off the farm. We have also been limited by the number of animals available and the time of year they are available since we only lamb once per year. Many of our customers have asked that we offer the service of cutting the carcasses for them with an electric (band) saw but this activity would put us in the custom slaughter business which requires state licensing. Sales of freezer lambs and cuts of lamb have been curtailed by the recent loss of the local USDA processing facility.

Future plans include the construction of an on-farm, state inspected processing facility for both milk and lamb. This will allow us to add value to the milk produced by our ewes as well as to expand the meat business by being able to provide additional services to our existing customers as well as custom meat processing to other sheep farmer. We will also be buying additional lambs from other farmers who meet our requirements. We will also expand our customer base to include other ethnic communities. This will require that I leave my 40 hour a week, off-farm office job to take on an 80+ hour a week full-time farm job which will pay much less. I can hardly wait !!!
MARKETING TO CULTURALLY DIVERSE FAMILIES

Judy Moses
Shepherd Song Farm
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What are you Marketing?
• A daily food
• Special occasion food
• Certified food (halal, kosher, organic)
• Personal value food (organic, grass fed)
• Combination

Ethnic Groups
• Might be religiously based or not
• Closely knit or not
• We tend to notice the extremes—very rich, very poor—people like us tend to be invisible.

Multi-Diversity
• Culturally diverse
• Linguistically diverse
• Economically diverse
• Religiously diverse

Does Ethnic Group = Ethnic Market?
• 30% of ethnic products purchased by ethnic families.
• Don’t forget the other 70%!
• Opportunity
• 65-70% of ethnic food consumption is from upscale mainstream consumers
• Consumption is estimated to more than double before 2011.
• HUGE opportunity if lamb is positioned as a ‘new’ ethnic food to upscale families

Know your customer’s food values:
• Is presentation and branding important?
• Buyer able to plan purchases such as CSA’s?
• Buyer able to store excess food in freezer?
• Holidays: left-overs for tomorrow?
• Holidays: no one leaves hungry—no left overs?
Money issues:
- Ability to purchase foods that match values?
- Best value for dollar?
- Spiritual value of food more important than dollar value?
- No charge cards to fall back on?

Transportation options:
- Favorite restaurants around the globe?
- Driving to a CSA no issue for family?
- May have to borrow a car to purchase live goat?
- May have to drive into unknown rural areas?

Start at Home
- Mexican workers at a nearby dairy…
- Develop a relationship with one family or individual
- Go into situations where you are the minority
- Find opportunities to share experiences

Your values
- Not a windfall profit
- Stay true to your own values
- If you really don’t like the idea of visitors showing up at your farm—don’t sell off the farm—your body language, tone of voice, etc. will give you away.

böylece keçilerim sevildiklerini anlar!
SO YOU WANT TO DIRECT MARKET LAMB?

Steve and Tammy Schotthofer Family
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Direct Marketing. Basic questions that you must ask yourself

1. Why do you want to sell meat? (Income or Disposal)

2. How do you want to sell your meat? (Direct or Indirect)

3. For what end result are you going to sell your meat? (Purpose)

4. Who are you going to sell to? (Determine your market – Major or Minor)

5. How long will your Selling Season be? (Short or All Year)

6. Who are your Partners going to be and how do you determine them? (Processors & Suppliers)

7. How are you going to pay for the Investment to enable you to sell meat? (Operating funds)

8. Who will actually be selling the meat? (Do you have Sales and Marketing Skills?)

9. Do you have the time to be a Retailer/Wholesaler? (Scheduling and Planning)

10. Are you properly Insured and Licensed to sell Meat? (Rules & Regulations for Markets)

11. Are you properly educated to do this? (Meat knowledge – cuts, handling, production, etc.)

12. Why will People/Businesses want to purchase your product? (Price, Health Benefits, Other)

13. Do you really want to sacrifice the time and resources to make the commitment to do this? (This can consume your evenings, weekends, holidays, and daytime hours if you are serious and successful.)

14. Don’t Quit your Full-Time paying job until you have truthfully answered all of the above questions and are committed to the cause and established yourself successfully.
RULES AND REGULATIONS REGARDING DIRECT MARKET MEAT SALES

Gary Onan
University of Wisconsin-River Falls
River Falls, Wisconsin

The Basic Rule

Meat cannot be sold unless it has been inspected. While there are a few exceptions to this rule, the vast majority of direct marketers must follow the basic rule. The audience for this presentation is likely interested in marketing primarily sheep or goat meat, but many of you may at some point expand your product line to include other species. Therefore rules regarding poultry and exotic species are touched upon as well.

Details of the Rule

Inspection means that the animals are slaughtered in a licensed facility under the supervision of personnel in the employ of either the United States Department of Agriculture or a comparable state agency such as Wisconsin’s Department of Agriculture, Trade, and Consumer Protection. It also implies that each carcass is individually examined for conditions that could potentially render it unsuitable for human consumption. Carcasses inspected under Federal supervision may be sold anywhere within the United States. Carcasses inspected under State supervision may be sold only within that state. If marketers live near the border of a state, they cannot deliver product across the state line with intent to sell it. Customers may come to them from other states and purchase product from their place of business however.

The most important exception to the rule that all carcasses must be inspected is what’s referred to as “custom slaughter”. Custom animals are those that are slaughtered for the owner’s family consumption. These need not be inspected, and therefore however, cannot be sold to other individuals. Some producers who are marketing meat are able to circumvent the requirement for inspection by selling live animals to their customers. The customer then has the animal slaughtered under “Custom” rules. This approach is completely legal only if:

- The animal is sold to only one individual (not for example four parties each receiving one quarter or other such arrangements)
- The customer arranges for slaughter and processing
- The customer takes delivery of the meat from the processor and pays all processing costs

If these guidelines are not followed, producers are potentially liable for legal action by the appropriate enforcement agencies (even though in many instances this does not happen). One circumstance that has resulted in legal action against producers (particularly sheep and goat producers) arises when they have sold live animals to the customer who has then slaughtered the animal on the producer’s premises. This situation often arises when animals are sold to individuals of ethnic groups with particular religious or cultural requirements. This is clearly a violation of inspection law. In this case the inspection agencies consider the producer’s premises to be a slaughter facility that must be licensed and inspected. Therefore if producers sell live animals to customers, those customers must transport the animals to another site for slaughter.
In addition to the requirement for inspection, other labeling and licensing requirements apply. For “amenable” animals (i.e. common livestock which includes cattle, calves, swine, sheep, goats, and ratites) products must contain a proper label including the following components:

- Product name
- Ingredients (if applicable)
- Name and address of processor, packer, or distributor; or a name and phone number
- Proper handling statement (i.e. Keep Refrigerated or Keep Frozen)
- Safe handling label (for raw products only)
- Inspection legend (USDA or State)
- Net weight (unless weighed at time of sale) *(incidentally, meat must be sold by weight, not by the piece)*

In addition, depending on the location at which the sale is made, certain licenses may be required. For sales made from the farm, a retail food license is required and a refrigerator that maintains a 40°F temperature or less or a freezer that maintains 0°F or less is required. If the producer is transporting meat from the farm to a different sale site, a vehicle with equipment capable of maintaining frozen product at 10°F or less and refrigerated product at 40°F or less is required. If that site is a farmer’s market, a retailer’s license is required; if that site is another retail establishment, a distributor’s license is required. If door to door sales are conducted, a mobile food license and a vehicle as described above are required.

If producers are selling whole carcasses, sides, quarters, etc. and their customers are picking those products up from the processor, no licenses are required and the processor will have the product labeled properly as part of their normal operating procedure.

Rules for poultry (chickens, ducks, geese, guinea fowl, turkeys) are somewhat different. If less than 1000 birds are sold per year and are sold from the farm directly to the final consumer, no inspection or licensing is required. Such birds must have a label that includes the name and address of the producer, a net weight (or weighed at time of sale) and the words “Not Inspected” in capital letters at least 3/8” high. If such birds are sold at a farmer’s market, they must be slaughtered at a licensed facility and labeled as above. Also a retail license is required. If birds are sold wholesale to retail establishments, bird-by-bird inspection is required along with full labeling and a distributor’s license. If more than 1000 birds are sold per year, bird-by-bird inspection is required for all sale circumstances as well as appropriate licenses and full labeling.

