PROCEEDINGS OF THE TWENTY-FIRST ANNUAL

FLORIDA DAIRY PRODUCTION CONFERENCE

"Effective Management"

UNIVERSITY OF FLORIDA, GAINESVILLE

MAY 1-2, 1984

Sponsored by
Department of Dairy Sciences
Cooperative Extension Service
Agricultural Experiment Station
of the
Institute of Food and Agricultural Sciences
with Cooperation of State Dairy Organizations
Dairy Family Award: The Arthur Aukema Family of Chipley receives the Florida Farm Bureau Federation Dairy Family Award. (L to R) Karen and Gary Aukema, Gary and Joy McAffer and Bonnie and Arthur Aukema with granddaughter.

Olympian Award: Dr. Roger Natzke (L) presents plaque to Shirley and Joe Buckler, owners of Pine Valley Dairy in Lakeland.

Cover Photo: Al Hammond, Vice President of Production Credit Service of Alachua presents plaques to Dairy Herd Management winners. (L to R) John Legg, Robin Bowie, and Mike Mattox.
Dairy Senior Award: Award sponsored by Dairy Farmers, Inc. and represented by Beth McAffee. Others (L to R) Dr. Kermit Bachman, student advisor, Ed Henderson and Jim Frazel.

DHIA Awards (L to R): Wallace Eicher, Eicher’s Dairy; Earl Van Wagner, Van Wagner Dairy; Dale Eade, Bassett’s Dairy; Bart Bongers, Oak Lane Dairy; Norm Watts, Swiss Haven Dairy; Gary Aukema, Aukema Dairy and; Wayne Wiggins, Wiggins Dairy.
Head Table (L to R): Dan Webb, Bill Bassett, John Woeste, Christina Meinhardt, Karen and Roger Natzke, Tom Braddock, Jay Boosinger, George and Carol Richardson and, Mary Lee and Barney Harris.

This publication was promulgated at an annual cost of $993.86, or $1.66 per copy, to provide participants of the conference with a copy of each presentation.
To: FLORIDA DAIRYMEN AND THOSE IN RELATED ENTERPRISES

Re: TWENTY-FIRST ANNUAL FLORIDA DAIRY PRODUCTION CONFERENCE
MAY 1-2, 1984

Dear Dairy Cooperator:

The 21st Annual Florida Dairy Production Conference brought together authoritative speakers on topics of current major interest. Special thanks is extended to the speakers for their excellent presentations.

Special thanks is given to the Dairy Division of the State Department of Agriculture and Consumer Services, the Federal Land Bank Associations & Production Credit Associations of Florida, the Florida Farm Bureau Federation, Florida Bankers Association, FDCA, State DHIA Board, and DFI for their support and participation in the awards program on Tuesday evening, May 1.

A list of those attending the conference is included. Also, a list of the sponsors and those having display tables at the conference are recognized.

Roger P. Natzke
Chairman, Dairy Science Dept.

Barney Harris, Jr.
Conference Chairman
Extension Dairyman
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NAMES AND ADDRESSES OF THOSE ATTENDING THE FLORIDA DAIRY
PRODUCTION CONFERENCE, MAY 1-2, 1984.............................................80
1. Dairy Family Award - Sponsored by the Florida Farm Bureau Federation and recognizes a dairy family each year with a minimum of two generations, cooperative, involved in community activities, and have shown significant progress.

The Arthur Aukema family received the Dairy Family Award at the 1984 Florida Dairy Production conference. Family history takes us back to Holland where the father of Arthur Aukema lived until departing for the United States in 1921. After arriving in the U.S., he was employed as a tenant farmer in Ohio before settling on his own farm in Michigan. Most of the family (8 children) have remained in the midwest. Arthur migrated to West Florida in the early 50's, met and married Bonnie Wilks and started dairying in the area. Arthur and Bonnie have five children - Ann, Patsy, Bob, Joy and Gary. Joy and Gary remain on the farm with plans to continue the tradition of dairying. Gary, upon receiving his BS in Dairy Science at the University of Florida, returned to the dairy to become general manager. He and his wife Karen have two daughters - Mandi and Mitze. Joy's husband, Gary McAffee, has also become involved in the operation. The Arthur Aukema family are looking forward to a lot of happiness and satisfaction in the operation of their 485 cow dairy located at the Washington-Jackson County line near Chipley.

2. Dairy Herd Management Awards - Sponsored by Federal Land Bank Associations and the Production Credit Associations of Florida. The herds are selected from those nominated by the local County Extension staff.

a. Small Herd Division - Bowie's Dairy, located near Jacksonville, was recognized and honored during the Dairy Production Conference as the winner in the Small Herd Division. The 188 cow dairy, originally owned by Albert Bowie, is presently owned by his two sons -- Robert and John Bowie. Also, a grandson, Robin Bowie, serves as herd manager. In 1983 the herd averaged 14,975 lbs. of milk per cow and a projected minimum calving interval of 12.9 months. The recipient was nominated by Mike Kelly, County Extension Agent in Duval County.

b. Medium Herd Division - Shamrock Dairy, owned and managed by Collie, Steve and Mike Mattox of Washington County, was the recipient of the top award in the Medium Herd Division. Forages are an important part of the program and several varieties are grown for haylage. The present dairy was constructed in 1981 and houses 281 dairy cows with a rolling herd average of 15,462 lbs. milk. The management team are very much involved in community affairs and serve on several important committees. The recipient was nominated by Lenzy Scott, County Extension Director in Washington County.
c. Large Herd Division - Turnpike Dairy, owned and managed by Jimmy Legg of Martin County, received the top award in the Large Herd Management Division. Receiving the management award was his son, John Legg. The dairy moved to new facilities in 1980 and presently house 814 dairy cows with a rolling herd average of 14,727 lbs. of milk. The dairy stresses the importance of producing quality milk and have consistently been recognized by the State Department of Agriculture for their efforts. Turnpike Dairy is very supportive of county activities and has been very helpful in providing heifers for 4-H and FFA projects, according to Bob Whitty, County Extension Director in Martin County.

3. Olympian Award - Sponsored by the Florida Bankers Association.

The award recognizes one dairyman each year who has demonstrated that unique ability in accomplishing goals, is industrious, involved in community affairs, and has demonstrated good organization and progress. Such is the case at Pine Valley Dairy Inc. of Lakeland where Joe and Shirley Buckler have worked unselfishly for several years in promoting youth activities, quality cows and the Florida Dairy Industry. Mr. Buckler has been actively involved in the Florida DHIA Board, West Central DHIA, PDCA, Tampa IDFA, Florida Holstein Association, Florida Jersey Cattle Club and the Florida BS Association. The dairy was a pilot herd on DART and continues to utilize those benefits. Those attending the dairy show at the Florida State Fair can well appreciate the input provided by Pine Valley Dairy. We salute the Buckler family and the Pine Valley Dairy Management team for their hard work and unselfish support of the dairy industry.

4. Dairy Senior Award - Sponsored by Dairy Farmers Inc.

The 1984 senior winners were Ed Henderson of Bradenton and Jim Frazel of Davie, Florida. Two recipients in the Dairy Science Department were selected as winners due to their overall leadership abilities, involvement in school activities and grades. Both will receive BS degrees at the end of the 1984 summer term. While attending the University of Florida, Ed has served as VP of the Dairy Science Club as well as assisted in the Extension office on computer software programs. Jim is presently President of the Dairy Science Club and as such has been involved in setting up field trips and other activities involving the Dairy Science Club. Both students plan to return to management positions at dairies where they have had previous work experience.

5. PDCA Awards - Mr. Wayne Odegard, County Extension Director in Lafayette County, received the Purebred Dairy Cattle Association (PDCA) Plaque from PDCA President Bill Bassett. The plaque was presented in recognition of distinguished service and support of Purebred Dairy Cattle Association activities and in the promotion of purebred dairy cattle.
6. **DHIA Awards**

Certificates of recognition were presented to herds with 16,000 pounds of milk per cow annual average. Awards are based on rolling herd average (DHIA, DHIR, Supervised M-O) at the end of the 1983 DHI test year.

1. Eicher Dairy  
   83 cows  
   20,490 M  
   725 F
2. Van Wagner Dairy  
   206 cows  
   17,617 M  
   569 F
3. Crary Dairy  
   339 cows  
   17,313 M  
   599 F
4. Bassett's Dairy  
   1,049 cows  
   16,976 M  
   525 F
5. Square D Dairy  
   151 cows  
   16,950 M  
   589 F
6. Shreves Summerfield  
   116 cows  
   16,620 M  
   513 F
7. Highview Dairy  
   254 cows  
   16,617 M  
   ---
8. Oaklane Dairy  
   593 cows  
   16,557 M  
   ---
9. Swiss Haven Dairy  
   813 cows  
   16,251 M  
   519 F
10. Aukema Dairy  
    412 cows  
    16,138 M  
    541 F
11. Wiggins Dairy  
    154 cows  
    16,123 M  
    ---

7. **State Department of Agriculture and Consumer Services Top Three Honor Roll Awards for 1983**

The top three Honor Roll Awardees were as follows:

a. Small Division (under 200) - Sandlin Dairy, Wesley Sandlin, Hawthorne, Florida - 84 cows, 1,386 bacteria, and 200,000 SCC.

b. Medium Division (200-499) - Adams and Sons Dairy, Glen St. Mary, Florida - 215 cows, 2,573 bacteria and 431,000 SCC.

c. Large Division (500+) - Turnpike Dairy, Palm City, Florida - 691 cows, 2,725 bacteria and 253,000 SCC.

Other herds receiving Honor Roll Certificates were as follows:

**12 MONTHS**

Milo Thomas  
Ish Dairy  
P.O. Box 2409  
Tampa, FL 33601

Russell Dairy, Inc. #1  
2517 W. Brandon Road  
Brandon, FL 33511

Steve Yoder  
Bluebird Farm  
Route 2, Box 737  
Grand Ridge, FL 32442

Barber Brothers Dairy  
Don & Douglas Barber  
Route 2  
Cottontdale, FL 32431

R. L. Price  
R. L. Price Dairy  
1107 Webb Street  
Graceville, FL 32440

Ronald P. Buckholtz  
J-Ron Dairy  
Route 2, Box 333Z  
Bonifay, FL 32425

Neal Cleghorn  
Cleghorn & Son Dairy #2  
Route 2, Box 178N  
Clewiston, FL 33440

A. B. Thien Dairy  
12201 Kings Road  
Jacksonville, FL 32219

Corwith Davis  
Yellow Water Ranch  
Box 52, Ortega Station  
Jacksonville, FL 32210
Norman Nickerson Dairy
Route 1, Box 305
Wauchula, FL 33873

Proctor Dairy
Route 1, Box 17
Zolfo Springs, FL 33890

James H. Hendrie
H & H Dairy #1
P.O. Box 358
Venus, FL 33960

O. W. Goolsby
Sandy Gully Dairy
1939 NE Lakeview Avenue
Sebring, FL 33870

O. W. Goolsby
Triple G. Dairy
1939 SE Lakeview Avenue
Sebring, FL 33870

Jose Angel Rodriguez
R & B Dairy
Route 3, Box 585
Sanford, FL 32771

Koehn Dairy
Star Route B, Box 385
Walnut Hill, FL 32568

Howard Nickerson
White Owl Dairy
Route 5, Box 149X
Live Oak, FL 32060

John F. Carter
Green Oak Dairy
Route 1, Box 67 A-9
McAlpin, FL 32062

Thomas Brothers Dairy
Route 1
Mayo, FL 32066

James K. Mills Dairy
Route 3, Box 279
Live Oak, FL 32060

John M. McCullers
McCullers Farms
Route 2, Box 922
Okeechobee, FL 34972

James L. Legg
Turnpike Dairy
P.O. Box 395
Palm City, FL 33490

Hans Sorenson Dairy
Route 2, Box 93-A
Monticello, FL 32344

Sandra Skehan
Win-D-Oaks
2905 Youngs Road
Leesburg, FL 32748

Leon N. Lockhart
Lockhart's Dairy
10020 SW 105th Street
Ocala, FL 32671

Frank Denham &
Carl Sheffield
D & S Dairy
4700 NW 16th Place
Gainesville, FL 32601

24 MONTHS

L. E. Jones
Jones Dairy
9820 Plummer Road
Jacksonville, FL 32219

Marmarada Farm
11855 VC Johnson Road
Jacksonville, FL 32218

M & M Dairy
12094 New Berlin Road
Jacksonville, FL 32226

Ericson's Dairy
Route 2, Box 231
Wauchula, FL 33873

Richard J. McKenney
Hoosier Dairy
8933 Park Byrd Road
Lakeland, FL 33805

Ferrell Dairy
Route 4, Box 432
Okeechobee, FL 33472

H. W. Rucks & Sons #1
P.O. Box 95
Okeechobee, FL 33472

Blue Jay Farm
Route 1, Box 572A
Brooksville, FL 33512

Wesley Sandlin
Sandlin's Dairy
Route 2, Box 403
Hawthorne, FL 32640
Jerry Campbell  
Sandridge Dairy  
739 Lake Asbury Route  
Green Cove Springs, FL  32043  

36 MONTHS  

J. E. Walden Dairy  
Route 1, Box 2040  
Plant City, FL  33566  

Wyatt Shaw Dairy  
Route 2, Box 123  
Mayo, FL  32066  

David & Judith Solger  
S & S Greenwood Farms  
Route 1, Box 157-B  
Chipley, FL  32428  

Theo Berman and  
James Hazel  
Davie Dairy, Inc.  
Route 1, Box 1845  
Okeechobee, FL  33472  

Thomas J. Adams  
Adams & Sons Dairy  
Route 1, Box 1170  
Glen St. Mary, FL  32040  

James L. Davis  
McArthur Farms, Inc. #2  
Route 2, Box 457  
Okeechobee, FL  33472  

48 MONTHS  

E. Wayne Wiggins  
Wiggins Dairy  
Route 1, Box 1578  
Plant City, FL  33566  

Con-Dale Farm Dairy  
Route 1, Box 1361  
Anthony, FL  32617  

84 MONTHS  

Wallace Eicher  
Eicher Dairy  
Route 1, Box 175  
McDavid, FL  32568  

108 MONTHS  

Max W. Brantley, Jr.  
Brantley's Dairy  
3820 Turtle Mound Road  
Melbourne, FL  32905  

River Dairy  
2642 Flowing Well Road  
Deland, FL  32720  

150 MONTHS  

Ray N. Fields  
Square D Dairy  
Route 2, Box 252-A  
Dade City, FL  33525
ORGANIZATIONS SPONSORING THE DAIRY PRODUCTION CONFERENCE

1. Upper Florida Milk Producers Association
2. Tampa IDFA
3. South Florida IDFA
5. Cargill, Nutrena Feed Division - Expenses for the two California speakers, John Siebert and Doug Maddox