Rules for non-amenable species (elk, deer, bison, llamas) are the same as for amenable species with one important exception—that being that state inspected non-amenable meats may be sold across state lines if they are minimally processed and contain no nitrite (i.e. not cured). Please note that there has recently been a change in the rules for non-amenable species. Previously producers could slaughter and process such animals on their farm and sell the meat from their farm without inspection. This is no longer allowed as of a few weeks ago.

Rabbits in any quantity may be sold without inspection or licensing if they are slaughtered, processed, and sold on the farm. If rabbit carcasses are wholesaled, they must be slaughtered, processed, and packaged in a licensed facility.
Other situations, such as religious or cultural exceptions must be negotiated with the appropriate inspection agency.

Marketing Claims

Direct marketers often include in their promotion specific claims about their product. Indeed this is a critical part of being successful in differentiating your product from that found in normal marketing channels. Such claims may include organic production, other production claims, or nutritional claims. All such claims must be approved by either USDA or the appropriate State agency (e.g. WDATCP). Application for approval must include validation of the claim.

Nutritional claims that will be approved with appropriate submission of data include “Lean”, “Low Fat”, “Low Sodium”, etc. Application for such claims must include official laboratory verification. Claims such as “Healthier for You”, “Will Prevent Chronic Disease”, “Better for You”, etc. will not be approved.

Claims of organic production cannot be made unless the farm has been certified under the National Organic Program (NOP). This program is administered by the Agricultural Marketing Service of USDA (a different agency than Food Safety and Inspection Service which performs meat inspection). The only exception for certification is if less than $5000 of product is sold per year. In that instance a producer may sell product as “Organic” but not as “Certified Organic”. Furthermore, these sales must be direct to the final consumer.

Production claims other than organic may include “Grain Fed”, “Free Range”, “Farm Raised”, “Grass Fed”, “Raised Without Added Hormones”, “Natural”, and others. Such claims must be validated when application is made for the label. “Natural” may be used if the product is either minimally processed or contains no additives that would not normally be present. It is illegal to claim “Raised Without Added Hormones” for species for which no hormones are approved such as swine and poultry. Claims such as “Antibiotic Free”, “Hormone Free”, or “Naturally Grown”, will not be approved.

Internet Sales

At present, if state inspected meat products are sold via the internet and the sale has been consummated prior to delivery of the product, such products may be shipped across state lines. The buyer must be made aware, however, that it is a violation of Federal Law to resell that product once delivered. It would likely however, be wise to have animals slaughtered and processed under Federal inspection if interstate internet sales are anticipated.

Summary

The basic rule for selling meat products is that they must be inspected and properly labeled. There are some exceptions to that rule, and if you believe your business falls under one of these exceptions, make very certain that this is indeed the case by consulting with meat inspection officials. In addition, even if you are subject to inspection rules, keep in contact with the
appropriate inspection agencies on a routine basis since rules are altered and modified fairly regularly.

References

- United States Department of Agriculture: www.usda.gov
- Wisconsin Department of Agriculture, Trade and Consumer Protection: www.datcp.state.wi.us
VARIABLE EFFECTIVENESS OF RADIO FREQUENCY EAR TAGS AND RUMEN BOLUSES FOR ELECTRONIC IDENTIFICATION OF SHEEP

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Background

The current National Animal Identification System (NAIS) was initiated by the U.S. Department of Agriculture in 2004 (NAIS web site – http://animalid.aphis.usda.gov/nais). The ultimate goal of the NAIS is to be able to track any farm animal to its current U.S. premise within a 48 hour period after the outbreak of an animal disease with important consequences to animal and/or human health. The NAIS has three major components: premises identification, animal identification, and animal tracking. At the national level, the NAIS is currently a voluntary program, but it may become mandatory in the future. Individual states can move into the NAIS more aggressively. By Wisconsin State law, livestock premise identification is now mandatory in Wisconsin. All livestock premises in Wisconsin are required to be registered through the Wisconsin Livestock Identification Consortium (WLIC). Information can be found at the WLIC web site (www.wiid.org).

The second and third steps of the program (individual animal identification and a central database tracking movements of these animals) currently are not mandated at the Federal or State level through NAIS. However, the sheep industry does have a national sheep identification program through the Mandatory Scrapie Eradication Program. The Federal government requires all sheep moving across state lines, except sheep under 18 months of age going to slaughter, to have an official scrapie tag that identifies the animal’s flock origin. There is pending State of Wisconsin legislation requiring that this also be required for sheep moving within Wisconsin. Therefore, the sheep industry, for all intent and purposes, currently has met the second step of the NAIS program, but through the Mandatory Scrapie Eradication Program.

The third step of tracking animal movements through a central database will be the most difficult to implement considering the millions of individual animal movements that take place each year in the U.S. The USDA has published requirements for official ear tags to be used in individual animal identification, so it appears, at least initially, that official ear tags for the NAIS program will be visual ear tags. The regulations state that official ear tags can be radio frequency (electronic) ear tags but this is not a requirement. Many people, including me, feel that the official animal identification method eventually will have to be electronic in order for animal movements to be efficiently and accurately entered into a national computer database. A visual-only ear tag for animal identification will require paper records that are subject to loss, errors from illegible handwriting, and transcription errors when written records are transferred to
computer files. The sheep research program at the University of Wisconsin-Madison has been involved in evaluation of various electronic identification devices for sheep since 2002. Following are our results.

**Electronic Ear Tags**

UW-Madison cooperated with the Wisconsin Sheep Breeders Cooperative and Wisconsin State Fair Park on a project funded by the WLIC and led by Michael Bishop on the evaluation of electronic ear tags and readers in 2005.

**Breeding Ewes.** Five types of electronic ear tags (see Table 1 for tag types) were placed in the ears of ewes at the UW-Madison Arlington Agricultural Research Station on February 15 or 22, 2005 and examined on May 2, June 2, and July 6, 2005 to determine retention and readability. All ewes with tags were not evaluated on each date due to sheep management issues. The main reason for not evaluating some ear tags during the first two evaluation periods was because they were in ewes with young lambs, and the corralling of such ewes for the reading of their ear tags would have subjected the young lambs to a risk of injury. The total number of ewes and tags evaluated at each date was 93 on May 2, 160 on June 2, and 180 on July 6. A total of 203 different ewes with tags were evaluated on at least one of the dates.

Each available ear tag was read at random with one of six commercial hand-held readers on each date, and the maximum distance at which the tag number was read was recorded. Each ewe was placed in a chute, her head was restrained, a tape measure or wooden yard stick was placed on the electronic ear tag and extended away from the ear, a reader was placed on the distal end of the tape measure and moved along the tape measure toward the ear tag until the electronic ear tag was read, and the distance of the reader from the ear tag was noted on the tape measure or yard stick and recorded. A total of 378 distance measurements were recorded on the 203 ewes/tags for an average of 1.86 distance measurements per ewe/tag.

Tags were dipped in a disinfectant solution before being placed in the ears of ewes on February 15 or 22, 2005. However, some sore and infected ears resulting from administration of the ear tags were present on each of the three evaluation dates. Moderately to severely infected ears were cleaned with a disinfectant at the time of evaluation. Ear tags were removed from some severely infected ears on and between the June 2 and July 6, 2005 evaluation dates to allow healing of ears.

Fourteen of 203 tags (6.9%) were lost between February 15/22, 2005 and July 6, 2005 with large differences among tag types in loss rate (Table 1). The AFB tags had a significantly higher loss rate (14.6%) than either the PRT (3.4%) or IHT (0.0%) tags. The PRB tag (9.1%) and DAB (4.3%) tags had intermediate loss rates that were not statistically different from the other three tag types.

The DAB tags resulted in a greater \( P < .10 \) incidence of sore and infected ears (17.4%) than the PRT (6.8%), AFB (4.9%), or the IHT (0.0%) tags (Table 2). The PRB tags also resulted in a high rate of sore and infected ears (9.1%) that was not statistically different from the DAB tags.
Five tags were removed due to very severe ear infections, and 3 of these were DAB tags (Table 1); providing more evidence that the DAB tags were detrimental to ear health.

All of the tag types had very acceptable electronic function. Only one tag (an AFB tag) could not be read with any of the readers (Table 1). This assumes that the tags that were lost would have had functioning electronics if they had been present. This is a realistic assumption given the very, very low rate of electronic failures among the tags that were present.

Table 1. Loss of electronic ear tags in sheep*

<table>
<thead>
<tr>
<th>Tag type</th>
<th>No. ewes tagged</th>
<th>% (no.) of tags lost by date last evaluated</th>
<th>% (no.) of tags removed by or at date last evaluated</th>
<th>% (no.) of tags not readable</th>
<th>Total % (no.) of tags lost, removed, or not readable</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB</td>
<td>41</td>
<td>14.6 b (6)</td>
<td>0.0 b</td>
<td>2.4 (1)</td>
<td>17.1 a (7)</td>
</tr>
<tr>
<td>DAB</td>
<td>23</td>
<td>4.3 a,b (1)</td>
<td>13.0 a (3)</td>
<td>0.0 (0)</td>
<td>17.4 a (4)</td>
</tr>
<tr>
<td>IFT</td>
<td>25</td>
<td>0.0 b (0)</td>
<td>0.0 b (0)</td>
<td>0.0 (0)</td>
<td>0.0 b (0)</td>
</tr>
<tr>
<td>PRB</td>
<td>55</td>
<td>9.1 a,b (5)</td>
<td>1.8 b (1)</td>
<td>0.0 (0)</td>
<td>10.9 a,b (6)</td>
</tr>
<tr>
<td>PRT</td>
<td>59</td>
<td>3.4 b (2)</td>
<td>1.7 b (1)</td>
<td>0.0 (0)</td>
<td>5.1 a,b (3)</td>
</tr>
<tr>
<td>Total</td>
<td>203</td>
<td>6.9 (14)</td>
<td>2.5 (5)</td>
<td>0.5 (1)</td>
<td>9.9 (20)</td>
</tr>
</tbody>
</table>

* Sheep were tagged on February 15 or 22, 2005, and tags were evaluated one to three times on May 2, June 2, and/or July 6, 2005.

a,b Means with no superscripts in common are different \((P < .05)\).

Table 2. Incidence of sore/infected ears in sheep with electronic ear tags*

<table>
<thead>
<tr>
<th>Tag type</th>
<th>No. ewes tagged</th>
<th>% (no.) of ewes with sore/infected ears</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB</td>
<td>41</td>
<td>4.9 b (2)</td>
</tr>
<tr>
<td>DAB</td>
<td>23</td>
<td>17.4 a (4)</td>
</tr>
<tr>
<td>IFT</td>
<td>25</td>
<td>0.0 b (0)</td>
</tr>
<tr>
<td>PRB</td>
<td>55</td>
<td>9.1 a,b (5)</td>
</tr>
<tr>
<td>PRT</td>
<td>59</td>
<td>6.8 b (4)</td>
</tr>
<tr>
<td>Total</td>
<td>203</td>
<td>7.4 (15)</td>
</tr>
</tbody>
</table>

* Sheep were tagged on February 15 or 22, 2005, and tags were evaluated one to three times on May 2, June 2, and/or July 6, 2005.

a,b Means with no superscripts in common are different \((P < .10)\).
Over the 134 or 141 day periods that these electronic tags were evaluated, a total of 20 tags out of 203 (9.9%) were lost, removed due to very severe ear infections, or were unreadable (Table 1). The total percentage of tags lost or removed was greatest for the DAB tags (17.4%) due primarily to removal of tags and for the AFB tags (17.1%) due primarily to a high loss rate.

Reading distances for different tags and readers are presented in Tables 3 and 4, however, the IHT tags and reader do not appear in these tables. The IHT tags utilized a different radio frequency than the other four tags and could only be read by one reader supplied by the manufacturer. All 23 of the IHT tags required the reader to be touching the tag before a reading was obtained. Therefore, average reading distance of the IHT tags was 0.0 in. with no variation. The inability of these tags to be read at a greater distance is a major disadvantage of this tag and/or the reader.

Some large differences were seen among the other tag types and readers for the maximum distance required for a tag to be read (Table 3). The PRT tags could be read at a greater ($P < .05$) distance (5.71 in.) than the other three tag types, and the DAB and PRB tags could be read at a greater ($P < .05$) distance than the AFB tags (4.93 and 4.74 in., respectively, versus 4.09 in.)

The two longer cane readers (I1R and I2R) had the greatest ($P < .05$) reading distances of any of the readers; they averaged a 3.41 in. greater reading distance than the average of the other three readers. The DAR reader had a greater ($P < .05$) distance than the AFR reader, and both had a reading distance greater ($P < .05$) than the GER reader.

<table>
<thead>
<tr>
<th>Reader:</th>
<th>Item</th>
<th>No. of distance measurements</th>
<th>Reading distance, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>93</td>
<td>3.43±.17 d</td>
<td></td>
</tr>
<tr>
<td>DAR</td>
<td>70</td>
<td>4.69±.18 c</td>
<td></td>
</tr>
<tr>
<td>GER</td>
<td>91</td>
<td>2.38±.18 e</td>
<td></td>
</tr>
<tr>
<td>I1R</td>
<td>44</td>
<td>7.34±.30 a</td>
<td></td>
</tr>
<tr>
<td>I2R</td>
<td>57</td>
<td>6.48±.19 b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag type:</th>
<th>Item</th>
<th>No. of distance measurements</th>
<th>Reading distance, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB</td>
<td>90</td>
<td>4.09±.15 c</td>
<td></td>
</tr>
<tr>
<td>DAB</td>
<td>37</td>
<td>4.93±.28 b</td>
<td></td>
</tr>
<tr>
<td>PRB</td>
<td>101</td>
<td>4.74±.16 b</td>
<td></td>
</tr>
<tr>
<td>PRT</td>
<td>127</td>
<td>5.71±.13 a</td>
<td></td>
</tr>
</tbody>
</table>

Means within the tag type or reader groups without a common superscript are different ($P < .05$).

There was a significant interaction between the ear tag type and the reader used, and reading distances for the 20 reader-tag combinations are presented in Table 4. The PRT tags had the
greatest \((P < .05)\) reading distance when read with the AFR, DAR, and GER readers, but the two
cane readers (I1R and I2R) had reading distances that were generally as great or greater with the
other 3 types of tags as they were with the PRT tags. The reading distances of the longer cane
readers were less affected by tag type than were the reading distances of the other readers.

Table 4. Least squares means for maximum reading distance by
reader-tag type combinations

<table>
<thead>
<tr>
<th>Reader - Tag type</th>
<th>No. of distance measurements</th>
<th>Reading distance, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF - AFB</td>
<td>23</td>
<td>2.55±.29 (g)</td>
</tr>
<tr>
<td>AF - DAB</td>
<td>9</td>
<td>3.00±.47 (g)</td>
</tr>
<tr>
<td>AF - PRB</td>
<td>26</td>
<td>3.18±.28 (g)</td>
</tr>
<tr>
<td>AF - PRT</td>
<td>35</td>
<td>5.00±.24 (c,f)</td>
</tr>
<tr>
<td>DA - AFB</td>
<td>15</td>
<td>4.21±.36 (f)</td>
</tr>
<tr>
<td>DA - DAB</td>
<td>10</td>
<td>4.25±.44 (f)</td>
</tr>
<tr>
<td>DA - PRB</td>
<td>19</td>
<td>4.50±.32 (e,f)</td>
</tr>
<tr>
<td>DA - PRT</td>
<td>26</td>
<td>5.80±.28 (c,d)</td>
</tr>
<tr>
<td>GE - AFB</td>
<td>22</td>
<td>1.16±.30 (h)</td>
</tr>
<tr>
<td>GE - DAB</td>
<td>7</td>
<td>1.30±.53 (h)</td>
</tr>
<tr>
<td>GE - PRB</td>
<td>29</td>
<td>1.71±.26 (h)</td>
</tr>
<tr>
<td>GE - PRT</td>
<td>33</td>
<td>5.35±.24 (d,e)</td>
</tr>
<tr>
<td>I1 - AFB</td>
<td>17</td>
<td>7.08±.34 (a,b)</td>
</tr>
<tr>
<td>I1 - DAB</td>
<td>2</td>
<td>8.75±.99 (a)</td>
</tr>
<tr>
<td>I1 - PRB</td>
<td>8</td>
<td>7.68±.50 (a,b)</td>
</tr>
<tr>
<td>I1 - PRT</td>
<td>17</td>
<td>5.85±.34 (c,d)</td>
</tr>
<tr>
<td>I2 - AFB</td>
<td>13</td>
<td>5.43±.39 (d,e)</td>
</tr>
<tr>
<td>I2 - DAB</td>
<td>9</td>
<td>7.33±.47 (a,b)</td>
</tr>
<tr>
<td>I2 - PRB</td>
<td>19</td>
<td>6.63±.32 (b,c)</td>
</tr>
<tr>
<td>I2 - PRT</td>
<td>16</td>
<td>6.53±.35 (b,c)</td>
</tr>
</tbody>
</table>

\(a,b,c,d,e,f,g,h\) Means without a common superscript are different \((P < .05)\).