COMPANIES HAVING DISPLAYS AT THE DAIRY PRODUCTION CONFERENCE

1. Ag Bag Corp. of Florida
   Book Cunningham
   Rt. 1, Box 7008
   Crystal River, FL 32629

2. AID Laboratories, Inc.
   J. R. Graves
   P.O. Box 1607
   Okeechobee, FL 33472

3. Alfa-Laval & Southern Dairy Supply
   Paul Tracy
   3857 Conga Street
   Jacksonville, FL 32217

4. American Cyanamid Company
   David Liddell
   P.O. Box 1702
   Gainesville, FL 32602

5. American Breeders Service
   Nils Ericson
   P.O. Box 5986
   Lakeland, FL 33803

6. Babson Brothers Co.
   Bill Isaacs
   2839 Lenora Road
   Snellville, GA 30078

7. CEVA Laboratories
   John Olsen or Chris Mudd
   10551 Barkley, Suite 500
   Overland Park, KS 66212

8. Dairy Farms Inc.
   Beth Mahaffey or Bronson Lane
   P.O. Box 7854
   Orlando, FL 32854

   Rob Cherry
   3461 SW Palm City School Avenue
   Palm City, FL 33490

10. Elanco Products Company
    Denise Lasher
    17807 Rivendel Road
    Lutz, FL 33549

11. Fogelman Welding & Fabrication Works, Inc.
    Boyd Fogelman
    2170 Herron Road
    Whitsett, NC 27377

12. George M. Manter
    George M. Manter
    4138 Piper Drive
    Jacksonville, FL 32207

    Ellis Gulledge
    606 N. Parrott Avenue
    Okeechobee, FL 33472

14. Miracle Feeds, Inc.
    Mark Pate
    11111 N. 30th Street
    Tampa, FL 33612

15. Moorman Mfg. Company
    Charles Winstead
    P.O. Box 1C
    Quincy, IL 62301

16. NOBA, Inc.
    Don Hanson
    P.O. Box 374
    Interlachen, FL 32048
17. Pillsbury Company  
Gene Klotz  
3422 Sylvester Road  
Albany, GA 31705

18. Pine Point Farms  
Ed Pedrick  
RFD #1, Box 34  
Quitman, GA 31643

Cynthia Long Ambrutis  
RD #2  
Tunkhannock, PA 18657

20. Specialty Feeds Company  
Ken Denison  
1301 Estatewood Drive  
Brandon, FL 33511

21. Suntec Paint, Inc.  
Joseph Anderson  
P.O. Drawer DD  
Gainesville, FL 32602

22. TUCO  
Frank Rowley  
Rt. 6, Box 911  
Lake City, FL 32055

23. University of Florida Vet College  
Jan Shearer  
J136 JHMHC  
Gainesville, FL 32611

24. VA/NC Select Sires  
Danny Yant  
1428 Rosecrans Lane  
Green Cove Springs, FL 32043

Roger Vaught  
P.O. Box 510  
Auburn, AL 36830

26. West-Falia Systemat  
Jim Abercrombie  
Box 642  
Clemson, SC 29633
Muzzling the Milk Maligners

by

Dr. C. Bronson Lane
Executive Director, Dairy & Food Nutrition Council of Florida

Milk and dairy food products are probably the most maligned foods on the market today. They are criticized unscientifically and unjustifiably. Such criticisms usually come from individuals desiring to mislead the consumer into believing that imitations and other such products are equal or even superior in quality to dairy food products in order to promote their products. These myths, regardless of the source, do tend to hurt the sales of dairy products. It has even been stated that milk is only for babies, that milk causes juvenile delinquency and that milk causes pimples. One of the more serious concerns of the industry involves the cholesterol issue. The fact is, however, that if a person could lower his serum blood cholesterol level that it would preclude a premature heart attack. Most people don't realize that only 20% of cholesterol comes directly from a person's diet, and that the body also manufactures cholesterol and the level can rise when a person is under stress. Current research indicates that other factors, such as heredity, gender and pollutants, may be much more important than diet in coronary heart disease.

On the positive side, research is finding strong evidence that the adequate intake of calcium may preclude the development of brittle bones, a condition particularly prevalent among older women. Also, there is strong evidence that higher calcium intake will lower blood pressure in select population groups. And as for teenagers worried about their complexion, there is no correlation between diet and pimples, which are related to hormonal changes in adolescents.

The dairy industry can and must take some positive steps to impede the marketing inroads of imitations, blunt and debunk the unsubstantiated and unscientific claims that its products may be injurious to health, and increase per capita consumption of its product mix. The following actions are suggested:

1. Eliminate "dairy product dropouts" - those with flavor and texture defects - using sound quality control principles. We can't afford to subject consumers to a quality gamble as the stakes are too high. All products must be at optimal palatability at the time of purchase and possess adequate shelf lives. Excellent raw milk quality coupled with good manufacturing, distribution, and storage practices will protect dairy foods from premature body and flavor degradations.

2. Support school feeding programs and assist foodservice personnel in their endeavors to increase student participation in the lunch program which will lead to greater consumption of milk and other dairy foods. Studies in the U.S. show that school lunch participants have higher intakes of calcium and other select nutrients than non-participants.
3. Increase investment in innovative advertising and promotion campaigns which will create greater consumer demand for milk and milk products. Studies have shown that one can expect a two dollar return for every dollar expended for promotion of select dairy foods.

4. Invest in and support new product development which will expand commodity lines that will appeal to more segments of the market.

5. Implement use of the "REAL" Seal. This identifying insignia for U.S. genuine dairy products provides a public service, cuts through the clutter of conflicting media messages, enhances the perceived value of milk and milk products, and provides for a multiplicity of advertising "tie-ins".

6. Eliminate the concerns held by confused consumers who have been bombarded with sensationalist and misleading claims that milk and dairy foods consumption can be allegedly detrimental to health.

7. Support "subtle sell" nutrition education programs which encourage the use of the basic four food group approach in meal planning. Additionally, the industry must go on the offensive against the food faddists and dietary hucksters who often demean dairy foods and promote eating plans which are more harmful than helpful.

8. Invest heavily in basic research pertaining to dairy foods. Relatively recently, for example, it has been discovered that consumption of certain cheeses may help protect against development of dental caries, increased use of calcium rich dairy products may lower blood pressure in select population groups and preclude the onset of osteoporosis, and certain cultured dairy food organisms may have anti-carcinogenic properties.

The dairy industry can take pride in the fact that it still offers consumers the most nutrient dense foods at reasonable costs. But, it must be understood that our products won't "sell themselves". Aggressive promotion and marketing of high quality dairy foods coupled with heavy monetary investment in basic research to validate the positive contributions they make to the nutritional integrity of all individuals is imperative; lest we perish.
Facilities for Handling, Storing and Processing
Feedstuffs on the Farm

by
George Richardson
Florida Dairyman
Sanderson, Florida

In 1978, the decision was made to build an on farm feed mill at Richardson's Dairy. On the recommendation of Dr. Barney Harris, we visited four dairy farms with feed mill operations. We then designed and built our mill. Construction was started in November of 1978 and mill operation began in June of 1979.

Our feed mill is 140 feet long, 60 feet wide, and 24 feet at eave height. It is divided into 9 compartments. We have 8 compartments 20 feet by 20 feet, each of which can hold 80 to 100 tons, and 1 area for cottonseed hulls which is 40 feet by 60 feet, which can hold 400 tons. The feed mixing area is 20 feet by 40 feet.

All feed ingredients are put into the mill by overhead conveyors. Ingredients are moved from the storage area to an Oswalt stationary mixer with a small articulated loader. After mixing, the complete ration is stored in upright storage tanks and distributed to overhead feeders that serve feed troughs with self locking stanchions. All feeding is done in this manner except for feeding replacement heifers. Heifers are fed in pasture troughs with an auger wagon.

We lease a rail siding and also have facilities for receiving truck deliveries. All shipments are weighed in on truck scales at the farm. In 1983, we installed a bucket elevator with dump pit and two 25,000 bushel grain bins. We also purchased a roller mill. This addition allows us to use the small grains that are becoming more plentiful in the Southeast. In the past year, truck delivery has been more economical than rail.

Feed ingredients are bought from brokers and feed merchandisers. Brokers operate on a commission and merchandisers usually own the ingredient. We shop both when buying. Purchasing feed ingredients is not difficult. It is like buying a truck, tractor, or any other piece of equipment; you shop for the best deal. In this case, you shop by phone on the feed dealers' Watts line.

In 1982, we purchased a micro-computer to balance rations and keep our feed inventory. Reliable inventory accounting without a computer is extremely difficult. With many tons of ingredients moving in and out at different prices, the computer keeps accurate records of inventory and actual costs of ingredients on hand.

The economic advantages of on-farm feed mixing are considerable. The following table shows our cost for the fiscal year May 1, 1982 - April 30, 1983, and the same period for 1983-84. All costs have been included except hay fed in the pasture.
FEED COST PER TON

<table>
<thead>
<tr>
<th></th>
<th>1982-83</th>
<th>1983-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation(^1)</td>
<td>5.51</td>
<td>6.45</td>
</tr>
<tr>
<td>Labor(^2)</td>
<td>4.48</td>
<td>4.38</td>
</tr>
<tr>
<td>Interest</td>
<td>3.74</td>
<td>5.87</td>
</tr>
<tr>
<td>Insurance</td>
<td>.38</td>
<td>.34</td>
</tr>
<tr>
<td>Power</td>
<td>.21</td>
<td>.34</td>
</tr>
<tr>
<td>Fuel</td>
<td>.21</td>
<td>.20</td>
</tr>
<tr>
<td>Ingredient cost(^3)</td>
<td>105.40</td>
<td>131.24</td>
</tr>
<tr>
<td>Total</td>
<td>$119.93</td>
<td>$148.71</td>
</tr>
</tbody>
</table>

\(^1\)Equipment is depreciated in five years. Building is depreciated in fifteen years. Anticipated useful life of equipment is fifteen years; of the building is thirty years.

\(^2\)Total labor cost for one employee includes wages, health insurance, employer's share of FICA, all bonus and retirement plan benefits. This employee spends only 75% of his work hours in feed operation, which is his main duty. All costs are charged to feed mixing, however.

\(^3\)The rations fed in 1982-83 contained 25% cottonseed hulls and in 1983-84 contained 19% cottonseed hulls. No urea was used. Crude protein was approximately 14%.

We produced complete rations for 576 adult cows and 450 replacement heifers in 1982-83. 44% of net milk income (less all Co-op deductions) was used to feed all animals. Net milk income was $16.09/cwt. Charging all feed against milk receipts, the feed cost per hundred weight of milk was $7.08. In 1983-84, we fed 661 cows and 600 heifers. 49.5% of milk income was used for feed during this period. Net milk price was $14.60/cwt. and feed cost per hundred weight of milk was $7.23.

Assuming a price difference of $25.00 per ton for commercially mixed feed over our cost:

1982-83  4454 tons at $25.00 Diff. = $111,350.00
1983-84  4970 tons at $25.00 Diff. = $124,250.00

The price differential of $25.00 per ton of commercial feed could prove to be high or low. We have a total of $220,000.00 invested in the feed facility. The figures shown above indicate a two year pay-off possible.

I urge you to take these figures and compare your cost. The on-farm feed mill is not for everyone. It is a separate business and must be approached with a sound business attitude. Whether we, as Florida dairy farmers mix our own feed or produce silage, we must gain control of our feed dollars.
EFFECTS OF GROWTH HORMONE ON MILK YIELD IN CATTLE

by

Robert J. Collier (Ph.D.)
Associate Professor
Department of Dairy Science
University of Florida
Gainesville 32611

Introduction

Growth hormone is a polypeptide hormone which is secreted from the anterior pituitary of the cow. Early research demonstrated that this hormone will increase growth rates and milk yield in cattle (Brumby, 1959; Brumby and Hancock, 1955). However, it was not possible to produce sufficient quantities for commercial use. Recent breakthroughs in biotechnology have now made study and commercial use of this hormone a reality.

Effects on Milk Yield

Injections of growth hormone have been known to increase growth rates in growing animals and milk yield in lactating dairy cattle. Therefore, this hormone is of great potential benefit to the dairy industry. Of the two processes, lactation has the greatest potential economic return. Therefore, it is not surprising that the majority of studies done with growth hormone in cattle have been lactation trials. To date, the only published report of growth hormone effects on growing cattle is the initial report by Brumby (1959) in which a positive response was reported. Studies in laboratory animals indicate that effects of growth hormone on growth are in part mediated by a wide variety of tissue specific growth factors (Bradshaw and Spron, 1983). The potential use of these growth factors in cattle remains to be elucidated.

Table 1, demonstrates the lactation responses reported by various investigators using different preparations of growth hormone at different stages of lactation. As can be noted from Table 1, growth hormone injections increase milk yield at every stage of lactation. The actual increase in milk yield appears to be similar in cattle in early or late lactation. However, due to lower milk yield during late lactation the percentage increase in milk yield is higher in these animals. Also apparent in Table 1, is the fact that genetically engineered or recombinant produced growth hormone was as effective as growth hormone of pituitary origin in increasing milk yield.
Recombinant growth hormone is produced by removing the growth hormone gene from cells in the pituitary of the cow and inserting this gene into bacteria. The bacteria then gain the capability to produce this hormone. Since bacteria grow quite rapidly it is possible to produce large quantities of the hormone in a short period of time. Thus, for the first time it is feasible to consider commercial use of growth hormone to increase productivity of dairy cattle.

Also of economic importance is the finding that cattle injected with growth hormone eat very little additional feed to produce the increase in milk yield. Growth hormone injection apparently causes an increase in gross efficiency of feed energy conversion to milk energy. This increase in gross efficiency of feed conversion does not appear to be due to a change in partial efficiency of energy utilization of metabolizable energy for milk synthesis (Tyrell et al., 1982). Growth hormone appears to cause a preferential partitioning of nutrients to the mammary gland at the expense of other tissues.

Thyroxine is also known to increase milk yield in cattle. However, long-term use of thyroid compounds resulted in "burned out" cows. Cattle on thyroid compounds did not produce as much milk in the subsequent lactation following treatment. We compared thyroxine and growth hormone injections on blood substrate concentration and their supply to the mammary gland to determine if growth hormone treatment would alter nutrient partitioning in cattle in a manner similar to thyroxine.

As shown in Table 2, both growth hormone and thyroxine treatment resulted in substantial increases in milk yield and fat yield. Also, both treatments resulted in large increases in mammary blood flow, Table 3. Increasing mammary blood flow would greatly increase nutrient availability to the udder. The increase in blood supply to the mammary gland was achieved by increasing the output of the heart, Table 3. This demonstrates that the heart acting as a pump increased its output to deliver more blood to the mammary gland. Did the growth hormone and thyroxine injection directly cause the increase in blood supply to the mammary gland. Probably not since blood flow is largely determined by metabolic activity of the tissue. An alternative explanation is that growth hormone and thyroxine increase the rate of milk synthesis. This increased metabolic activity results in the increase in mammary blood flow.

Data in Tables 4 and 5 demonstrate the difference between growth hormone and thyroxine treatment. Growth hormone injection did not result in any change in blood glucose, free fatty acids or triglycerides. This indicates that the increase in milk yield caused by growth hormone injection did not cause an excessive increase in fat metabolism. However, thyroxine treatment resulted in large increases in arterial free fatty acid and glucose concentrations and a decrease in triglyceride concentrations, Tables 4 and 5. This indicates that substantial mobilization of body reserves occurs in the thyroxine treated animal due in part to the fact that thyroxine treatment results in an increase in whole body metabolism while growth hormone treatment
primarily increase the metabolic rate of the mammary gland. Of practical importance to the dairy farmer is the possibility that long term use of growth hormone in lactating cows should not be detrimental to their health or lifetime production.