Conclusions from breeding ewe study with electronic ear tags:
1. The overall loss of electronic tags of 9.9\% in the 4.5 months of this study is unacceptably
   high for use as official permanent identification of sheep.
2. The one tag that had no losses had a reading distance of 0.0 inches which is impractical in
   normal production and marketing situations.
3. The 7.4\% of ewes with sore and infected ears after placement of the ear tag is of great
   concern and contributed to the high loss rate of one of the tags.
4. There are large differences between readers and tags in average reading distance that should be considered when deciding on which products to use.

5. Based upon these results, the PRT electronic tag and both of the longer cane readers were superior to the other tags and readers. However, there are many other electronic tags and readers available that were not evaluated in this trial that may be superior to these. Readers in this study were not evaluated for their durability or data storage capabilities, which are important attributes.

State Fair Market Lambs. In late April, 2005, radio frequency ear tags were sent to coordinators of the Wisconsin regional lamb weigh-in sites with instructions for application. The tamper-proof radio frequency tags were of a single type (AFB). The electronic buttons (AFB) were coupled with a non-electronic hang tag with a three-digit number purchased from another supplier. The tags were applied at regional weigh-in sites throughout Wisconsin during the first half of May, 2005.

On August 9, 2005, 271 of the lambs tagged in May were evaluated at the Wisconsin State Fair in West Allis, WI for tag retention and readability. The tags of 254 lambs were read with each of three readers (small AFR hand-held reader, DAR short wand reader, I2R long cane reader) and the reading distances recorded. A tape measure was placed on the electronic ear tag and extended away from the ear, a reader was placed on the distal end of the tape measure and moved along the tape measure toward the ear tag until the electronic ear tag was read, and the distance of the reader from the ear tag was noted on the tape measure and recorded. A total of 761 distance measurements were recorded. Reading distances were not taken on 15 lambs that came to the WI State Fair without their original electronic tags and a replacement was applied at the fair and on 2 lambs with tags in place but that were missed.

The rate of failure of electronic function was very low. Of the 254 tags that were read, only one failed to be read, for an electronic failure rate of only 0.39%.

However, there was a relatively high rate of loss of the tags. Of the 271 lambs evaluated on August 9, 2005 at the Wisconsin State Fair, 52 lambs (19.2%) had lost their original electronic tag within about 3 months of application. Tag loss by breed of lamb and identification site in May is presented in Table 5. While there appear to be some large differences among breeds and sites in percentage of tag loss, none of these differences were statistically different. In addition to breed of lamb and identification site, weight of lamb at the time of initial tagging, sex of lamb, and owner of the lamb within an identification site were examined for their effects on tag loss. The only effect that was a significant factor in tag loss was owner of the lamb ($P < 0.01$). This suggests that the environment in which the lamb was raised after it was tagged had a large effect on whether or not it lost its tag. For example, fences and feeders found on some farms may be more conducive to catching ears and ripping out tags than fences and feeders found on other farms.

Average maximum reading distance of the electronic tags with each of the three readers is presented in Table 6. The I2R cane reader had a greater ($P < 0.0001$) reading distance than the other two readers, and the DAR wand reader had a greater ($P < 0.0001$) reading distance than the AFR hand-held reader. In the companion study conducted at the UW-Madison Arlington
Agricultural Research Station with these same AFB tags in ewes, these three readers ranked the same for reading distance. However, the reading distances were .45 to 1.54 inches greater in the UW-Madison study than in this study.

Table 5. Electronic ear tag loss of 2005 Wisconsin State Fair market lambs by breed of lamb and identification site.*

<table>
<thead>
<tr>
<th>Effect</th>
<th>No. of lambs tagged</th>
<th>Tags lost No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breed:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Other, Columbia, Oxford, Shropshire, and Unknown(^1)</td>
<td>20</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Crossbred</td>
<td>82</td>
<td>19</td>
<td>23.2</td>
</tr>
<tr>
<td>Dorper</td>
<td>12</td>
<td>3</td>
<td>25.0</td>
</tr>
<tr>
<td>Dorset</td>
<td>20</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>Hampshire</td>
<td>32</td>
<td>3</td>
<td>9.4</td>
</tr>
<tr>
<td>Natural Colored</td>
<td>34</td>
<td>10</td>
<td>29.4</td>
</tr>
<tr>
<td>Southdown</td>
<td>18</td>
<td>4</td>
<td>22.2</td>
</tr>
<tr>
<td>Suffolk</td>
<td>53</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td><strong>Identification site:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dodge County</td>
<td>38</td>
<td>9</td>
<td>23.7</td>
</tr>
<tr>
<td>Jefferson</td>
<td>23</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>Mineral Point</td>
<td>34</td>
<td>8</td>
<td>23.5</td>
</tr>
<tr>
<td>Other (Dane County and Manawa)(^2)</td>
<td>25</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td>Rock County</td>
<td>36</td>
<td>2</td>
<td>5.6</td>
</tr>
<tr>
<td>Sheboygan County</td>
<td>33</td>
<td>8</td>
<td>24.2</td>
</tr>
<tr>
<td>Tomah</td>
<td>36</td>
<td>7</td>
<td>19.4</td>
</tr>
<tr>
<td>UW-River Falls</td>
<td>25</td>
<td>6</td>
<td>24.0</td>
</tr>
<tr>
<td>Wausau</td>
<td>21</td>
<td>5</td>
<td>23.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>271</td>
<td>52</td>
<td>19.2</td>
</tr>
</tbody>
</table>

*None of the differences between breeds or between identification sites were significantly different from zero.

\(^1\)Fewer than 10 lambs of each breed.

\(^2\)Fewer than 15 lambs identified at each site.

Breed and sex of lamb did not affect reading distance. However, it was surprising to find that the identification site and the owner of the lamb within the identification site were significant \((P < 0.001\) and \(P < 0.01\), respectively) factors influencing reading distance. This indicates that there may be factors associated with RFID tag application and the environment in which the tagged animal is raised that influence reading distance. However, it must be noted that the type of reader was a far more important factor in determining reading distance than the other two factors; differences among readers accounted for over 30 times more of the variation in reading distance than was accounted for by either identification site or owner of the lamb.
Table 6. Least squares means for maximum reading distance by reader.

<table>
<thead>
<tr>
<th>Item</th>
<th>No. of distance measurements</th>
<th>Reading distance, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR hand-held</td>
<td>254</td>
<td>2.10±.10 c</td>
</tr>
<tr>
<td>DAR wand</td>
<td>253</td>
<td>3.27±.10 b</td>
</tr>
<tr>
<td>I2R large cane</td>
<td>254</td>
<td>3.89±.10 a</td>
</tr>
</tbody>
</table>

a,b,c Means without a common superscript are different (P < .0001).

Conclusions from State Fair market lamb study with electronic ear tags:
1. The overall loss of electronic tags of 19.2% in the approximately 3 months of this study is unacceptably high for use as official permanent identification of sheep.
2. It appears that environmental and management factors that differ between farms are more important in determining electronic tag loss and retention than breed of lamb, sex of lamb, weight of lamb at the time of application, or the individual person inserting the tag.
3. There are significant differences between readers in maximum average reading distance that should be considered when deciding on which product to use.
4. At this time, there is no good explanation for the significant effect of identification site and owner of the lamb on reading distance, but they deserve further investigation.

Electronic Rumen Boluses

Different identification systems have been used in livestock, such as tattoos, ear notching, or visual and/or electronic ear tags, but most of them do not achieve the requirements for a satisfactory identification system. The main problems with these identification systems have been losses, short reading distances, errors during manual recording, and the possibility of replacement and fraud. Identification using an electronic rumen bolus has been successfully tested in Europe and could be an alternative system for permanent animal identification in the U.S.