Much additional research is required to determine effects of growth hormone under different feeding and management regimens. Data from Table 1 demonstrated that all breeds of Bos taurus respond to the hormone. However, research is also needed in the Bos indicus breeds to determine their response to this hormone. Additionally it is not known what effects different environments may have in response of cattle to growth hormone treatment.
References


<table>
<thead>
<tr>
<th>Reference</th>
<th>Breed</th>
<th>Stage of lactation</th>
<th>Control milk yield, kg</th>
<th>Δ Milk yield, kg</th>
<th>Δ Milk yield, %</th>
<th>GH&lt;sup&gt;a&lt;/sup&gt; dose mg</th>
<th>Duration GH treatment</th>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brumby and Hancock (1955)</td>
<td>Mixed breeds</td>
<td>Peak</td>
<td>11.0</td>
<td>7.0</td>
<td>64</td>
<td>50</td>
<td>12 wk</td>
<td>Grass + Meal (oats:bran, 4:1)</td>
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<tr>
<td>Brumby and Hancock (1955)</td>
<td>Mixed breeds</td>
<td>Late (265 d)</td>
<td>7.0</td>
<td>3.0</td>
<td>43</td>
<td>50</td>
<td>4 wk</td>
<td>Pasture only</td>
</tr>
<tr>
<td>Bines et al. (1980)</td>
<td>Friesian</td>
<td>7 mo</td>
<td>18.0</td>
<td>2.3</td>
<td>12.5</td>
<td>30</td>
<td>1 wk</td>
<td>Hay concentrate</td>
</tr>
<tr>
<td>Davis et al. (1983)</td>
<td>Jersey</td>
<td>3-6 mo</td>
<td>16.2</td>
<td>3.0</td>
<td>18.7</td>
<td>40</td>
<td>4 wk</td>
<td>Complete diet</td>
</tr>
<tr>
<td>Machlin (1973)</td>
<td>Holstein</td>
<td>NR</td>
<td>13.3</td>
<td>3.3</td>
<td>25</td>
<td>33</td>
<td>10 d</td>
<td>Complete diet</td>
</tr>
<tr>
<td>Machlin (1973)</td>
<td>Holstein</td>
<td>NR</td>
<td>14</td>
<td>5.0</td>
<td>35</td>
<td>40</td>
<td>8 wk</td>
<td>Complete diet</td>
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<tr>
<td>Peel et al. (1983)</td>
<td>Holstein</td>
<td>Early</td>
<td>28</td>
<td>4.3</td>
<td>14</td>
<td>44</td>
<td>10 d</td>
<td>Complete diet</td>
</tr>
<tr>
<td>Peel et al. (1983)</td>
<td>Holstein</td>
<td>Late</td>
<td>12</td>
<td>3.9</td>
<td>31</td>
<td>44</td>
<td>10 d</td>
<td>Complete diet</td>
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</table>

<sup>a</sup>GH = growth hormone.
NR = not reported.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Growth Hormone</th>
<th>Thyroxine</th>
<th></th>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
<td>SEM</td>
<td>Δ(%)</td>
<td>Control</td>
<td>Treatment</td>
<td>SEM</td>
</tr>
<tr>
<td>Milk yield (kg/day)</td>
<td>16.2</td>
<td>19.2</td>
<td>0.2</td>
<td>+18.7</td>
<td>15.5</td>
<td>19.4</td>
<td>0.4</td>
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<tr>
<td>Milk fat %</td>
<td>4.86</td>
<td>5.11</td>
<td>0.08</td>
<td>+5.1</td>
<td>4.63</td>
<td>5.41</td>
<td>0.14</td>
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<tr>
<td>Milk fat yield (g/udder half)</td>
<td>370.7</td>
<td>495.6</td>
<td>29.6</td>
<td>+33.7</td>
<td>365.6</td>
<td>527.6</td>
<td>12.1</td>
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</table>

140 mg/day Miles Lot #12
25 ng/day
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Growth Hormone</th>
<th>Thyroxine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
</tr>
<tr>
<td>Half udder blood flow (L/min)</td>
<td>2.43</td>
<td>3.22</td>
</tr>
<tr>
<td>Cardiac output (L/min)</td>
<td>46.20</td>
<td>50.30</td>
</tr>
</tbody>
</table>

140 mg/day Miles Lot #12
225 mg/day
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Growth Hormone&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Thyroxine&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
</tr>
<tr>
<td>Arterial glucose (mg %)</td>
<td>70.7</td>
<td>70.7</td>
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<tr>
<td>Glucose uptake (mg/min)</td>
<td>429.3</td>
<td>507.4</td>
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<tr>
<td>Acetate A-V (mg %) difference</td>
<td>6.62</td>
<td>7.79</td>
</tr>
<tr>
<td>Acetate uptake (mg/min)</td>
<td>160.9</td>
<td>250.8</td>
</tr>
</tbody>
</table>

<sup>1</sup>40 mg/day Miles Lot #19
<sup>2</sup>25 mg/day
Table 5. Effect of Growth Hormone and Thyroxine on Free Fatty Acid Supply and Triglyceride Uptake at the Mammary Gland.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Growth Hormone</th>
<th>Thyroxine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
</tr>
<tr>
<td>Art [FFA] (μeq/L)</td>
<td>302.2</td>
<td>361.2</td>
</tr>
<tr>
<td>FFA Supply (μeq/L)</td>
<td>734.3</td>
<td>1163.1</td>
</tr>
<tr>
<td>Art [TG] (ng/100 ml)</td>
<td>33.3</td>
<td>35.2</td>
</tr>
<tr>
<td>TG A-V diff (ng/100 ml)</td>
<td>14.7</td>
<td>14.3</td>
</tr>
<tr>
<td>TG Uptake (ng/100 ml)</td>
<td>364.8</td>
<td>468.3</td>
</tr>
</tbody>
</table>

140 mg/day Miles Lot #19
225 mg/day
Tremendous Differences Exist in Economic Efficiency of Dairy Farms

by
Dr. John W. Siebert
Extension Economist
University of California -- Davis

Surplus dairy product purchases appear to be down by at least forty percent for the months of March and April. This is great news. Even so, the dairy industry has quite a way to go before the surplus problem is solved. As the economic crunch continues, only one thing is certain -- the future belongs to the efficient.

A survey of seventy-six Southern California dairy farms reveals significant differences in farm performance. When corrected for herd size differences, average monthly profits ranged from $6,050 among the top 25% of farms down to -$9,528 among the bottom 25% of farms. Bankers and others can take notice. All dairy farms are not alike.

The statistics analyzed herein come from the California Bureau of Milk Stabilization's Feedback Information. This cost information is used as an input to setting the price of Class 1 Milk in California.

These statistics pertain only to the months of December 1983 or January 1984. As such the cost for herd replacements has been set at the average for all dairies so as to prevent distortions. Also, this cost has been reduced by twenty percent to account for a return to owner raised animals.

Another adjustment which must be made concerns interest expense. The Bureau figures interest expense based on the assumption that the entire farm is financed. To allow for fifty percent owner equity, we will cut this expense in half. Even so, keep in mind that this study cannot account for the true out-of-pocket interest expenses of dairy farmers.

The final adjustment to the Bureau's data will be the elimination of the depreciation expense. This is certainly a real cost of doing business. However, in the short run it is not a cash cost.

Income per Hundredweight

Table 1 provides a comparison of income per hundredweight (cwt.) of milk produced. The statistics are presented in three columns. The first column is an average for the most profitable nineteen farms. The second column is an average for all seventy-six farms. Finally, the last column is an average for the least profitable nineteen farms.

The performance differences are startling. As shown on the bottom line, the most profitable farms average an income of $0.82/cwt. In contrast, the least profitable farms lose $1.21/cwt. Overall, the average farm made only $0.03/cwt. Certainly times are tough. Even so, some farms are making good money. How are they doing it?
As shown in table 1, price is not the answer. In fact, the most profitable farms had a lower milk price than the average or least profitable farms.

Feed costs and labor costs account for the major differences in farm performance. Feed costs per cwt. of milk are $0.50 lower than average in the most profitable group and $0.59 higher than average in the least profitable group. The case is similar with labor costs. Labor costs per cwt. are $0.25 lower than average in the most profitable group and $0.39 higher in the least profitable group.

Key Differences

Why is performance so different between these farms? In the area of feeding it would seem likely that careful buying of feed ingredients, computerized ration formulation and careful feeding are the keys. Differences in feed costs as a percentage of receipts are shown on line 1 of table 2.

In the area of labor, line 2 table 2 shows that milkers actually make more per hour on the most profitable farms. Wage rates range from $10.80 per hour on the most profitable farms down to $9.20 per hour on the least profitable farms. The average wage was $10.30 per hour. Note that this wage includes all the employer's cash and non-cash expenses.

When comparing milk production, real differences appear. Line 3 of table 2 shows that milk production per cow per year ranges from 17,568 lbs. in the most profitable group down to 14,880 lbs. in the least profitable group. The average milk production per cow per year was 16,200 lbs. As would be expected, culling rates are higher on the most profitable farms. Such rates range from 33.5% on the most profitable farms down to 27.3% on the least profitable farms. The average cull rate was 31.0%.

Herd Sizes

Finally a comment is necessary regarding herd size. The most profitable farms had an average herd size (milking and dry) of 647 cows. This compares to 441 cows on the least profitable farms and 568 on the average for all farms. Does this mean all farmers should strive for growth? No. The most profitable farms also have the highest cull rates.

As the dairy industry continues to progress genetically, the most important factor determining the success of any farm will be efficiency and not size. For drylot dairy farms, it is probably a safe statement that physical economies of size are fully realized by the time the herd reaches 400 cows.

As a final comment, it should be noted that economic efficiency has two dimensions. These two dimensions are the physical and the financial. Due to data limitations, this paper has focused only on physical efficiency. Regarding the financial side, I can only say that I have never seen a dairy farmer go broke by culling too much. As times get tougher, standards for cows, labor, and borrowing money must all increase.
Table 1. Performance Comparison of 76 Southern California Dairy Farms for the Month of December 1983 or January 1984*

<table>
<thead>
<tr>
<th></th>
<th>Average Top 19 Farms</th>
<th>Average All 76 Farms</th>
<th>Average Low 19 Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($/cwt)</td>
<td>($/cwt)</td>
<td>($/cwt)</td>
</tr>
<tr>
<td>Farm milk price</td>
<td>12.18</td>
<td>12.46</td>
<td>12.60</td>
</tr>
<tr>
<td>Feed cost</td>
<td>7.31</td>
<td>7.81</td>
<td>8.40</td>
</tr>
<tr>
<td>Labor cost</td>
<td>1.22</td>
<td>1.47</td>
<td>1.86</td>
</tr>
<tr>
<td>Operating cost**</td>
<td>1.33</td>
<td>1.50</td>
<td>1.72</td>
</tr>
<tr>
<td>All other costs***</td>
<td>1.50</td>
<td>1.65</td>
<td>1.84</td>
</tr>
<tr>
<td>Total costs</td>
<td>11.36</td>
<td>12.43</td>
<td>13.81</td>
</tr>
<tr>
<td>Net income****</td>
<td>0.82</td>
<td>0.03</td>
<td>-1.21</td>
</tr>
</tbody>
</table>

* Source: California Bureau of Milk Stabilization with modifications as described in text.

** Operating costs include veterinarian, supplies, utilities, repairs, maintenance, fuel, DHIA, truck and tractor use, etc.

*** All other costs include interest, herd replacement, taxes and insurance.

**** The following expenses must be paid out of net income: depreciation, return on owner equity, and return to raising replacements.

Table 2. Key Statistical Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Average Top 19 Farms</th>
<th>Average All 76 Farms</th>
<th>Average Low 19 Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($/cwt)</td>
<td>($/cwt)</td>
<td>($/cwt)</td>
</tr>
<tr>
<td>Feed cost as a % of income</td>
<td>60.0%</td>
<td>62.7%</td>
<td>66.6%</td>
</tr>
<tr>
<td>Milker wage per hour</td>
<td>$10.80</td>
<td>$10.30</td>
<td>$9.20</td>
</tr>
<tr>
<td>Production per cow per year**</td>
<td>17,568 lbs.</td>
<td>16,200 lbs.</td>
<td>14,880 lbs.</td>
</tr>
<tr>
<td>Culling rate</td>
<td>33.5%</td>
<td>31.0%</td>
<td>27.3%</td>
</tr>
</tbody>
</table>

* Source: California Bureau of Milk Stabilization with modifications as described in text.

** Milk marketed divided by all cows.
Conceptus Survival In Cattle

W. W. Thatcher\textsuperscript{1}, J. McDermott\textsuperscript{1}, J. J. Knickerbocker\textsuperscript{1}, W. Bradley\textsuperscript{2}, M. Drost\textsuperscript{2} and J. Martin\textsuperscript{2}

Dairy Science Department\textsuperscript{1}; Department of Reproduction\textsuperscript{2}, Veterinary College; Larson Dairy, Inc.\textsuperscript{3}

It has been estimated that rates of fertilization failure were approximately 13\%, whereas rates of embryonic mortality, as a percentage of cattle inseminated, averaged about 15\%. These are the two major causes of reproductive failure in dairy cattle that contribute to an overall failure rate of approximately 40\%. During the summer periods in Florida, these losses are much greater due to heat stress effects on the maternal unit.

Maintenance of the corpus luteum (CL) in cattle is required if pregnancy is to persist. Uterine production of prostaglandin \(\text{F}_{2\alpha}\) (PGF\(_{2\alpha}\)) causes CL regression in cyclic cattle. Maintenance of the CL and hence survival of the conceptus or embryo depends upon the ability of conceptus produced products to "signal" the uterine endometrium and/or ovary to maintain the CL. The signal is initiated or produced by the conceptus between 15 to 17 days after estrus. A protein produced by the conceptus is involved because we have demonstrated that conceptus secretory proteins (produced by the conceptus during a 24 hour incubation in a culture dish at 37\(^\circ\)C) will extend life span of the CL when injected twice daily into the uterine lumen from day 15.5 to day 21. Cows given the conceptus secretory proteins returned to estrus at a mean of 33.4 days (n=3 cows) \textbf{versus} 23.5 days (n=3 cows) for the control group. These results combined with plasma progesterone analyses indicate that the conceptus is able to prevent regression of the CL which is essential for maintenance of pregnancy. Research is being continued to characterize and purify the specific protein so that we may be able to improve conceptus survival in the future. At the present time, we know that the conceptus secretory proteins reduce the ability of the uterus to secrete PGF\(_{2\alpha}\) when estradiol is injected at day 18 postestrus.

Research in our and other laboratories indicates that injection of Human Chorionic Gonadotrophin (HCG) will extend estrous cycles in cattle. We have conducted a series of experiments to examine if HCG delays CL regression, if it does how does it act, and if injection of HCG will improve pregnancy rates.

In all of our experiments, HCG (3300 IU) was injected intravenously at day 15 of the estrous cycle; day 15 just precedes the critical time when the conceptus "signals" or initiates the pregnancy recognition process or extends life span of the CL. In experiment I, injection of HCG caused animals (n=15) to have an estrous cycle length of 24.0 days \textbf{versus} 20.0 days for control animals (n=15). Analyses of plasma progesterone indicated that CL regression was delayed by approximately 3 weeks.

days for animals injected with HCG. HCG may delay CL regression via several possible mechanisms such as: blocking the luteolytic action of PGF<sub>2α</sub>, reducing uterine secretion of PGF<sub>2α</sub>, altering ovarian activity that delays ovarian induced secretion of uterine PGF<sub>2α</sub>, or induction of a new ovulation and CL formation.

Experiment II indicated that injection of HCG on day 15 did not block the luteolytic effect of a PGF<sub>2α</sub> injection (25 mg) given 24 hours later on day 16. Both groups of cows (HCG or Saline treatments) had an abrupt decrease in plasma progesterone associated with CL regression that occurred on day 17 and 18 following the injection of PGF<sub>2α</sub>. All control cows (n=5) had an induced estrus on day 18.5. In contrast none of the HCG treated cows had a detected estrus by day 25. Although HCG treated cows had an abrupt decrease in plasma progesterone concentrations, values did not go below 1 ng/ml, and these values were sustained until at least day 28. When additional cows (n=3) were treated (HCG on day 15 plus PGF<sub>2α</sub> on day 16) and ovariectomized on day 18, the ovarian responses were clear. The original CL was regressed, several follicles were luteinized and a new CL (≥2.5 days old) was present. Consequently, HCG did not block the luteolytic effect of exogenous PGF<sub>2α</sub> and ovulated a follicle that was present on day 15. Formation of a new CL and luteinization of follicles were probably responsible for the sustained basal levels of P<sub>4</sub> in the range of 1 to 2.5 ng/ml. The important point of the experiment was that HCG did not block the luteolytic effect of PGF<sub>2α</sub> (25 mg) that was injected.

Experiment III was conducted to determine if HCG reduced the uterine secretion of PGF<sub>2α</sub> when ovariectomized cows were injected intravenously with estradiol (3 mg). The experimental model was that ten cows were ovariectomized on day 14 of the estrous cycle, injected with either HCG (n=5 cows) or saline (n=5 cows) on day 15, and all were injected with estradiol on day 16. Progesterone concentrations of 2 ng/ml of plasma were maintained by installation of a "Progesterone Release Intravaginal Device" (PRID) on day 13 or 24 hours prior to ovariectomy (day 14). The uterine secretion of PGF<sub>2α</sub> induced by estradiol injected on day 16 was monitored over a 10 hour period (30 min sample) in which plasma concentrations of 15 keto-13,14 dihydro-PGF<sub>2α</sub> were measured. Results indicated that estradiol induced PGF<sub>2α</sub> secretion, but the response was the same for cows treated with either HCG or saline. Implications are that HCG does not directly inhibit uterine secretion of PGF<sub>2α</sub> in ovariectomized cows, and that a delay of CL regression in intact cows (Experiment I) is likely due to some ovarian effect (e.g. follicle luteinization) which delays the normal ovarian induced secretion of PGF<sub>2α</sub> from the uterus that would cause CL regression. It is important to recognize that mechanisms of luteal maintenance brought about by HCG and conceptus secretory proteins are probably different. The reason for this assumption is that we know uterine PGF<sub>2α</sub> secretion in response to an injection of estradiol is reduced in cows treated with conceptus secretory proteins but not when treated with HCG.

At this point, a series of field experiments (IV and V) was conducted at Larson's Dairy, Inc., Okeechobee, FL to determine if injection of HCG on day 15 postinsemination affected pregnancy rates.
Our rationale for treatment was that an induced delay in CL regression may permit developing conceptuses an additional 24 to 48 hours to expand so they would have a greater probability of blocking the normal cyclic release of PGF2α that causes CL regression. Two hundred and four heifers were injected randomly with either HCG or saline on day 15 postinsemination. Injections were completed over a 7 day period (October 9 to 16, 1983), and all heifers palpated for pregnancy on 12-14-83 between 74 to 81 days of pregnancy. Pregnancy rates for Experiment IV are presented in Table I.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>ALL SERVICES</th>
<th>SERVICE 1</th>
<th>2-5 (POOLED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL MEAN</td>
<td>46.6%</td>
<td>53.2%</td>
<td>31.7%</td>
</tr>
<tr>
<td>HCG</td>
<td>51.9%</td>
<td>59.7%</td>
<td>34.4%</td>
</tr>
<tr>
<td>(54/104)</td>
<td>(43/72)</td>
<td>(11/32)</td>
<td></td>
</tr>
<tr>
<td>SALINE</td>
<td>41.0%</td>
<td>46.4%</td>
<td>29.8%</td>
</tr>
<tr>
<td>(41/100)</td>
<td>(32/69)</td>
<td>(9/31)</td>
<td></td>
</tr>
<tr>
<td>DIFFERENCE</td>
<td>+10.9%</td>
<td>+13.3%</td>
<td>+5.4%</td>
</tr>
</tbody>
</table>

a 3,300 International Units (IU) given intravenously.

Overall pregnancy rate was 46.6%, and a clear difference was detected between heifers bred to their first service versus services 2 to 5 (53.2% > 31.7%). Pregnancy rates were lower than expected and may be due to a continued heat stress effect during early fall in South Florida. HCG caused a significant (P<.10) overall increase in pregnancy rate of 10.9%, and the benefit was greater in first service heifers (13.3%) than those presented for second to fifth services (5.4%). In heifers that were not pregnant, inter service intervals were 29.0 and 24.0 days for HCG (n=36) and saline (n=49) treated heifers, respectively. If inter service intervals are restricted to cycles less than 38 days (to avoid the bias of possible missed heats), then inter service intervals for HCG (n=27) and saline (n=42) groups were 24.3 and 21.3 days, respectively. This 3 day delay agrees closely with the earlier results in Experiment I.

An exact replicate of Experiment IV was repeated during a 20 day period of February 18 to March 9, 1984 (Experiment V). Reasons for replicating the experiment were two fold: to repeat or further document the beneficial effect of HCG and perform the experiment when herd fertility would be higher (cooler period of year).
TABLE 2. PREGNANCY PERCENT IN 206 HEIFERS TREATED WITH HCG\textsuperscript{a} OR SALINE AT DAY 15 POSTINSEMINATION: TRIAL II.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>ALL SERVICES</th>
<th>SERVICE 1</th>
<th>2-5 (POOLED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL MEAN</td>
<td>61.2%</td>
<td>68.8%</td>
<td>36.7%</td>
</tr>
<tr>
<td>HCG</td>
<td>54.8%</td>
<td>63.3%</td>
<td>29.0%</td>
</tr>
<tr>
<td>(57/104)</td>
<td>(50/79)</td>
<td>(7/25)</td>
<td></td>
</tr>
<tr>
<td>SALINE</td>
<td>67.6%</td>
<td>74.4%</td>
<td>45.8%</td>
</tr>
<tr>
<td>(69/102)</td>
<td>(58/78)</td>
<td>(11/24)</td>
<td></td>
</tr>
<tr>
<td>DIFFERENCE</td>
<td>-12.8%</td>
<td>-11.1%</td>
<td>-17.8%</td>
</tr>
</tbody>
</table>

\textsuperscript{a} 3,300 International Units (IU) given intravenously.

As described in Table II, 206 heifers were treated randomly with either HCG or saline. Overall pregnancy rate was 61.2%, and a clear difference in pregnancy rate was detected between first service (68.8%) and services 2-5 (36.7%). Results of Experiment V indicated that HCG decreased overall pregnancy rate by 12.8% compared to the control group (54.8% < 67.5%). Furthermore, this decrease due to HCG was expressed uniformly in groups of heifers presented for first service (-11.1%) or 2 to 5 services (-17.8%).

The contrasting results of both experiments were unexpected but quite interesting. A pooled statistical analysis with 410 heifers indicated that their was a highly significant "Experiment by Treatment" interaction. Biologically this means that HCG had affects on fertility in both experiments, but the effects differed (positive in Experiment IV and negative in Experiment V) between experiments. It is also important to recognize that both experiments represent sensitive systems for testing a treatment effect on pregnancy rate. The experiments were: conducted on one farm, completed over a short period of time (7 to 20 days), inseminations were made by essentially one inseminator who was the same for both experiments, and heifers were uniform in quality and assigned randomly to treatments. Thus, why were the treatment effects different between the two trials? There may have been a true effect of environment between the two experiments. Fertility was lower in Experiment IV. If this was due to a heat stress than conceptuses that survive may benefit from a delay in luteal regression which will permit them an additional period for elongation of extraembryonic membranes. Such a benefit may account for the 10.9% increase in fertility. In contrast, heifers in Experiment V did not have to cope with possible thermal stress effects and pregnancy rate was indeed higher (saline group of Experiment V, 67.6% versus 41.0% for saline group of Experiment IV). In fact, animal ovarian responsiveness was different between the two experiments. The frequency of double corpora lutea between pregnant heifers, treated with HCG versus saline, for Experiment IV (HCG, 7 of 54 [13.0%] versus saline, 0 of 41 [0%]) and
Experiment V (HCG, 17/56 [30.4%] versus saline, 3 of 69 [4.4%]) were different. Ovaries appeared to be more responsive to HCG in Experiment V, and this increased ovarian sensitivity to HCG may exert an overall detrimental effect when embryo survival or fertility is high. Although reasons for the differential response of pregnancy rate to HCG are not now apparent, the potential benefit in periods of lower fertility, associated with a possible heat stress, justifies a third replicate during the intense summer months (e.g., July) of thermal stress. It is not a surprise to Florida dairymen that factors governing fertility during summer and early fall (heat stress periods) differ from those of late fall to early spring. Consequently, a seasonal difference of HCG effects on pregnancy rate may not be surprising. We all look forward to results of Experiment VI to be replicated in July, 1984 during the heat stress period of South Florida.
Dairy Science Department Activities
Dr. Roger P. Natzke, Chairman

Each year it is my privilege to report to you some of the significant accomplishments of the previous year and share with you some of the concerns of the department. This year has been a very exciting one for us.

Florida Ag in the 80's

One of the truly significant events of the year was the implementation of our segment of the Florida Ag in the 80's program. You will recall from last year that members of the dairy advisory committee, the Dairy Science faculty and faculty members with interest in dairy from other departments prepared a report to project the probable status of the industry in 1990. In addition the committee made a list of changes in program thrust so that the department could better meet the needs of the industry.

Suggested New Emphasis Areas

Computer Use

The computer has become an integral part of our undergraduate curriculum. Our newest faculty member, Dr. DeLorenzo, developed an advanced dairy management course which is based almost entirely on computer based examples. From now on it will be virtually impossible to get a degree in Dairy Science without being computer competent. Dr. Van Horn is starting to use the computers in his nutrition course and the computer is being used by Dr. Harris for developing rations in his extension effort. Thanks to a grant from Upper Florida Milk Producers and Independent Dairy Farmers of Ft. Lauderdale, Dr. Webb was able to establish a computer software center in the department. The center's objective is to assemble software programs for the dairy industry. A special program to assess the economic consequences of the Dairy Diversion was one of the first successful projects. Programs developed at other Land Grant Colleges are being tested to determine if they apply to the Florida situation.

Biotechnology

On the research side it was recognized that some major advances would come from applications available through biotechnology or genetic engineering. Using techniques gained through their sabbatical leaves, Drs. Collier and Thatcher will be using this new technology to speed the progress of their research programs.

Forage Production

As a result of the dairymen input, the Department will soon launch a large forage research and extension program. The administration agreed to provide us with a new faculty position to develop this area. The person employed will have a responsibility for selecting suitable forages for high producing dairy cows and putting together a system of growing, harvesting, storage and feeding. The Departments of Agricultural Engineering, Agronomy and Animal Science will all cooperate in the effort. Finding some suitable forages to reduce the cost of feeding should be a major step forward in allowing our dairymen to compete economically with their Northern neighbors.
New Building

At last year's conference I encouraged you to contact your elected officials to convince them that they should put the item back into the budget to provide planning money for our new building. They not only came up with the planning money they provided the building money as well. It's a dream come true. Watching them pour concrete and lay block is a real boost to the morale of the department. I drive past the building site regularly to convince myself that it is real. This new building will allow us to have our entire faculty to be under one roof. It will have new modern laboratories and a teaching laboratory for our specialized needs. Being attached to the Animal Science Building will allow us to use some specialized joint facilities and provide a closer working relationship between the scientists of the two departments. The project should be nearing completion by this time next year.

Budget

The cost of conducting research continues to increase at a rapid rate, while the money available from the State has been remaining constant or declining. This is a fact of life and our faculty is making a concerted effort to secure outside funds to keep their programs going.

In looking at the situation in the department, we feel that a major limitation is due to the way money is provided to IFAS and then to the Department. At the start of each fiscal year we are provided a budget to cover all costs. If, during the year, the cost of feed goes up we have to cut back on research so that we can feed the cows. All income from cull cows and milk goes back to the state. We feel that a better concept would be to develop a revolving fund. The following proposal has been presented to the Agricultural Council and in turn to the legislature.

Legislative grant $300,000

Objective: To develop a method of financing program and maintenance costs of large animal research herds and provide the flexibility needed to adjust and respond to the research needs of the industry.

Use of funds

These funds will be used to maintain facilities and cattle in a manner which will relate as well as possible to conditions faced by farmers growing cattle and producing milk in the Florida environment. Milk and animal sales will support base expenditures but an advance account balance is needed to cover expenditures that will precede income.

The money will be placed in the revolving fund and will insure a positive cash balance at all times. It will cover all expenditures such as purchase of cattle which are needed to initiate a research trial, cost of feed, added labor, seed and fertilizer, building and equipment maintenance and machinery replacement. Income from the pool of milk and cull animals will be returned to the fund to maintain an average yearly balance of $300,000. Thus once the fund is established it will continue to perpetuate itself without additional state appropriation. It is anticipated that between $300,000 and $450,000 from sales of milk and animals will pass through the fund each year.
Industry Support

Once again I would like to say a special thanks to the Industry for their support.

1. The Advisory Committee and its chairman, Woody Larsen, for their guidance and input into our program.

2. Our milk cooperatives, the George Richardson family and Mr. Clarence Reaves for providing financial support for scholarships for our undergraduates.

3. To our dairymen who spent many hours working with their representatives to convince them to fund our new building.

4. Mr. and Mrs. Wilmer Bassett for their very generous gift of stock.

5. To those dairymen who allowed us to use their cows and records to conduct research studies.
Summary of Early Calving Studies

C. J. Wilcox and N. A. Simerl

Objectives of work just completed were to estimate effects of age at first exposure to breeding and age at first calving on reproductive and production traits. Population surveyed was the University of Florida dairy research herd at Hague. Time interval was 1959 through 1978. More than 80% of all records represented Holstein and Jersey cattle; limited numbers of Ayrshire, Brown Swiss and Guernsey records also were included.

Beginning in 1959, heifers were bred artificially at first normal estrus following 14 months of age, or 13 months in 1960 and thereafter; heifers were maintained generally without breeding from March 31 through October 15. Commercially available A.I. bulls selected for high P.D. milk were used except in experimental matings. Heifers were kept on pasture with supplements from 3 months of age through birth of their first calf; they then joined the regular milking herd.