Each of 420 rams, ewes, and ewe lambs in the meat flock at the Arlington Agricultural Research Station and 365 rams, ewes, and ewe lambs in the dairy flock at the Spooner Agricultural Research Station were orally administered one of three electronic rumen boluses in September 2002. The three types of electronic rumen boluses consisted of ISO radio frequency transponders of different technology encased in capsules of different size and construction: B1 (full duplex; 21 × 66 mm (.8 x 2.6 in.), 70 g (.15 lb.), white plastic cover), B2 (half duplex; 21 × 68 mm (.8 x 2.7 in.), 79 g (.17 lb.), white ceramic cover), and B3 (half duplex; 12 × 42 mm (.5 x 1.7 in.), 16 g (.04 lb.), brown ceramic cover). Bolus readability was checked immediately before and immediately after administration to ensure that only functional boluses were administered and present in each sheep. Boluses were then read in the animals the day after application (day 1) at both stations and on days 9, 32, 72, 102, 154, 204 and 318 at Spooner and on days 19, 40, 68, 99, 159, 203 and 279 at Arlington.
Sheep ranged in body weight from 25 to 145 kg (55 to 319 lb.) at the time of bolus administration, and there were no injuries or deaths from bolus administration. Application time averaged 67.5 ± 1.5 seconds and was affected by operator (P < 0.05). Most of the people administering the boluses were novice applicators, and no attempt was made to administer the boluses at a fast rate of speed. The application process is very simple, and commercial application of the boluses by shepherds with only a little experience would be expected to be much faster than the 67.5 seconds recorded in this study. Application time was greater (P < 0.05) for rams than for adult ewes or ewe lambs.

At the end of the trial, readability of B1 boluses was much lower (P < 0.05) than B2 and B3 readability in each flock. Readability in the Spooner dairy sheep flock was: B1, 7.6%; B2, 100%; and B3, 98.8% (Table 7); and, readability in the Arlington meat sheep flock was: B1, 42%; B2, 100%; B3, 98.6% (Table 8). The B2 and B3 boluses proved to be very effective over a long period of time. While no subsequent experimental recording of bolus readability has been done, the vast majority of the sheep that are still present in 2006 that received B2 and B3 boluses still have an active, readable bolus almost 4 years after administration.

During the experiment, most boluses at Spooner were read in the milking parlor and boluses at Arlington were read in a metal working chute. Due to somewhat easier access to animals in the milking parlor than in the working chute, time required to read each bolus was lower (P < 0.05) in the Spooner flock (16.6 ± 0.64 seconds) than in the Arlington flock (24.2 ± 0.54 seconds). Reading times would be expected to be considerably lower if only boluses with high readability (like B2 and B3) were used. Since the B1 boluses had very poor readability, considerable time was spent on each sheep with an inactive B1 bolus to make sure that we could not read the bolus, and this slowed down the entire reading process for the flock.

Conclusions from the breeding sheep study with electronic rumen boluses:
1. The B1 bolus was insufficiently readable (7.6% at Spooner and 42.0% Arlington) by the end of the trial.
2. B2 and B3 boluses were very effective in electronic identification of sheep with over 98% readability at the end of the trial at both locations.
3. The B2 bolus had 100% readability, but is a larger bolus than the B3 bolus. The B3 bolus may be a better option than the B3 bolus for smaller lambs if a 1% to 2% loss in readability is acceptable.
Table 7. Overall readability of dairy sheep electronically identified with different rumen bolus types at the Spooner Agricultural Research Station.

<table>
<thead>
<tr>
<th>Bolus type</th>
<th>Time after application (days)</th>
<th>Item</th>
<th>B1 (21 x 66 mm)</th>
<th>B2 (21 x 68 mm)</th>
<th>B3 (12 x 42 mm)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Readability</td>
<td>83/83 (100%)</td>
<td>83/83 (100%)</td>
<td>199/199 (100%)</td>
<td>365/365 (100%)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>80/83 (96.4%)</td>
<td>86/86 (100%)</td>
<td>199/199 (100%)</td>
<td>365/368 (99.2%)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>71/83 (85.5%)</td>
<td>85/86 (98.8%)</td>
<td>198/199 (99.5%)</td>
<td>354/368 (96.2%)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td>66/83 (79.5%)</td>
<td>86/86 (100%)</td>
<td>198/199 (99.5%)</td>
<td>350/368 (95.1%)</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td></td>
<td>58/82 (70.7%)</td>
<td>86/86 (100%)</td>
<td>197/199 (99%)</td>
<td>341/367 (92.9%)</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td></td>
<td>44/82 (53.7%)</td>
<td>85/85 (100%)</td>
<td>196/198 (99%)</td>
<td>325/365 (89.0%)</td>
<td></td>
</tr>
<tr>
<td>154</td>
<td></td>
<td>34/82 (41.5%)</td>
<td>85/85 (100%)</td>
<td>193/198 (97.5%)</td>
<td>312/365 (85.5%)</td>
<td></td>
</tr>
<tr>
<td>204</td>
<td></td>
<td>19/79 (24.1%)</td>
<td>81/81 (100%)</td>
<td>193/194 (99.5%)</td>
<td>293/354 (82.8%)</td>
<td></td>
</tr>
<tr>
<td>318</td>
<td></td>
<td>5/66 (7.6%)</td>
<td>65/65 (100%)</td>
<td>158/160 (98.8%)</td>
<td>228/291 (78.4%)</td>
<td></td>
</tr>
</tbody>
</table>

a, b Row values with different superscripts differ (P < 0.05)

c, d Row values with different superscripts differ (P < 0.0001)

1 Three more boluses used to re-identify the ewes with lost boluses. Retention in the rumen of EZ-ID-70 g boluses was proved by using a metal detector at 72 d.

2 1 bolus unreadable in a test but readable in the following tests.

3 1 ewe culled.

4 1 ewe-lamb and 2 ewes died.

5 5 ewe-lambs, 7 ewes culled and 1 ram died

6 1 ram died.

7 2 ewe-lambs and 2 ewes died.

8 2 ewe-lambs and 1 ewe died, and 5 ewe-labs and 8 ewes culled.

9 1 ewe died.

10 2 ewe-lambs and 2 ewes died.

11 1 ewe-lamb died, 1 ram died and 11 ewe-lambs and 21 ewes culled.
### Table 5. Overall readability of dairy sheep electronically identified with different rumen bolus types at the Arlington Agricultural Research Station.

<table>
<thead>
<tr>
<th>Bolus type</th>
<th>Item</th>
<th>Time after application (days)</th>
<th>B1 (21 x 66 mm)</th>
<th>B2 (21 x 68 mm)</th>
<th>B3 (12 x 42 mm)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readability</td>
<td>0</td>
<td>113/113 (100%)</td>
<td>110/110 (100%)</td>
<td>197/197 (100%)</td>
<td>420/420 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>111/114 (97.4%) ¹</td>
<td>111/111 (100%) ²</td>
<td>198/198 (100%) ³</td>
<td>420/423 (99.3%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>103/114 (90.4%)</td>
<td>110/111 (99.1%)</td>
<td>196/198 (99.0%)</td>
<td>409/423 (96.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>98/114 (85.9%)</td>
<td>111/111 (100%)</td>
<td>196/198 (99.0%)</td>
<td>405/423 (95.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>91/114 (79.8%)</td>
<td>111/111 (100%)</td>
<td>196/198 (99.0%)</td>
<td>398/423 (94.1%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>83/112 (74.1%)</td>
<td>111/111 (100%)</td>
<td>194/196 (99.0%)</td>
<td>388/419 (92.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>159</td>
<td>64/107 (59.8%)</td>
<td>106/106 (100%)</td>
<td>187/189 (98.9%)</td>
<td>357/402 (88.8%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>203</td>
<td>35/98 (35.7%)</td>
<td>95/95 (100%)</td>
<td>165/168 (98.2%)</td>
<td>295/361 (81.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>279</td>
<td>34/81 (42.0%)</td>
<td>78/78 (100%)</td>
<td>141/143 (98.6%)</td>
<td>253/302 (83.8%)</td>
<td></td>
</tr>
</tbody>
</table>

¹ Row values with different superscripts differ (P < 0.05)
² Row values with different superscripts differ (P < 0.0001)
³ Three more boluses used to re-identify the ewes with lost boluses. Retention in the rumen of EZ·ID-70 g boluses was proved by using a metal detector at 68 d.

1 1 ewe and 1 ewe-lamb died
2 1 ewe sold and 1 ram died
3 1 ewe and 2 died, and 2 ewe-lambs died
4 1 ewe sold and 3 died
5 4 ewes sold, and 4 ewe-lamb sold and 1 died
6 5 ewe-lambs sold and 1 died, 3 ewes sold and 1 died, and 1 ram sold
7 13 ewe-lambs sold and 2 died, and 5 ewes sold and 1 died
8 6 ewe-lambs sold, 6 ewes sold, 1 died and 4 lost
9 4 ewe-lambs sold, 1 died and 2 lost, and 8 ewes sold and 2 died
10 7 ewe-lambs sold, 11 ewes sold and 7 died
DEALING WITH DROUGHT IN PASTURE SYSTEMS

Phil Holman  
Spooner Agricultural Research Station  
University of Wisconsin-Madison  
Spooner, Wisconsin

This summer the UW-Spooner Ag Research Station has experienced an extended drought. Rainfall totals were an inch below normal in April, an inch below normal in May, two inches below normal in June and were three inches below normal for the first 29 days of July. The drought caused pasture grasses to go dormant and severely limited legume yields as well. From July 29th till August 2 the station received 5.81” of rain to break the drought. Pastures are starting to recover, and we have resumed our normal grazing pattern of all the ewes except for a few in a breeding group.

The UW-Spooner Ag Research Station hosted a UW-Extension grazing pasture walk in July. Different pasture management strategies were discussed at that time. These strategies include 1) using harvested feed for part of the forage needs, 2) increasing the pasture acres available, 3) decreasing the number of animals grazing, and 4) pasture irrigation (if available and practical). All four of these methods were employed with our sheep flock this summer.

1) On June 10th we started feeding silage to a majority of the flock. We continued feeding silage until August 9th when we refilled the silo. Currently only a small group of ewes in a breeding group are being fed dry hay. The rest of the flock is back on pasture.

2) We increased pasture available by planting a nearby seven acre field to Italian Ryegrass. The Italian Ryegrass was planted on April 28th and we were able to first graze this pasture in late June. Italian Ryegrass is a fast growing annual (generally) that can provide excellent forage quality and high yields. Last year, we had 18 acres of Italian Ryegrass, and the additional forage acres allowed us to graze the whole season in spite of the 2005 drought. This increase in acreage can be as simple as using some nearby hay fields as well.

3) We decreased the number of animals grazing and fed harvested feed by removing approximately 2/3 of the flock from the grazing rotation. Ninety-six ewes were on a grazing trial with different levels of grain supplementation. These ewes required pasture availability for the research. Enough pasture was maintained through the drought to keep this trial group on pasture. Another method of reducing the flock size would be to initiate culling earlier in the year. Every flock has some animals that are performing poorly or are already destined to be culls. Sheep producers should move the culls to market early to reduce the amount of pasture forage needed.

4) Lastly, we have the ability to irrigate some of our pasture acreage. One of our pastures is at the end of a center pivot and another pasture is accessible by using portable irrigation pipe to get water there. However, part of this pasture was renovated this year and not in production until recently. Irrigation on the pasture renovation was needed for the seeding to successfully germinate.
To summarize, managing pastures in a drought year takes a willingness to use a variety of strategies to maintain productivity of the sheep flock and maintain the long term viability of the pastures.
Fescue, Chicory and Clover Variety Palatability

A trial to observe sheep grazing preferences of varieties of tall fescue, chicory, white clover and kura clover was seeded in late May 2006. This trial is being conducted in conjunction with Paul Peterson, University of Minnesota Forage Specialist. The area has been irrigated three times and forage stands appear adequate. So far this plot area has been clipped twice to help reduce weed pressure. Once the stands become more established, sheep will be allowed to graze the area. Individual varieties will be observed for grazing preferences. This trial is to be maintained for three to four years. Observation results will be available once grazing begins.

Kura Clover & Orchardgrass Pasture Establishment

A five acre pasture was renovated this year. The pasture contained mainly bluegrass and quackgrass. Several attempts had been made to interseed clovers into the pasture. None of these attempts have worked, so the decision was made to renovate the pasture to improve pasture yield by having more desirable plant species.

To prepare for renovation, the old pasture was sprayed with glyphosate in the fall of 2005 and moldboard plowed. This spring the pasture was fertilized, limed, and disked for seedbed preparation. On April 27th, 2006, the pasture was seeded with 8lbs/A of Endura III kura clover and 7 lbs/A of Albert orchardgrass. Endura III is a newer variety of kura clover and Albert orchardgrass was selected for its winter hardiness.

Weed control has been attempted by spraying Butyrac 200 for broadleaf weeds in June and clipping for the grass weeds. There is still considerable weed pressure from fall panicum and foxtails, but a good stand of kura and orchardgrass is present. We have started grazing the pasture to allow the sheep to forage the desirable species before clipping the remaining plant growth.

We look forward to a more productive pasture next year as it is more established.

Italian Ryegrass Variety Trial

On April 20, 2006 a Ryegrass Variety trial was seeded. This trial is being mechanically harvested every 28 days to determine total forage yields. Samples are being collected to determine the grass maturity stage and forage quality. This trial is repeated at the University of Wisconsin Ag Research Stations at Marshfield and Arlington. Results from these trials will be combined to evaluate which ryegrass varieties provide high yields and high quality forage. This trial is being done with Dr. Ken Albrecht, University of Wisconsin Forage Specialist.
Late Summer Seeding Oats for Fall Grazing

On August 18, 2006, oats were seeded into fields that had been in winter rye. The winter rye was grown for grain and straw. The winter rye was harvested in late July and the straw was baled in early August. There is time yet this year to grow additional forage on acres. One field is located directly west (and across the road) of the sheep barn. The plan is to be able to graze these acres in October to increase our grazing acres as forage production slows in the fall and to allow a longer rest period between grazings for our regular pastures.
ESTIMATING PASTURE FORAGE AVAILABILITY

Claire Mikolayunas and Steve Eckerman
Department of Animal Sciences
University of Wisconsin-Madison

Dry matter intake on pasture depends on animal species, production stage and pasture availability. The following are estimates of dry matter intake per day as a percentage of animal body weight:

- Commercial sheep – 3.5- 4 %
- Dairy sheep – 4 - 6 %
- (based on Italian breeds ~ 45 kg)
- Dry cows – 2-2.5 %
- Lactating cow – 3- 4 %
- Horses – 2.5-4 %

There are a number of methods used to estimate the amount of forage available in a given paddock:

- **Pasture Probe** (capacitance reading) – A cylindrical probe is placed on the ground and the amount of electrical current running from one end of the probe to the other depends on the amount of water bound in the fresh biomass surrounding the probe. There is a relationship between the strength of the electrical field and the biomass.

- **Pasture Ruler** – A rapid estimate which relates plant height to plant yield. Plant species have different leaf and stem architectures. Some plants concentrate stem and leaf growth close to the ground, while others extend stems and leaves above the competing canopy. The following table distinguishes the dry matter yield of various pasture species, as growth type and density will affect dry matter per inch of growth:

<table>
<thead>
<tr>
<th>Forage Type</th>
<th>Pasture Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fair</td>
</tr>
<tr>
<td>Tall Fescue + N</td>
<td>250-350</td>
</tr>
<tr>
<td>Tall Fescue + Legumes</td>
<td>200-300</td>
</tr>
<tr>
<td>Smooth Brome + Legumes</td>
<td>150-250</td>
</tr>
<tr>
<td>Orchardgrass + Alfalfa</td>
<td>100-200</td>
</tr>
<tr>
<td>Bluegrass + Whiteclover</td>
<td>150-250</td>
</tr>
<tr>
<td>Mixed Pasture</td>
<td>150-250</td>
</tr>
<tr>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Tall Fescue + N</td>
<td>350-450</td>
</tr>
<tr>
<td>Tall Fescue + Legumes</td>
<td>300-400</td>
</tr>
<tr>
<td>Smooth Brome + Legumes</td>
<td>250-350</td>
</tr>
<tr>
<td>Orchardgrass + Alfalfa</td>
<td>200-300</td>
</tr>
<tr>
<td>Bluegrass + Whiteclover</td>
<td>300-400</td>
</tr>
<tr>
<td>Mixed Pasture</td>
<td>250-350</td>
</tr>
<tr>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>Tall Fescue + N</td>
<td>450-550</td>
</tr>
<tr>
<td>Tall Fescue + Legumes</td>
<td>400-500</td>
</tr>
<tr>
<td>Smooth Brome + Legumes</td>
<td>350-450</td>
</tr>
<tr>
<td>Orchardgrass + Alfalfa</td>
<td>300-400</td>
</tr>
<tr>
<td>Bluegrass + Whiteclover</td>
<td>400-550</td>
</tr>
<tr>
<td>Mixed Pasture</td>
<td>350-450</td>
</tr>
</tbody>
</table>

From Iowa State Extension: [http://www.extension.iastate.edu/Publications/PM1758.pdf](http://www.extension.iastate.edu/Publications/PM1758.pdf)

- **Rising Plate Meter** (falling plate or disk meter) - incorporates both plant height and density in estimates of dry matter per acre. Rising plate meter may be calibrated to fields with similar pasture species.