For the 20 year period, normal parturitions numbered 1144; normal parturition records were defined to exclude gestation lengths less than 251 days and all twin births. Occurrence of calving difficulty did not constitute an abnormal record. There were 1023 normal lactation records available for study. For analysis of some responses, further restrictions were imposed; smallest group investigated was 504 heifers. Up to 47 measures of production and reproduction were used for each heifer. Total of 261 heifers, or 18% of all heifers born, died before 13 months or exposure to breeding. Of these, 37% died at or within 24 hours of birth, 27% died between 24 hours and 30 days, 28% died from 31 days through 6 months, and only 8% died between 6 months and exposure.

Holstein and Jersey frequencies of losses generally did not differ.

Age at first estrus was not monitored in this population; however, 54% of all heifers which survived to exposure exhibited estrus within 30 days of initial surveillance. Following exposure, Jersey heifers experienced higher losses to infertility (nonpregnant following 10 services) than other breeds.

Of those heifers which ultimately calved, Jersey heifers exhibited estrus more quickly than Holstein heifers (see Table 1, 24 versus 30 days); however, Jersey heifers required more services for conception and experienced longer intervals from first service to conception. Interval from first service to conception and number of services for conception apparently were not affected by age at first exposure. Breed influences appeared to be primary cause of differences in conception rate for dairy heifers in the DRU herd.


Norwich-Eaton Pharmaceuticals, Norwich, NY 13815.
Age at first parturition was 25.8 months overall. Overall, 40% of all heifers calved at 23 months or less; intermediate ages, 24 to 27 months, comprised 34% of all heifers, 26% calved at 28 months or greater. Gestation length of cow and birth weight of calf increased with age at parturition.

Frequencies of problems at parturition are in Table 2. These are simple averages. Detailed statistical analyses indicated that stillbirth and retained placenta were not affected by dam age in the range 18 to 40 months. Metritis increased with age. Incidence of dystocia was high in young heifers, low in intermediate aged heifers and highest in the oldest group. There was no detectable difference in incidence between oldest group and combined incidence of two younger groups. Holstein heifers experienced higher incidence of all problems than Jersey heifers; retained placenta, 4.9 versus 1.0%; dystocia, 6.6 versus 1.8%; metritis, 14.2 versus 4.2; and stillbirth, 16.0 versus 9.1. Incidence of stillbirth was highest in young Holstein and old Jersey heifers, 17.9 and 12.9%, respectively.

There were no significant effects of age detected for postpartum reproductive traits. Days to first estrus were longer following birth of light or extremely heavy calves; heifers 23 months or younger which delivered calves greater than 40 kg at birth experienced very long intervals to first postpartum estrus when compared to older heifers with comparable weight calves. Heifers 27 months or less showed fewer days open, days to successful service and shorter calving intervals following abnormally short or long gestations. In contrast, heifers 28 months or older at parturition experienced lengthened calving intervals and more days open and days to successful service than younger heifers. Retained placenta extended days to first postpartum estrus an average of 9 days. Other problems exhibited no apparent affects on postpartum estrus. Stillbirth had no apparent affects on postpartum reproductive performance. Retained placenta, dystocia, or metritis extended calving interval 33, 45 or 27 days.

Age at parturition effects were not detectable for protein to fat and solid not fat to fat percentage ratios, total solids, solids not fat, protein and fat percentages. All yield traits and chloride percentage increased with heifer age at parturition. Milk yield increased 67 lb/mo. Lactose mineral percentage declined with age. Titratable acidity was highest in very young and very old heifers. Milk yield increased 20 lb following birth of a male calf compared with birth of a female. Effects of stillbirth, retained placenta, dystocia and metritis on milk yield were large and variable; they averaged -399, -526, -382, and -216 lb, respectively. Generally, losses in constituent yields were proportional to effects of problems on milk yield overall. Length of record was apparently not affected by problems at parturition.

Results of genetic investigations indicated that reproductive traits were low to moderately heritable: interval from exposure to first service, .22; interval from first service to conception, .11; number of services for conception, .05; age at first parturition, .43; body weight of calf, .31; gestation length, .24; and days to first
postpartum estrus, .14.

Some reproductive traitheritabilities apparently were
approximately zero. These included heritability of calf survival for 24
hours, retained placenta, dystocia, metritis, and postpartum measures,
days from first to successful service, days pregnant during first
lactation, and calving interval. Heritabilities of and correlations
between milk production traits closely resembled most of published
literature concerning dairy cattle genetics.

No evidences of culling differences between age groups were
detectable during the first lactation. Culling frequencies within the
three age groups were 33.6, 30.9 and 35.4%. By planned policy,
significantly fewer Holstein (18.0%), than Guernsey (39.4%) or Jersey
(34.0%) cattle were removed during first lactation.

In conclusion, policy of early freshening did not appear
contradictory to other goals of DRU dairy management. Problems at
parturition were at the low end of the range reported in herds with
older freshening ages. This study indicated that dairymen with
selection programs emphasizing P.D. milk yield may wish to alter
reproductive management to monitor estrus in relatively young heifers
and to breed at younger ages if present practice is to breed at ages
greater than 13 months. From DRU experience, breeding restrictions
based upon weight appeared unnecessary. Estrus in heifers appears to be
the surest indication of appropriate physiological development for
breeding.
Table 1. Mean reproductive performance of DRU yearling heifers (1959-1978).

<table>
<thead>
<tr>
<th>Response</th>
<th>Jersey</th>
<th>Holsteins</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 1st exposure</td>
<td>416</td>
<td>410</td>
<td>414</td>
</tr>
<tr>
<td>Exp. to 1st service</td>
<td>24</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Age 1st service</td>
<td>439</td>
<td>439</td>
<td>441</td>
</tr>
<tr>
<td>Number of services (#)</td>
<td>2.6</td>
<td>2.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Gestation length</td>
<td>280</td>
<td>278</td>
<td>280</td>
</tr>
<tr>
<td>Calf birth weight (lb)</td>
<td>51</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>Age at parturition (mo)</td>
<td>26.0</td>
<td>25.0</td>
<td>25.8</td>
</tr>
<tr>
<td>Days to 1st heat</td>
<td>31</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>Days to 1st service</td>
<td>74</td>
<td>70</td>
<td>73</td>
</tr>
<tr>
<td>Days open</td>
<td>112</td>
<td>115</td>
<td>116</td>
</tr>
<tr>
<td>Calving interval</td>
<td>391</td>
<td>394</td>
<td>395</td>
</tr>
</tbody>
</table>

*In days except where noted; represents 297-450 Jerseys, 338-473 Holsteins, 766-1144 total.

Table 2. Frequency of problems at parturition by age group (%).

<table>
<thead>
<tr>
<th>Age</th>
<th>Stillbirth</th>
<th>Ret. Placenta</th>
<th>Metritis</th>
<th>Dystocia</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;23 mo</td>
<td>12</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>24 to 27</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>&gt;28 mo</td>
<td>13</td>
<td>5</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Overall</td>
<td>12</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>
What's New in Milking Management
D.R. Bray, Dairy Science Dept., University of Florida

The term "Milking Management" can mean many different things. In this talk it will cover the milking machine and mastitis, milk quality and even the use of the computer in culling for mastitis.

One of the many good things about Florida is the cooperation between the various departments in the university system which makes many of these variable projects possible.

What I'm reporting today is not my research or Dairy Sciences work but the work of a team of researchers from several departments.

The Milking Management Team consists of the following:

R.K. Braun, Veterinary Sciences  
D.R. Bray, Dairy Science  
D. Morse, Dairy Science  
P. Reed, Veterinary Science  
J.K. Shearer, Veterinary Science

Other cooperators are:

K.C. Bachman, Dairy Science  
K. Smith, Food Science  
C.J. Wilcox, Dairy Science

And also the following county agents involved in our research:

J. Brenneman, Polk County  
P. Glasscock, Hillsborough County  
W. Odegaard, Lafayette County

The Quarter Milker

We have just started the Quarter Milker Experiment at the Dairy Research Unit. We are using a special claw developed by the N.I.R.D. in England which has check valves for each quarter. This should prevent any cross contamination of infection from an infected quarter in a cow to another quarter in the same cow. This research is needed because in previous research cows with one infected quarter often became infected in one or more other quarters with the same pathogen. This is especially true with over milking.

We think this claw has one advantage over other quarter milkers that have been developed in that it does not have four separate milk hoses. The chances of four hoses coming off is much greater than one hose. This may not be a problem in small dairies but in our large herds where milking is done for most of the day it may be important.
Predipping

The second trial is the use of pre-teatdipping. Predipping is quite popular in some parts of the country and research is needed to determine if it is an effective way to prevent mastitis.

The first part of the study will be to check this practice and its effect on milk quality. If iodine residues are high and cannot be avoided we can not recommend this practice. Our overall concern should be for milk quality.

If no residues can be found in the milk then the second part of the trial will begin. Predipping will actually be teat spraying, using automated teat sprayers before milking. Several ways may be tried: spraying and a short 10 second contact time made and then applying the machine, or spraying then wiping off much of the iodine with a a paper towel.

The idea behind predipping is to reduce mastitis by milking a sanitized teat and this should also improve milk quality by reducing bacteria counts.

Backflushing

Some preliminary work has been done on several dairies as far as consistency of both iodine concentrations and the total volume of liquid flushed. Work has also been done on the reduction of bacteria in liners back flushed and liners that are flushed with cone type sprayers. The lower the bacteria level the higher the milk quality.

We have 2 backflushers installed in the Food Animal Barn at the Veterinary College which are on loan from Babson Brothers. We will use them to do much of the next phases of backflush research which includes removing antibiotic and chemical residues from the liners. We will also test for a reduction in mastitis pathogens in the liners using the backflusher and finally using the backflusher in trying to eliminate or reduce Mycoplasma from the teat cup liners.

Herd Health Management Computer Program

We hope to develop a computer program that will identify cows with a history of mastitis and hopefully to predict which cows may become reinfected. This program should benefit the Florida dairyman with large herds and hired milkers where often management really has no way of knowing how many times a lactation a cow has been treated for mastitis. This program would flag cows who have been treated enough times for mastitis that due to the cost of drugs and dumped milk she is no longer profitable or will not be profitable if treated another time in this lactation. The dairyman can cull these cows before he loses money on them.

Feed Trial with "Somato-Staph"

We now have five herds in the state who are vaccinating one half of their cows, and in some cases heifers also with "Somato-Staph". We are in the second year with this trial and hopefully can continue for several more
years to determine if we can prevent or at least lessen the severity of clinical mastitis due to Staphylococcus aureus.

Philips Roxane, Inc. is supplying the "Somato'Staph" for this experiment and the county agents in these counties are doing most of the work in monitoring the program.

Summary

We think that we have some valuable research going on that is especially geared to the problems of the Florida dairyman and their unique problems. I'm sorry I don't have all the results of these experiments but it will give you something to look forward to in upcoming Dairy Production Conferences.
Impact of Federal Dairy Legislation on the Florida Dairy Industry

by

Paul Halnon
USDA Market Administrator
Ft. Lauderdale, Florida

I appreciate the invitation to participate in this year’s Dairy Production Conference and welcome the opportunity to discuss with you the impact of Federal Dairy Legislation on the Florida dairy industry.

Obviously the present price support legislation is having a substantial impact on Florida's dairy industry. However, in discussing this subject we must look back to previous Federal legislation because the difficult situation we now find ourselves in was created in large part because of what we can probably now characterize as ill-advised dairy legislation that we operated under for several years, beginning in 1977.

The basic legislation establishing dairy price supports is the Agricultural Act of 1949. Under this legislation the Secretary was, until 1977, required to establish a price support level in the range of 75 to 90 percent of parity. The actual level within this range was generally left to his judgement and based on such factors as supply and demand and farmers' production costs. The important factor, however, was that there was some flexibility to adjust the actual support price from year to year based on significant economic factors.

The 1977 amendments to the Act required the Secretary to set the initial support price at 80 percent of parity and then to adjust it upwards every six months to reflect increases in the wholesale price index. As you will recall, this was a period of high inflation so the wholesale price index was moving up rapidly.

When this legislation was passed in 1977 the support price was $9.00 cwt. and government costs for the price support program in that year were $451 million (just a little above the average of the past 30 years). By October 1, 1980, just three years later, the support price had risen 45 percent and stood at $13.10. During the 1980-81 marketing year government expenditures reached nearly $2 billion.

The support price remained at the $13.10 level until the recent diversion program became effective and purchases under the price support program rose to $2.6 billion for the marketing year ending September 30, 1983. To put the seriousness of the surplus situation in perspective consider the fact that in the last marketing year the Department of Agriculture purchased 30 percent of all the butter produced in the U.S. It purchased 25 percent of all the cheese produced and 70 percent of all the nonfat powder. In terms of whole milk equivalent, the Department removed 16.6 billion pounds or about 12 percent of the nation’s milk supply last year.
While Florida dairymen enjoyed reasonably high prices during most of this period, the burdensome surplus being created by this inflexible price support program began having a detrimental effect on the state's dairy industry. This is true even though throughout this period Florida's production remained inadequate to supply the state's fluid needs. Why? Because the unrealistically high prices were creating additional unneeded production in areas of the country that serve as alternative supply sources for Florida. As long as such milk was available, Florida's ability to negotiate reasonable prices was impeded. And as we all know substantial additional volumes of milk did come into Florida with a resulting depressing effect on prices.

Under normal circumstances this type of price competition would create a healthy economic climate but much of this additional supply was developed in response to artificially high price supports, and not in response to economic signals in the market place.

Congress' attempt to correct the price support problem with the so-called dairy assessment legislation didn't make matters any better for Florida farmers. Rather than address the support price problem head on, it assessed all farmers in the country 50 cents cwt. — and then a few months later $1.00 cwt., on all of their production. This further reduced Florida farmers' returns but didn't cut into the surplus. Nobody liked this legislation and Congress immediately began considering alternative measures to deal with the problem. The so-called "compromise" legislation that we are now operating under was the result of many months of negotiation among milk producers and with our elected representative.

Briefly, these are the principal provisions of the current legislation. 
(1) On December 1, 1983 the support price was reduced from $13.10 to $12.60 cwt. This support price is to be effective until September 30, 1985, except that the Secretary may reduce it another 50 cents on April 1, 1985 if CCC purchases are estimated to exceed 6 billion pounds for the succeeding 12 months. Also, he may reduce the price another 50 cents on July 1, 1985 if purchases are estimated to exceed 5 billion pounds in the succeeding 12 months; (2) the dairy farmer assessment on all milk production was set at 50 cents cwt. for the period December 1, 1983 through the end of March, 1985; (3) a milk diversion plan was implemented on January 1, 1984 which pays dairy farmers $10 cwt. to cut production in the range of 5 to 30 percent. Each producer participating in the diversion program has already signed a contract with the Secretary; (4) beginning May 1 all dairy farmers will be assessed 15 cents cwt. with the funds earmarked for advertising and promotion of milk and dairy products.

And now the important question is — how is the diversion program working and what impact will it have nationally and on the Florida dairy industry?