Calibration of plate meter: Drop the plate meter at 20 locations throughout the field. At each location, note plate meter reading and clip plant material underneath the plate. Once these samples are dried, the plate meter reading is associated with a specific amount of dry matter per surface area under the disk. Plate meter recalibration is needed for changes in plant species composition, such as seasonal or annual changes.
Pasture estimates of dry matter: Walk through the field and take 15-30 rising plate meter measurements. The average of these readings corresponds to dry matter availability per acre or paddock. The density and height of the plate on the rising plate meter will affect the compression of the forage and influence estimates of dry matter. A practical plate meter is diagramed below:

Dr. Cosgrove and Dr. Undersander developed a pasture plate calibration based on measurements from rotationally grazed pastures in 7 counties across Wisconsin (http://www.uwex.edu/ces/forage/wfc/COSGROVE.html). In this survey, species ranged from pure grass pastures (bromegrass, orchardgrass and bluegrass) to mixed, cool season grass/legume pastures. Based on the height (in inches) that the plate raises:

**Dry matter yield (lb./acre) = 390 * Height (in.)**

This value represents *available forage*, not *grazable forage*. The pasture rest period between grazing events is critical to maintain animal performance and pasture quality because:

1) Limiting pasture availability also limits feed intake and animal performance.

2) Plant regrowth is stunted if the photosynthetic leaf area is over-grazed. Once 50% of the leaf growth has been removed, root mass begins to decline. Some recommend “take 50%, leave 50%”, in reference to the amount of above ground biomass which should be removed from a field by grazing livestock.

The general guideline is to leave ~ 3 inches of above ground plant material to allow for continued plant growth.
Throughout the production cycle, sheep producers must know whether or not their sheep are in condition (too thin, too fat, or just right) for the stage of production: breeding, late pregnancy, lactation.

Weight at a given stage of production is the best indicator, but as there is a wide variation in mature size between individuals and breeds, it is extremely difficult to use weight to determine proper condition. Body condition scoring describes the condition of a sheep, is convenient, and is much more accurate than a simple eye appraisal.

A body condition score estimates condition of muscling and fat development. Scoring is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Figures 1-3). In addition to the central spinal column, loin vertebrae have a vertical bone protrusion (spinous process) and a short horizontal protrusion on each side (transverse process). Both of these protrusions are felt and used to assess an individual body condition score.

Figure 1 - Feel for the spine in the center of the sheep's back, behind its last rib and in front of its hip bone.
Figure 2 - Feel for the tips of the transverse processes.
Figure 3 - Feel for fullness of muscle and fat cover.
The system used most widely in the United States is based on a scale of 1 to 5. The five scores (Figures 4-8) are:

Condition 1 (Emaciated)
Spinous processes are sharp and prominent. Loin eye muscle is shallow with no fat cover. Transverse processes are sharp; one can pass fingers under ends. It is possible to feel between each process.

Condition 2 (Thin)
Spinous processes are sharp and prominent. Loin eye muscle has little fat cover but is full. Transverse processes are smooth and slightly rounded. It is possible to pass fingers under the ends of the transverse processes with a little pressure.

Condition 3 (Average)
Spinous processes are smooth and rounded and one can feel individual processes only with pressure. Transverse processes are smooth and well covered, and firm pressure is needed to feel over the ends. Loin eye muscle is full with some fat cover.

Condition 4 (Fat)
Spinous processes can be detected only with pressure as a hard line. Transverse processes cannot be felt. Loin eye muscle is full with a thick fat cover.

Condition 5 (Obese)
Spinous processes cannot be detected. There is a depression between fat where spine would normally be felt. Transverse processes cannot be detected. Loin eye muscle is very full with a very thick fat cover.
The system contains everything from emaciated sheep to those that are grossly obese due to over feeding or being nonproductive. In most typical sheep flocks, over 90 percent of the sheep should have a body condition score of 2, 3, or 4. It is recommended that half scores be used between 2 and 4, giving the following scores: 1, 2, 2.5, 3, 3.5, 4, and 5.

The intermediate half scores are helpful when an animal's condition is not clear. Keep in mind that placing an exact score is not as important as being able to assign a relative score. A body condition score of 3 versus a 3.5 is not such a big deal, but the relative difference between a 2.5 and 4 certainly is of concern.

Other than practical experience, there is little available research comparing condition scores with performance. The majority of the research reported has dealt with the relationship of body condition score at breeding to ovulation rate and subsequent lambing percentage. Generally, the better the body condition score at mating, the higher the ovulation rate and therefore the higher the potential lambing percentage. However, ewes with a condition score greater than 4 at breeding tend to have a higher incidence of barrenness. Ewes with a condition score less than 3 at breeding will be more responsive to the effects of flushing than those with condition scores at 3.0-3.5 at mating.

Two research trials conducted by Oregon State University found that ewe body condition score at lambing had an effect on total pounds of lamb weaned per ewe. Ewes with a body condition score of 3 to 4 at lambing lost fewer offspring and weaned more pounds of lamb than those with a condition score of 2.5 or less.

In one study, ewes with a body condition score of 4 at lambing had a total weight of lamb weaned per ewe that was 82 percent greater than ewes with a body condition score of 2.5. The total weight weaned was 113 pounds versus 62 pounds per ewe. The increase in total weaning weight was due to improved lamb survival and heavier weaning weights.

In the other study, there was a 33 percent difference in total weight of lamb weaned (64 versus 85 pounds per ewe) between ewes with pre-lambing body condition scores of 2.5 to 3.5. This increase in pounds of lamb weaned was primarily due to improved lamb survival for offspring from the ewes with the higher body condition score.

Some suggested (optimum) condition score values for the various stages of the production cycle are:

<table>
<thead>
<tr>
<th>Production</th>
<th>Optimum stage score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Early - Mid Gestation</td>
<td>2.5 - 4</td>
</tr>
<tr>
<td>Lambing</td>
<td></td>
</tr>
<tr>
<td>(singles)</td>
<td>3.0 - 3.5</td>
</tr>
<tr>
<td>(twins)</td>
<td>3.5 - 4</td>
</tr>
<tr>
<td>Weaning</td>
<td>2 or higher.</td>
</tr>
</tbody>
</table>
The scores suggested above should allow for optimum productivity in highly prolific ewes. On average, a difference of one unit of condition score is equivalent to about 13 percent of the live weight of a ewe at a moderate (3 - 3.5) body condition score. Thus, a ewe with a maintenance weight of 150 pounds would need to gain approximately 20 lb to go from a body condition score of 2.5 to 3.5.

Body condition scoring is a subjective way to evaluate the status of a sheep flock--a potential tool for producers to increase production efficiency in their flocks.

References


If you have any questions or comments, contact: e-mail: James.Thompson@orst.edu
Table 1. 2006 Reproductive performance of mature ewes (milking). All ewes bred naturally by Hampshire rams starting August 16 while ewes were still at milking. Lambing started January 10. All lambs raised on milk replacer.

<table>
<thead>
<tr>
<th>Breed*</th>
<th>1/2E,C</th>
<th>3/4E,C</th>
<th>&gt;3/4E,C</th>
<th>1/2L,C</th>
<th>3/4L,C</th>
<th>&gt;3/4L,C</th>
<th>E x L or L x E</th>
<th>D x L or D x E</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of ewes at breeding</td>
<td>12</td>
<td>17</td>
<td>23</td>
<td>11</td>
<td>18</td>
<td>5</td>
<td>150</td>
<td>10</td>
</tr>
<tr>
<td>No. of ewes at lambing</td>
<td>12</td>
<td>15</td>
<td>23</td>
<td>11</td>
<td>18</td>
<td>5</td>
<td>147</td>
<td>10</td>
</tr>
<tr>
<td>No. of ewes aborted</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No. of ewes open</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>No. of ewes lambed</td>
<td>12</td>
<td>15</td>
<td>20</td>
<td>11</td>
<td>17</td>
<td>4</td>
<td>146</td>
<td>10</td>
</tr>
<tr>
<td>No. of lambs born</td>
<td>26</td>
<td>36</td>
<td>43</td>
<td>23</td>
<td>38</td>
<td>9</td>
<td>307</td>
<td>19</td>
</tr>
<tr>
<td>No. of lambs weaned at 30 days</td>
<td>24</td>
<td>33</td>
<td>36</td>
<td>19</td>
<td>35</td>
<td>9</td>
<td>259</td>
<td>14</td>
</tr>
<tr>
<td>Fertility</td>
<td>100</td>
<td>100</td>
<td>86.9</td>
<td>100</td>
<td>94.4</td>
<td>80</td>
<td>99.3</td>
<td>100</td>
</tr>
<tr>
<td>Litter size</td>
<td>2.00</td>
<td>2.4</td>
<td>2.15</td>
<td>2.09</td>
<td>2.23</td>
<td>2.25</td>
<td>2.10</td>
<td>1.9</td>
</tr>
<tr>
<td>Survival to weaning</td>
<td>92</td>
<td>92</td>
<td>84</td>
<td>83</td>
<td>92</td>
<td>100</td>
<td>84</td>
<td>74</td>
</tr>
<tr>
<td>Birth wt</td>
<td>10.2</td>
<td>11.1</td>
<td>11</td>
<td>11.1</td>
<td>10.4</td>
<td>10.7</td>
<td>11.3</td>
<td>10.6</td>
</tr>
<tr>
<td>30 d wt</td>
<td>34.6</td>
<td>34.3</td>
<td>33.4</td>
<td>32.5</td>
<td>31.5</td>
<td>32.4</td>
<td>33.2</td>
<td>30</td>
</tr>
<tr>
<td>100 d wt</td>
<td>90.5</td>
<td>82.4</td>
<td>84.5</td>
<td>86.1</td>
<td>78.3</td>
<td>87.9</td>
<td>81.7</td>
<td>81</td>
</tr>
</tbody>
</table>

E = East Friesian  
L = Lacaune  
C = ½ Dorset, ¼ Romanov (or Finn), ¼ Targhee  
D = Dorset
Table 2. 2006 Reproductive performance of 1 year old dairy ewes. EF and Lacaune ewes were artificially inseminated. All other were naturally bred with dairy breed rams. Natural breeding on October 1 and artificial insemination on October 15. All lambs were raised on milk replacer.

<table>
<thead>
<tr>
<th>Breeds*</th>
<th>E x L</th>
<th>L x E</th>
<th>EF</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of ewes at breeding</td>
<td>22</td>
<td>26</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>No. of ewes at lambing</td>
<td>22</td>
<td>26</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>No. of ewes aborted</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>No. of ewes open</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>No. of ewes lambed</td>
<td>18</td>
<td>20</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>No. of lambs born</td>
<td>29</td>
<td>30</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>No. of lambs weaned</td>
<td>24</td>
<td>23</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Fertility</td>
<td>81.8</td>
<td>76.9</td>
<td>42.3</td>
<td>33</td>
</tr>
<tr>
<td>Litter size</td>
<td>1.61</td>
<td>1.50</td>
<td>1.33</td>
<td>1</td>
</tr>
<tr>
<td>Survival to weaning</td>
<td>83</td>
<td>77</td>
<td>67</td>
<td>60</td>
</tr>
<tr>
<td>Birth weight</td>
<td>10.2</td>
<td>11.8</td>
<td>12.1</td>
<td>12.8</td>
</tr>
<tr>
<td>Weaning weight</td>
<td>31.8</td>
<td>31.2</td>
<td>34.2</td>
<td>36</td>
</tr>
<tr>
<td>100 d weight</td>
<td>81.4</td>
<td>73.1</td>
<td>92.3</td>
<td>82</td>
</tr>
</tbody>
</table>

*EF = East Friesian  
L = Lacaune  
x L or x E = various percentages of Lacaune or East Friesian
Table 3. 2005 milk production by lactation and genotypes

<table>
<thead>
<tr>
<th></th>
<th>Number of ewes</th>
<th>Average production (pounds)</th>
<th>%BF</th>
<th>Average days at milking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st lactation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ EF</td>
<td>10</td>
<td>473</td>
<td>5.6</td>
<td>175</td>
</tr>
<tr>
<td>½ Lacaune</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>¾ EF</td>
<td>2</td>
<td>410</td>
<td>4.9</td>
<td>177</td>
</tr>
<tr>
<td>¾ Lacaune</td>
<td>2</td>
<td>576</td>
<td>6.0</td>
<td>198</td>
</tr>
<tr>
<td>7/8 EF and EF</td>
<td>9</td>
<td>402</td>
<td>5.3</td>
<td>172</td>
</tr>
<tr>
<td>7/8 Lacaune and Lacaune</td>
<td>3</td>
<td>512</td>
<td>5.9</td>
<td>200</td>
</tr>
<tr>
<td>Lacaune x EF</td>
<td>27</td>
<td>433</td>
<td>5.3</td>
<td>162</td>
</tr>
<tr>
<td>EF x Lacaune</td>
<td>19</td>
<td>503</td>
<td>4.9</td>
<td>167</td>
</tr>
<tr>
<td>DY1 weaning</td>
<td>52</td>
<td>511</td>
<td>5.4</td>
<td>183</td>
</tr>
<tr>
<td>30 Day Weaning</td>
<td>20</td>
<td>327</td>
<td>4.9</td>
<td>134</td>
</tr>
<tr>
<td><strong>Total ewe lambs</strong></td>
<td>72</td>
<td>460</td>
<td>5.3</td>
<td>169</td>
</tr>
<tr>
<td><strong>2nd, 3rd, 4th lactation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ EF</td>
<td>23</td>
<td>592</td>
<td>5.8</td>
<td>193</td>
</tr>
<tr>
<td>½ Lacaune</td>
<td>15</td>
<td>567</td>
<td>6.6</td>
<td>220</td>
</tr>
<tr>
<td>¾ EF</td>
<td>19</td>
<td>795</td>
<td>5.6</td>
<td>214</td>
</tr>
<tr>
<td>¾ Lacaune</td>
<td>18</td>
<td>627</td>
<td>6.3</td>
<td>186</td>
</tr>
<tr>
<td>7/8 EF and EF</td>
<td>19</td>
<td>769</td>
<td>5.7</td>
<td>237</td>
</tr>
<tr>
<td>7/8 Lacaune and Lacaune</td>
<td>3</td>
<td>632</td>
<td>6.7</td>
<td>207</td>
</tr>
<tr>
<td>Lacaune x EF</td>
<td>67</td>
<td>745</td>
<td>5.9</td>
<td>208</td>
</tr>
<tr>
<td>EF x Lacaune</td>
<td>62</td>
<td>803</td>
<td>5.65</td>
<td>221</td>
</tr>
<tr>
<td><strong>Total adults</strong></td>
<td>226</td>
<td>729</td>
<td>5.9</td>
<td>209</td>
</tr>
<tr>
<td><strong>All ewes</strong></td>
<td>299</td>
<td>662</td>
<td>5.7</td>
<td>199</td>
</tr>
</tbody>
</table>

Table 4. 2005 milk production of ewes receiving or not receiving supplementation while grazing Kura clover-Orchard grass pastures.

<table>
<thead>
<tr>
<th></th>
<th>Ewes having lambed in January</th>
<th>Ewes having lambed in April</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pounds</td>
<td>% fat</td>
</tr>
<tr>
<td>Supplemented</td>
<td>779</td>
<td>6.2</td>
</tr>
<tr>
<td>Not supp.</td>
<td>768</td>
<td>6.2</td>
</tr>
</tbody>
</table>
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University of Wisconsin-Madison
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Madison, WI 53706
dlthomas@wisc.edu

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Thomas, Randy G Gottfredson, Yves M. Berger, Bruce R. Southey
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Introgression of the Gene for Increased Ovulation Rate (FecB) from the Booroola
Merino into a Rambouillet Flock - Bruce R. Southey, David L. Thomas, Randy G.
Gottfredson, Jim F. Elphick
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Southey, Sandra L. Rodriguez-Zas and Tristan L. Thomas
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Show Judges Respond to this Heavy Muscling Phenomenon? - Dennis Buege,
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