Nationally, the signup was not nearly as high as it was hoped. When the program was implemented there were fears that the signup would result in a national milk shortage; the legislation even gave the Secretary authority to cut all contracts if such a shortage developed. Actually only about 38,000 farmers signed up for the program. This represents less than 20 percent of the nation's commercial dairy farms. These dairy farmers contracted to divert 7.5 billion pounds of milk in 1983 or 22.9% of their base marketings of 32.8 billion pounds. However, because a number of these producers had already
reduced their 1983 marketings from their base period, the actual reduction in 1984 as compared with 1983 will be less than the contracted diversions. The effective reduction from 1983 to 1984 will be around 5.3 billion pounds -- contracted diversion of 7.5 billion pounds less 2.2 billion pounds of marketings already diverted before the program started.

As you can see from these numbers, the impact on the national supply will not be nearly enough to bring the surplus down to acceptable levels. We are now estimating a reduction in the national supply of somewhere between 3 and 5 percent, which means 1984 production of around 136 billion pounds. There should be some improvement in commercial sales, which will help, but it is now clear that purchases under the price support program will remain high and will probably exceed the "trigger" levels next April 1 and July 1. As I indicated earlier, if purchases exceed these "trigger" levels the Secretary will have the authority to reduce price support 50 cents cwt. on each of those dates.

Looking at the diversion program on a regional basis shows that a larger proportion of total production is being diverted in those areas that produce a relatively small proportion of the nation's milk supply. (See attached exhibit.) These are, for the most part, the deficit areas of the country and this means they will be even shorter this year.

On the other hand, the heavy milk production areas of the country have the lowest participation rate. The Pacific, Lake States and Northeast regions are by far the heaviest milk production regions of the country, accounting for about 60 percent of the nation's milk supply. Yet, the effect of the diversion program in these regions will be relatively minor, reducing production only 3.5, 3.2 and 2.0 percent respectively, in 1984 as compared with 1983. Contrast that with the deficit southeast where the diversion program will reduce production more than 10 percent.

In Florida the diversion payment signup was the highest of all the states in the nation. Nearly half of the state's producers signed contracts with the Secretary. Only five states (California, Iowa, Texas, Minnesota and Wisconsin) will divert more milk than Florida. Even before the diversion program was implemented, Florida had the greatest milk deficit of any state in the nation and now that Florida farmers have signed up in such large numbers the situation for the coming year could be extremely critical.

As announced by the Department, 185 Florida farmers signed contracts to divert 317.2 million pounds of milk during the 15 months the diversion program will be in effect. After adjusting for cuts already made during 1983 and taking into account an estimate of the production increases by dairymen not participating in the program, it appears that Florida production will be down about 12 percent in 1984, as compared with 1983.

There is another factor that will complicate the supply situation later this year. Many of the Florida dairymen who signed up for the program did not cut their production very much, if any, during the first quarter of 1984. This means that they will have to catch up later in the year in order to meet their commitment, or face stiff penalties for not complying with their contract. They probably will do this catching up during the late summer months when supplies are the shortest and the need for imported milk is the greatest.
Taking all these factors into consideration it is clear that Florida will have a critical shortage of locally produced milk this fall. The Florida cooperatives are now estimating that they will need about 146 million pounds of additional out-of-state supplies to fulfill their processors' needs during the June - December period. Nearly 33 million additional pounds will be needed in September when school will reopen.

Now, where will all of this additional milk come from? Florida is already drawing heavily on nearby states' supplies to fill handlers' requirements. For example, in March about 49 million pounds of the total producer milk supply pooled in the three Florida orders was from producers in other states. This was more than 20 percent of the total producer supply for the month. Because of supply changes made last fall, the monthly volume of out-of-state milk associated with the three markets is far greater than in any previous year. Thus, Florida is already laying claim to large volumes of nearby supplies and we haven't yet entered the deficit season.

The problem for the coming short season months will be aggravated by the fact that the nearby states that normally serve as the primary source of supplemental milk are also participating heavily in the diversion program and it is very unlikely that there will be much milk available from these areas to make up the Florida deficit this summer and fall.

So, where will the milk come from? In the past we have looked to the upper midwest (primarily Wisconsin and Minnesota) and the northeast for limited volumes of supplemental milk. These areas are not participating in the diversion program to the extent that other areas are, so there may be additional milk available there for shipment to Florida. But that means a long haul and transportation costs are going to make it very expensive. And it is going to be difficult to get enough tankers to haul this milk all the way to Florida. It promises to be a very challenging time for the Florida dairy industry. We'll just have to wait and see whether we get through the year without any real serious problems developing.

Just a few comments on Florida's participation in the diversion program. I have been asked a number of times as to why the participation rate here was so much higher than the rest of the country. At least one of the reasons is obvious to all of us. Dairy farming in Florida has not been profitable during the past year. We have been through some serious price disruptions in the last few months and at the same time feed costs have been climbing rapidly. This depressed situation certainly has provided an incentive to participate. Another reason the participation rate was higher here is that a large proportion of dairymen's total costs in Florida are for feed, replacement cattle and labor. These costs can be reduced or eliminated by cutting production. Dairymen in the northeast and midwest grow most or all of their own feed, raise most of their replacements and have a substantial investment in machinery, silos and building. Most of these farmers intend to grow crops anyway, and most of their other costs will continue, whether they cut production or not. A third reason I believe participation was higher here is that Florida producers were well-informed about the advantages of the diversion program and were able to make their decision on the basis of this good information. Florida cooperatives did a commendable job working with their members. While some cooperatives in other areas may have done as well, I don't think that was generally true throughout the country.
The nation's dairy industry is going through some difficult times. Many observers believe we could have avoided these difficulties by not tinkering with the price support program back in the late 70's. In almost thirty years the support program had provided a safety net against disastrously low prices. At times in the past surpluses were a problem, but when they were, the Secretary had some flexibility to bring prices down and supply and demand back into reasonable balance. But as you can see, when that flexibility was taken away from him in 1977, things really got out of hand. The result has not only been mounting surpluses and high government costs, but also severe criticism of the program from the press, Congress and the general public. Whether this damage can be undone in the future remains to be seen.

One thing is clear, however; we have been reminded in a forceful way of a basic law of economics we should never again ignore. You cannot administratively set prices without taking into account what impact those prices will have on the supply of, and demand for, the product. The laws of supply and demand will work every single time. The dairy price support program was never intended as a price setting mechanism. Hopefully, the new dairy legislation to be included in next year's farm bill will bring the program back to its original purpose, which was to provide farmers with assurance that prices would not get disastrously low.
DAIRY FARM APPLICATIONS FOR MICROCOMPUTERS

Dan W. Webb
Extension Dairyman
University of Florida

There was a time when farmers operated without tractors. This, of course, is almost unheard of today because we have recognized the tractor as an effective tool. The tractor is classified as a tool because it helps farmers perform a task, making that task easier, faster or more complete. In the past, most farmers have managed their businesses without using a computer. Those times may be coming to an end.

The microcomputer is a part of today's agricultural technology. These electronic devices are information management tools. They can be used to make the task of handling information easier, faster or more complete. Information is a valuable resource for management and decision-making. However, it must be utilized in order to demonstrate its value. A computer can make it possible to get the most from our information.

Farm management is making, implementing, and accepting responsibility for decisions to maximize net returns to the resources a farmer owns or controls. A careful distinction between goals and strategies is helpful. Goals are ends and strategies are means to those ends. The permanence of goals contrasts to the timely adjustment of strategies to changing conditions both inside and outside the firm. Goals and performance standards are needed in every area where the decisions of the farm manager can potentially affect progress and survival of the business. Strategies focus on the accomplishment of these goals and performance standards.

There are four fundamental functions of managers: Planning, organizing, directing and controlling. These functions describe what managers do.

The fourth function of management is control. The farm manager's job is to get things done. Decisions in the control function concentrate on how well things are getting done. Is the farm performing as planned? Are the goals and objectives realistic? What changes need to be made to improve performance? These kinds of questions are addressed in the control function.

The three steps in control are: 1) establish standards; 2) measure performance and compare with standards; and 3) take corrective action, if necessary. Explicit standards are essential to the evaluation of performance and thus basic to corrective action. Standards are directly related to the objectives, policies and strategies from the planning process. Standards are models or criteria which can be quantified. These standards are acceptable rather than maximum levels of performance. These standards also provide the guidelines for determining which performance data to collect and analyze.

Measuring performance involves collecting the information necessary to determine if the standards are being met. Information begins with collecting data about performance. The effectiveness of data in supplying information may be determined by asking the following kinds of questions:
applications, including agriculture. A partial list of uses includes:

1. budgets,
2. cash flows,
3. projections,
4. balance sheets,
5. income statements,
6. break-even analysis,
7. formulations,
8. payroll calculations,
9. inventories,
10. travel vouchers,
11. classroom gradebook,
12. invoices,
13. purchase orders.

The VisiCalc program was born out of the observation that many problems are commonly solved with a calculator, a pencil, and a sheet of paper - three nearly universal tools. Calculating projections, income taxes, financial ratios, budgets, engineering changes, cost estimates, and balancing your checkbook are done with these tools.

The VisiCalc program combines the convenience and familiarity of a pocket calculator with the powerful memory and electronic screen capabilities of the personal computer. With the VisiCalc program, the computer's screen becomes a "window" that looks upon a much larger "electronic worksheet". You can move or "scroll" this window in four directions to look at any part of the worksheet, or you can split the computer screen into two "windows" to see any two parts of the worksheet at the same time.

The worksheet is organized as a grid of columns and rows. The intersecting lines of the columns and rows define thousands of entry positions. At each position you can enter an alphabetic title, a number, or a formula to be calculated. Just by "writing" on the worksheet, you can set up your own charts, tables, and records.

The formatting commands let you individualize the appearance of each entry, row, or column. If you wish, for example, you can make your VisiCalc checkbook record look just like your bank statement.

But the power of the VisiCalc program lies in the fact that the computer remembers the formulas and calculations you use in solving a problem. If you change a number you had previously written on the electronic worksheet, all other related numbers on the worksheet change before your eyes as the VisiCalc program automatically recalculates all of the relevant formulas.

Recalculation makes the VisiCalc program a powerful planning and forecasting tool. You can correct mistakes and omissions, and examine various alternatives - effortlessly.
The minimum requirements to use a spreadsheet such as VisiCalc include:

1. computer 48K,
2. video monitor,
3. 1 disk drive,
4. blank disks, and
5. spreadsheet program disk for the specific computer you have.

Keeping herd records is a major application of interest to most dairymen. Options for computerization of livestock records include:

1. Buy a commercial program package,
2. Utilize a data base manager
3. Participate in organized program such as DHIA,
4. Hire custom programmer, or
5. Combination.

Some available commercial herd record packages include:

1. Farm plan
2. Dairy Herd Management Services, Inc.
3. Marshall's Dairy Programs
4. AgDisk
5. Agri-Management Serv
6. Farm Management Systems
7. Others

Whichever option is selected, a good herd record keeping system should handle all of the following functions:

1. data entry,
2. data editing,
3. sorting,
4. locate specific animals,
5. print reports,
6. delete animals, and
7. perform calculations.

Other considerations which should be remembered when selecting any computerized record keeping program include: capacity, ease of operation, flexibility, support and cost. Most dairymen and other farmers we have talked to are pleased with their computers and the performance of the system. A general recommendation for selecting a system is to first list the tasks you wish to computerize. Next, locate software (computer programs) which perform the operations needed for your situation. Then last, select the hardware which will run those programs. Of course, due consideration should be given to service and support as well as price. Remember, software is the key!

Yes, computers can be effective tools and contribute significantly to sound management decision-making. We should remember however, that computers do not generate information. They process it. Data entry is of primary importance. Many have found it much easier to write data on cards and in books than to type it into a computer. Without routine, consistent and complete data entry, a computer system will fail!
The following is offered as a suggestion in setting up a computer system:

**Requirements for Success**

1. Have detailed knowledge of tasks to be computerized.
2. Select software for each specific task.
3. Obtain hardware appropriate for the software selected.
4. Make commitment to data entry.
5. Avoid duplication of effort.
6. Become thoroughly informed on operational procedures before placing total dependence on new system.
7. Have lots of time and patience for the introductory period.

Farmers should give serious consideration to the adoption of computers in their operations. The computer is a powerful tool with many possible uses. It is a machine that is fast, accurate and versatile. With proper software a farm computer system can improve decision making capability and make information management more efficient. On the other hand, you wouldn't buy hay machinery if you have no hay to cut! Don't buy a computer and then decide how to use it! Determine what your use will be and decide whether or not you can justify it on that basis. A computer should be able to help you accomplish tasks BETTER, EASIER or CHEAPER in order to pay its way.
Economics of Grouping Cows for More Effective Management and Feeding

Dr. Barney Harris, Jr.
Prof. Dairy Science Department
University of Florida

It is a well recognized fact that high producing cows require more feed than low producing cows and at some stage of lactation cows need to be bred for the subsequent lactation. Maintaining a 12-13 month calving interval suggests that cows need to be bred as soon as healthy after calving or otherwise the interval gets extended and the herd becomes less profitable. Likewise, since cows produce more milk in early lactation, it is more profitable to have more feed going toward milk production and a lesser percentage toward maintenance. Table 1 shows the percentage of feed needed for maintenance and milk production when producing from 30 to 90 pounds.

Table 1. The percentage of feed needed for maintenance.

<table>
<thead>
<tr>
<th></th>
<th>30</th>
<th>50</th>
<th>70</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance (%)</td>
<td>51</td>
<td>39</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>Milk Production (%)</td>
<td>49</td>
<td>61</td>
<td>68</td>
<td>74</td>
</tr>
</tbody>
</table>

In recent years, dairymen have applied a number of management techniques to improve efficiency and reduce costs in feeding cows. Some have incorporated various systems of grouping cows while others have introduced automated systems using magnet and electronic feeders to better feed the high producing cows. The overall objective has been an attempt to better feed the high producing cows and a more economical approach to feeding the lower producing cows.

The nutrient requirements of dairy cows are shown in Table 2. Note maintenance as a percent of requirements for different levels of production.

Table 2. Nutrient requirements of dairy cattle (1400 lbs.).

<table>
<thead>
<tr>
<th>Function</th>
<th>CP</th>
<th>TDN</th>
<th>Ca</th>
<th>Phos</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(lb)</td>
<td>(lb)</td>
<td>(lb)</td>
<td>(lb)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>1.12</td>
<td>9.82</td>
<td>.05</td>
<td>.04</td>
</tr>
<tr>
<td>Heavy Springs</td>
<td>2.13</td>
<td>12.80</td>
<td>.09</td>
<td>.06</td>
</tr>
<tr>
<td>30 lb. milk</td>
<td>3.67</td>
<td>19.40</td>
<td>.13</td>
<td>.10</td>
</tr>
<tr>
<td>60 lb. milk</td>
<td>6.22</td>
<td>28.80</td>
<td>.21</td>
<td>.15</td>
</tr>
<tr>
<td>90 lb. milk</td>
<td>8.77</td>
<td>38.40</td>
<td>.29</td>
<td>.20</td>
</tr>
</tbody>
</table>
Heavy producing dairy cows are in a negative energy balance in early lactation (Figure 1). Studies reported by USDA workers suggests that the loss of 2.2 lbs. body weight in early lactation is equivalent to about 6 Mcal of energy. When converted to milk at an efficiency of 82% it will provide for the production of approximately 15 lbs. of milk. The loss of 200 lbs. in early lactation provides enough energy for the production of 1450 lbs. of milk or about $217.50 more income ($15 for milk per cwt.) per cow during the lactation.

Figure 1. The normal cycle of a lactating cow.

<table>
<thead>
<tr>
<th>Periodes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Grouping the Dry Cows

Many Florida dairymen have been grouping cows by production and/or stage of lactation for a number of years as well as maintaining cows in dry herds. An Arizona study showed the importance of good dry cow management and how it is associated with the amount of milk a cow will produce in her next lactation. The results showed that cows receiving a maintenance ration during the dry period and a high energy ration after calving outperformed the other groups. The results are in Table 3.

Table 3. Response of Holstein cows to energy levels before and after calving.

<table>
<thead>
<tr>
<th>Energy Level</th>
<th>Milk Yield</th>
<th>Service Conception</th>
<th>Calving Interval</th>
<th>Economic&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Low (1)</td>
<td>12,340</td>
<td>2.1</td>
<td>290</td>
<td>$ 0.00</td>
</tr>
<tr>
<td>Low-High (2)</td>
<td>15,404</td>
<td>1.6</td>
<td>386</td>
<td>459.60</td>
</tr>
<tr>
<td>High-Low (3)</td>
<td>13,591</td>
<td>1.9</td>
<td>392</td>
<td>202.65</td>
</tr>
<tr>
<td>High-High (4)</td>
<td>14,375</td>
<td>1.5</td>
<td>379</td>
<td>305.25</td>
</tr>
</tbody>
</table>

<sup>1</sup>Change in energy level made at calving.
<sup>2</sup>Price based on $15/cwt. over the low-low group.

The low energy level in Table 3 was NRC requirements for maintenance and reproduction. High energy was about 40% more than actual requirements. High (excess) energy during the dry period had no beneficial effect on production during the next lactation. The second group in the table fed at requirements during the dry period but fed extra after calving produced more and were essentially the same in reproduction as the high-high group. Limiting energy during the early lactation lowers production and reproductive performance, even though the cows were fed well before calving.

Since cows need less feed during the early dry period and more the last 2-3 weeks prior to calving, many dairymen use two dry cow groups - early drys and heavy springers. Feeding the heavy springs more feed during the last 2-3 weeks of the dry period helps adjust them to the lactating cow ration, reduces stress, provides an opportunity for closer observations, and helps prevent metabolic problems.

Grouping the Lactating Herd

It is a common practice to group cows in most Florida dairies since milking hours usually run from 5-9 hours at a single milking. By dividing the herd into groups, cows spend less time at the milking barn and more time eating. Smaller groups help reduce stress on cows, allows for better traffic patterns and increases the effectiveness of feeding and breeding programs. The concept of grouping animals is promoted primarily because this reduces the amount of variation existing within an animal group, thereby allowing the development of a feeding program which will more nearly satisfy the requirements of the majority of the animals within each group. Also, a good grouping program will allow high producing cows to peak higher and prevent
lower producing cows from getting overconditioned. Other advantages of grouping by production are: 1) easier to vary the roughage:concentrate ratio, 2) heat detection is simplified, 3) more uniform milkout in the parlor, and 4) first calf heifers may be maintained as a separate group until desireable to blend with remaining herd. English workers recently reported an increase in milk production of 1573 lbs. milk per cow when first calf heifers were grouped together and compared to those that were blended with the older cows.

Disadvantages of grouping cows by production include: 1) labor and time are needed periodically to regroup cows, 2) facilities may need adjustments to handle more groups, 3) more formulations may be needed where some or all feedstuffs are mixed on the farm, and 4) regrouping increases social adjustments that may affect the production of certain cows. Social adjustments tend to be more of a problem in small herds and groups as compared to groups of 80 or more cows. In Florida, dairymen regrouping monthly see little to no change in production of cows. This has also been reported to be true in California herds.

A number of studies have been conducted to study the value of grouping cows. Many have, however, involved small numbers of cows, frequently only two groups with less than 50 cows per group, and conditions are often different than one might observe in the field.

Virginia workers compared the effects of grouping dairy cows by three production groups versus feeding as one group at all stages of lactation. A private herd of 360-380 cows was used for the study where 25% of the herd was allotted randomly into one herd to serve as the control. The other 75% were divided into three equal size groups according to milk production and designated high, medium and low. As dry cows freshened, they were placed in the high group and remained there until after two monthly DHI test periods. Cows were regrouped at monthly intervals, thereafter. The ration was formulated to meet the needs of cows that were one standard deviation above the mean in the group. The H, M, L cows produced 1069 lbs. more milk per cow in 305 days. The greatest advantage appeared to be in the first 3 and last 2 months of lactation. Average feed intake and costs for the H, M, L cows was slightly higher than the control cows or about $8.00 more per cow. Milk income ($15.00/100 lbs.) for the grouped cows showed an advantage of $160.35 or a return above feed costs of $152.35 per cow. In a herd of 370 cows the net income would amount to $56,369.50 added income.

Several experiments have been conducted showing little to no advantage in grouping cows. Most have used small numbers of cows and some with only two groups vs. one group. In Florida we recommend a minimum of three groups and preferably four or more groups with 50-100 per group. Smith et al. (JDS 61:1138) using two groups vs. one group showed the greatest advantage of grouping and feeding cows according to production to be increased income over feed costs ($30/cow per year). The $30 income over feed costs for a 500 cow dairy would have added $15,000 to income and possibly more where more groups are used in large herds. Similar results were obtained in North Carolina studies (JDS 61:1429).

In a California case study, Kutches demonstrated the economic importance of group feeding cows. The results are in Table 3.
Table 4. Economics of group feeding - a realistic case study*

<table>
<thead>
<tr>
<th></th>
<th>Production groups, lbs. milk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65+</td>
</tr>
<tr>
<td>Number cows</td>
<td>180</td>
</tr>
<tr>
<td>Grain (barn &amp; outside)</td>
<td>32</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>19</td>
</tr>
<tr>
<td>Actual average of groups, lbs. milk</td>
<td>76</td>
</tr>
<tr>
<td>Feed costs</td>
<td></td>
</tr>
<tr>
<td>Grain (barn &amp; outside)</td>
<td>$2.53</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.19</td>
</tr>
<tr>
<td>Total:</td>
<td>$3.72</td>
</tr>
</tbody>
</table>

Group feeding vs. all cows fed alike

<table>
<thead>
<tr>
<th></th>
<th>Group feeding</th>
<th>All cows fed alike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily feed costs, average</td>
<td>$ 3.46</td>
<td>$ 3.67</td>
</tr>
<tr>
<td>Daily milk, average, lbs.</td>
<td>58.70</td>
<td>55.20</td>
</tr>
<tr>
<td>Milk income, $12.40/cwt</td>
<td>$ 7.28</td>
<td>$ 6.84</td>
</tr>
<tr>
<td>Return over feed costs, $</td>
<td>$ 3.82</td>
<td>$ 3.17</td>
</tr>
<tr>
<td>Feed costs as % of milk</td>
<td>47.50</td>
<td>53.70</td>
</tr>
</tbody>
</table>


Survival in the 80's has been an important subject confronting dairymen in recent weeks. With the present situation and outlook for dairying, the climate dictates that dairymen infuse improved economic practices into their operations. One approach in accomplishing this goal would be to feed better and cheaper. Cheaper doesn't mean lowering quality but simply feeding cows according to production and taking advantage of cheaper feedstuffs by varying ration components to different groups of cows. Feeding according to production improves nutrient management and thereby reduces the likelihood of some cows being overfed or underfed. Also, feeding according to production results in more efficient conversion of feed to milk, together with greater returns over feed costs. An example of one sort of group feeding system is in Table 5.

Table 5. Comparison of five levels of production.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Fresh</th>
<th>High</th>
<th>Med-High</th>
<th>Med.</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basis for feeding (lbs. milk)</td>
<td>60</td>
<td>80+</td>
<td>65</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Avg. milk production</td>
<td>40</td>
<td>74</td>
<td>60</td>
<td>44</td>
<td>28</td>
</tr>
<tr>
<td>Feeding (1b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hay ($60/ton)</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sorg. silage ($30/ton)</td>
<td>45</td>
<td>45</td>
<td>50</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Grain mix ($180/ton)</td>
<td>29</td>
<td>38</td>
<td>30</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>Feed cost/cow/day</td>
<td>2.90</td>
<td>3.71</td>
<td>2.99</td>
<td>2.27</td>
<td>1.64</td>
</tr>
<tr>
<td>Return over feed cost*</td>
<td>3.10</td>
<td>7.39</td>
<td>6.01</td>
<td>4.33</td>
<td>2.56</td>
</tr>
</tbody>
</table>

*($15.00 cwt. milk, 3.8% fat, 1400 lbs body weight)
Data in Table 5 shows that returns per hundred weight of milk increases as production increases. Even so, the important point is that returns above feed costs are also greater making the high producing cow much more profitable to the dairy.

Since peak production and persistency are key factors in determining level of milk production, programs should be developed that would allow lactating cows the opportunity of expressing their genetic potential. Research indicates that for each pound increase in peak production there is a 200 pound increase in total lactation. Our experiences show that with three or more production groups the dairyman can maximize milk production, feed utilization and income.

A possible scheme for grouping cows according to production is explained below. Other systems are being used with equal degrees of success. Develop a system that has good application and works at your dairy. Generally, three to four groups offer good flexibility and less range in milk production. In order to challenge cows, feed each group to the top of the range. As an example, cows producing from 50-65 lbs. would be fed for 65 lbs. milk.

1. **Grouping by Production.** Grouping cows by level of milk production and feeding accordingly appears to be the most effective approach in controlling the feeding program and still achieving maximum milk production. Florida dairymen have found that 3 to 4 production groups are satisfactory. More groups may be needed to reduce the number of animals per unit. Also, some dairymen maintain a first-calf heifer group the first 90-120 days of lactation to reduce variation in size and stimulate feed intake and milk production.

   a) **Fresh Cow Group.** A fresh cow group is maintained by many dairymen in order to more closely observe cows following calving. The cows are usually maintained in the group for about one month. Then the cows are moved from the fresh cow group to the high group for challenge feeding.

   b) **High Group.** A high group contains early lactation cows for 2-3 months. While many Florida dairymen feed the same complete feed but variable amounts to all production groups, the system does allow for more high energy feed to be fed to the high group. Less silage or roughage is fed to the high group.

   c) **Super-High Group.** Only the very best cows are allowed in a super-high group. Cows are usually producing over 80 pounds. Such a group is used by a few Florida dairymen.

   d) **Medium-High Group.** Large herds using 8-10 groups find the medium-high group to offer some advantages.

   e) **Medium Group.** One or two groups are usually maintained in this category and are simply fed a lesser amount than the high group. Usually more silage or hay is fed per cow as production decreases.
f) **Low Group.** A number of lower producing cows and cows approaching the end of their lactation will normally find themselves in the lower group. The group offers the distinct advantage of reducing feed offered to the cows and the feeding of more fibrous feeds. Since maximum consumption is not desired, a less palatable grain mixture could possibly be offered the cows. An example would be in the feeding of less natural protein and more urea in the ration.

2. **Grouping by Stage of Lactation.** Another desirable system involves the grouping of cows by stage of lactation. The system has one fault in that it assumes all cows have similar consistency patterns and level of milk production. The cows are fed similar to cows fed by milk production groups.

3. **Dry Cow Group.** The separation of the dry cows from the remaining herd is a common practice in large herds. Many dairymen maintain the dry cows in two groups: 1) light springers, and 2) heavy springers.

   The program for maintaining the light springers is frequently quite flexible. Cows over-conditioned during lactation are allowed to lose some body weight during the dry period. Other cows are simply fed a maintenance ration or a small amount of grain to supplement pasture. Cows under-conditioned are usually fed additional feed or simply allowed to remain with the heavy springers.

   The heavy springers are the dry cows with 3-4 weeks remaining until parturition. They are kept closer to the barn and observed daily. The feed is increased during the period. The herd ration is usually fed to the heavy springers according to NRC requirements. Ample hay is suggested.

4. **Hospital Group or Herd.** Herd owners are encouraged to maintain a hospital herd in order to avoid getting antibiotics and other drugs in the milk supply. All cows having mastitis or other problems requiring daily treatment should be maintained in the herd. As the cows regain their health, they are returned to the active herd.

Grouping cows according to production or stage of lactation allows the dairymen a choice since problems with labor are sometimes encountered. The system reduces variation between groups and allows for cows with similar requirements to be managed as a unit. High energy feeds can be more liberally fed to high producing cows and lower producing cows can be more nearly fed according to production.
GETTING THE MOST FOR YOUR SEMEN DOLLAR

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Dairy Science Department
University of Florida, Gainesville

Breeding dairy cattle can be a frustrating experience. Sorting through breeding information can be confusing since dairymen are confronted by a complex combination of genetics, selection, planning, record management, percentages, averages, and not the least of all, chance. Further, results of breeding decisions are not seen until 3-4 years later which makes the effect of decisions less obvious. It is understandable why many dairymen feel they don't have the time to devote to sifting through the large amount of computer generated lists of bulls ranked on everything from Predicted Difference Dollars (PD$) to foot angle.

Choosing AI sires to breed dairy cattle need not be as complicated as some would like to make it. There are a few basic principles which lead to fairly simple strategies which allows us to achieve the right combination of genetic progress and economic return. Most of the difficult parts of the job have already been done by DHIA, the USDA, and the AI studs.

Genetic Programs are Practical

Dairy cattle have to be bred to initiate the reproductive cycle. It costs the same to raise the resulting offspring no matter who her sire is. If the heifer is going to enter the milking herd the return on the investment in her will depend on who her sire is. Breeding the replacement is a management opportunity to increase profits. No decision at breeding time is a decision to settle for less profit at milking time.

Genetic progress is permanent and accumulates. Once dairymen have superior genes in their herd they remain there as long as the cattle are reproducing. Dairymen can cash in on DNA replication.

No matter what level of management exists in other areas such as nutrition or reproductive management the genetically superior cows will make more money. Current genetic evaluations on sires permit dairymen to choose how superior their cows will be. How often is there a business opportunity with guaranteed results? Beyond predicting what you can expect, confidence ranges and repeat bilities tell you exactly how much risk is associated with any one individual sire. The costs are small compared to other production inputs (like feed) and since results are known, we can determine how much to pay based on expected returns. The return per dollar is potentially as high as any other dollar spent in the dairy business.

How can we take advantage of superior genetics to increase profits? Let's look at some basic principles.
Chance, Variation, and Averages

It is not possible to predict the exact outcome of any single mating between a dairy cow and bull with any significant degree of certainty. This is a biological fact. Breeding values (genetic evaluations) predict the average value of the genes an animal transmits to its offspring. This is true because when the primary cells divide to produce sperm cells in the bull, and egg cells in the cow, there is tremendous variability created by the cell division. There are 30 pairs of chromosomes in the dairy cow. There can be at least 1,073,741,824 possible genetically different sperm cells generated by a single bull. An equal number of different combinations are possible when a cow produces an egg. When trying to decide whether a cow was bred 'right', try to decide which sperm and which egg the heifer got! That's why most animal breeders talk about averages.

Another deceptive feature of evaluating dairy cattle is separating management and environment from genetics. If a herd of cows looks uniform is it from culling or breeding or chance? Can anyone really answer that question? Genetically identical cows would appear only 25% less variable that a 'normal' herd, and a herd sired by a single bull would appear only about 6% less variable.

Average Genetic Value and Breeding

Breeding and selecting dairy cattle have two objectives. The genetic program can increase the frequency of desirable genes in a herd of cows and can possibly optimize genetic combinations of certain genes. Most selection programs based on genetic evaluations have as their goal increasing the frequency of desirable genes.

Almost all traits of economic importance such as milk yield, fat yield and protein yield are affected by thousands of different genes. The sum total effect of all an animal's genes (some good, some bad) affecting a trait, like milk yield for instance, is the sum of the effects of all the individual genes. This total effect is therefore called the additive genetic value.

Sire evaluations rank bulls by their average genetic values. This is because sires are progeny tested. Remember that any one sire can potentially produce over a billion genetically different sperm cells. The additive value of any single sperm cell is the sum value of all the genes it contains. The additive genetic value of the sire is just the average effect of all its genes which are passed on to its daughters and influence their performance. Any single daughter receives only the sample of the sire's genes contained in a single sperm cell.

Does this theory really work? Research has shown an increase of 100 lbs. of ME milk in daughters for every 100 lb. difference in sire PD Milk (PDM).

Most of the genetic progress in the national dairy herd is due to increasing the frequency of superior genes and, therefore, is an increase in additive genetic merit. Progress has amounted to about 70 lbs. of milk per year since 1960. This has been achieved by AI studs proving genetically superior sires for use in dairy herds. This genetic progress is permanent. The inferior sires have not produced as many daughters as superior sires.
Still, genetic progress for production traits is less than half of what we know can be achieved.

Optimizing genetic combinations is the goal of crossbreeding, linebreeding, purposeful inbreeding, and other forms of assortative mating (for instance, individual cow corrective mating). Superior gene combinations are difficult to maintain to the extent they are broken up when the animal reproduces (remember 1,073,741,824). Cloning would get around this problem.

Genetic Progress

Genetic progress for additive genetic merit is directly proportional to the estimated genetic superiority of the animals selected to be the parents of the next generation. It is also proportional to the accuracy with which these animals are evaluated. The better the sires, the better the daughters, the higher the genetic progress. Very few sires, relatively speaking, need be parents of the next generation of dairy cows. We can pick the very few that are the very best. Selection intensity for selecting sires to breed AI sires is even higher. Only the top 5% of proven AI sires need be used.

Most dairymen need 90% or more of their milking cows to be parents of the next generation unless they are purchasing replacements. There is very little opportunity for increasing selection intensity choosing superior cows within the milking herd. This is why selection intensity can be so much higher for sires than cows. The one place intense cow selection takes place is selecting dams for AI sires. Only the top 2% of all cows need be used.

The second major factor determining genetic progress is the accuracy of the genetic evaluations. Accuracy is the correlation between the animals true genetic value and our estimate of it. For sires this can be as high as 90% or more. The usual range for cows is 60% or less. The difference is due to the the fact that sires have so many more offspring than cows. This means we have a much better estimate of their additive genetic value, or the average value of the genes being passed on to their offspring.

Putting all this together sires can potentially account for over 70% of the genetic progress yearly in the dairy herd. A heifer calf gets half her genes from both her sire and dam, but more superior ones can potentially come from her sire. Table 1 shows the pathways of genetic progress. The key is how good are the sires we are using. Of the total genetic progress in one generation about 76% in most instances comes from the sire. The USDA summarized, by state, the average PD$ of the sires of first lactation cows calving in 1981. Florida ranked 41st. Embryo transfer will provide an opportunity to increase both the selection intensity and accuracy of genetic evaluation on cows.
Table 1. Relative importance of four genetic pathways.

<table>
<thead>
<tr>
<th>Source</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paternal Grandsire</td>
<td>43</td>
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<tr>
<td>Paternal Granddam</td>
<td>33</td>
</tr>
<tr>
<td>Maternal Grandsire</td>
<td>18</td>
</tr>
<tr>
<td>Maternal Granddam</td>
<td>6</td>
</tr>
</tbody>
</table>

Total Genetic Merit

What is total genetic merit? Up to this point we have been talking as if we knew exactly what we should be selecting for. Total genetic merit implies a complex combination of traits which all add up to the whole cow. Genetic evaluations are computed for milk yield, protein yield, fat yield, calving difficulty, conception rate, overall type score (PDT), individual type traits, disposition, etc. Which should we use, and how?

Indexes have been computed to combine different traits to summarize the overall performance of the sire's daughters. The most successful of these is PSD which reflects the value of the product produced by the sire's daughters.

Different dairymen have different goals, however, and believe different traits should be weighted in different ways. Have we arrived where we started, again being frustrated by the rising tide of information? Invariably dairymen hear they must simplify, be practical. Often those who say this then present a long list of the 'most critical traits of economic importance.' This leads to selecting for more than one trait at a time or, multiple trait selection.

Multiple Trait Selection

The purpose of multiple trait selection is to make genetic progress in more than one trait because more than one have identifiable economic impact. The dangers of multiple trait selection are two. First, when one trait is of such predominant economic importance as milk yield, there is a real danger of compromising economic progress in the major trait. Secondly, since very few animals excel in many traits, exceptional genes are generally very expensive.

Determining whether a trait should be included in a breeding program requires knowing fours thing about it. They are:
1) is it economically valuable, and if so how valuable?
2) is it reasonably heritable?
3) how accurately is it really measured and evaluated?
4) are there substantial differences between animals for the trait?
Often the most difficult question to answer is the first and, of course, it is where there are the most differences of opinion.

It is easy to determine the value of milk and fat production. If we assume milk is worth $14.50 per cwt with a fat differential of $.17 per point, fluid milk is worth $14.50 - (35 x .17) = $8.55 per cwt. because there are 35 points in 3.5% fat milk. This is the value of the milk minus the
value of the fat it contains. The value of fat is \((35 \times .17)/3.5 = \$1.70\) per pound. This is how dairymen are paid for their milk, so dairymen know the value, in terms of production, of a sire's genes based on his milk and lbs. fat evaluation.

How about type (or conformation)? Putting a economic value on type is difficult and is usually reduced to a relative measure compared to production traits. There are two possible economic returns from proper conformation. The first is animal sales. High type scores are positively related to sale prices for those who sell dairy cattle for breeding purposes. The relative weight of type should reflect the relative income from cattle sales compared to milk sales. The Holstein Association recommends a weighting of production:type of 3:1. This is probably too high for those who don't realize substantial income from sales of breeding stock. Most dairymen probably realize 90% or more of their income from milk sales.

The second is increased returns from decreased culling caused by conformation defects. Most culling of dairy cattle is for low production and reproductive problems. Probably 10% or less culling is for type problems. Based on these figures most estimates of the relative importance of production:type range from 20:1 to 6:1.

What about individual type traits? Breeding for individual type trait improvement on individual cows intuitively makes sense. Again the problem arises of two many possible alternative strategies. How many dairymen have time to type match all their cows for all traits? Fortunately a practical, no cost solution is available.

Two independent research studies have shown that dairymen make virtually equivalent progress in individual type traits on all cows whether correctly mating individual cows by individual type traits or simply by choosing sires which are above average for overall type evaluation (PDT).

The reasons for this go back to three of the above four points on multiple trait selection; heritability of the traits, accurate measurements, and differences between animals. Measuring actual results obtained from breeding cows indicates the simpler strategy is effective. The results of individual matings are simply too variable. Additionally, within one generation most of any effect would be lost due to genetic recombination.

Net Economic Value

Net economic value goes a step farther then total value. Not only are all economic returns accounted for, but the costs incurred are subtracted from the additional gains. This makes sense. If the genetically best sire were available at $50 a unit how many units would you buy? How many, if any at $25, at $10 or $5? Optimal genetic progress may not equal optimal financial progress. On the other hand, what can you get for $4 or $2 per unit? The cheapest may not be the most economical either.

Net Present Value

Researchers at Texas A&M have come up with a computerized system to rank
bulls by a system which takes into account both the cost of the semen and the expected returns from using the semen. The service is available through DHI via DART or your county extension agent. The advantage of this index is that it summarizes a number of variables that affect the the economic value of different potential semen purchases. The values can be tailored to reflect individual dairy situations. A sample listing is shown as Figure 4.

The index is called Net Present Value Dollars (NV$). Net because costs and returns are used. Present value because dairymen pay for the semen 3-4 years before they start realizing the returns from their investment and interest must be paid on the money spent for semen.

NV$ incorporates the value of daughter production (PD$), type, herd conception rate, calf mortality, semen price, return over feed costs, interest rate, calving interval, number of generations of expected return (1-3) and the relative weighting of income as production:type.

Table 2 shows why conception rate is important along with calf mortality in considering semen price. With the assumptions in Table 2 the probability of obtaining a milking heifer from one unit of semen is 13 out of 100 or 7-8 units on average. The real cost, then, is the semen price times 7. A conception rate of .40 is the Florida average for herds on DHI in 1983 and is equivalent to 2.5 breedings per conception. Added to the conception rate are aborted conceptions and pregnancies, calf and heifer mortality and culling, and only 50% calves being female.

<table>
<thead>
<tr>
<th>Table 2. Probability of a live heifer from one unit of semen.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conception rate</td>
</tr>
<tr>
<td>Survival to birth</td>
</tr>
<tr>
<td>Percent heifers born</td>
</tr>
<tr>
<td>Survival to freshening</td>
</tr>
<tr>
<td>Net probability of milking heifer per unit of semen</td>
</tr>
</tbody>
</table>

Tables 3 and 4 show how PD$, PDT, and semen price change when picking the top twenty sires for net value with different weightings of production and type at two different conception rates. Note that even with a zero weighting for type the top twenty sires average .10 PDT. The average price for 1:0 is $10 with semen prices on individual sires ranging from $5-18. There is no one price that is always most economical, it depends on what you get for your dollar. Figure 1 shows average PD$ and price of the top twenty sires for the different weightings with a 30% conception rate. The researchers at Texas A&M found the top twenty sires for net value cost less to use than bulls of average value.

Also note that as type receives more weight, progress for production decreases. At the same time semen price rises. Nothing is free. Comparing Tables 3 and 4 shows that with a higher conception rate slightly more expensive semen is a better value. This results in higher average genetic
Table 5. Average PD$ for top 20 bulls for Net Present Value $ for different conception rates.

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Conception Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD$:Type</td>
<td>30</td>
</tr>
<tr>
<td>1:0</td>
<td>131</td>
</tr>
<tr>
<td>10:1</td>
<td>131</td>
</tr>
<tr>
<td>5:1</td>
<td>126</td>
</tr>
<tr>
<td>3:1</td>
<td>118</td>
</tr>
<tr>
<td>1:1</td>
<td>81</td>
</tr>
</tbody>
</table>

Based on 1984 Jan USDA-DHIA Sire Summary.

Semen Value

Is the cheapest, most expensive, or intermediate priced semen the best value? Picking the top five Holstein sires for NV$ at different semen prices and comparing the average NV$ for each five helps answer the question. Table 6 and Figure 3 show that on average, for balancing genetic superiority vs. price, the $10 price range is the most economical. In general dairymen won't come out ahead with cheaper semen unless conception rates are unusually low. At 30% conception the top twenty NV$ sires still average $9 per unit with a range of $5-14. Current prices as reported by the AI studs are used and do not include any discounts. Note that average PD$ may be higher for more expensive semen but the net value is lower. The least expensive semen is rarely the most economical. On average, the lower cost doesn't compensate for the reduced production.

Table 6. Average NV$ and PD$ for top 5 Holstein sires for Net Present Value $ by semen price.

<table>
<thead>
<tr>
<th>Price ($)</th>
<th>18</th>
<th>12</th>
<th>10</th>
<th>8</th>
<th>6</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NV$</td>
<td>147</td>
<td>152</td>
<td>194</td>
<td>156</td>
<td>157</td>
<td>120</td>
</tr>
<tr>
<td>PD$</td>
<td>150</td>
<td>130</td>
<td>149</td>
<td>117</td>
<td>109</td>
<td>81</td>
</tr>
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</table>

Based on 1984 Jan USDA-DHIA Sire Summary. PD$:PDT, 1:0; 40% conception rate.

Maximizing Breeding Goals With More Than One Sire

Rankings are informative but dairymen don't breed their entire herd to the top bull, even if they could get as much of its semen as they wanted. What is needed is a combination of sires that meets the appropriate goals. Establishing breeding goals and finding the right combination of sires that satisfies the goals is probably how most breeding decisions are made.

Consciously or not many dairymen edit what bulls they will consider using
by setting limits on price, PDZF, PDT, repeatability and AI stud. This is also were most compromises are made against production. A computer program developed at Virginia Polytechnic Institute (VPI) can help dairymen sort through all active AI sires that have genetic evaluations computed by the USDA, eliminating those that don't meet their individual edits while picking a group that maximizes production. The program is called MAXBULL.

Besides insuring that a dairyman's minimum limits for any one sire are met, individual dairymen defined goals are met by the group of sires selected. The group of sires will meet or exceed the goals. Goals include average semen price, average PDT, average PDZF, and percent cows needing improvement in udder support, rear udder, fore udder, teats, hind legs, and feet. A group of sires is chosen which meets these goals while maximizing milk production. In the near future dairymen will be able to select one of four goals to maximize. They will be:

1) PD Milk
2) PD Milk - Confidence Interval
3) PD Dollars
4) PD Dollars - Confidence Interval.

Goals 3) and 4) account for the risk involved when using imperfect genetic evaluations.

Since MAXBULL can be useful to find a combination of bulls, which as a group, achieve dairymen goals, the number of units of semen required, minimum number of bulls, and minimum repeatability are also user defined. A sample MAXBULL output is shown in Figure 5. If you would like to find out more about it or have an output using your own edits and goals contact the dairy extension office.

We saw above that the net present value ranking indicated that the best semen buys were at about $10. Table 7 shows how setting a goal for average semen price affects the average PD$ and PDM of the resulting group of sires selected by MAXBULL. PDZF and PDT averaged 0.0 and a minimum of ten bulls were required to be in the group selected. Table 8 shows the results with the additional limitation of using only one AI stud.

<table>
<thead>
<tr>
<th>Ave. Cost($)</th>
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<tr>
<td>PD$</td>
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<td>125</td>
<td>100</td>
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<tr>
<td>PDM</td>
<td>1172</td>
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<td>1014</td>
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<table>
<thead>
<tr>
<th>Ave. Cost($)</th>
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<td>PD$</td>
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<tr>
<td>PDM</td>
<td>1036</td>
<td>968</td>
<td>866</td>
<td>669</td>
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</table>
Summary and Conclusions

1) The most genetic progress is made by choosing the best sires for those traits which have certain and identifiable economic value. The more traits included in the selection program the lower the progress realized in any one trait. Choosing sires by additive genetic merit increases the frequency of superior genes in the dairy herd over time. Particular gene combinations are difficult to maintain.

2) Economic value depends on the units required to get a milking replacement, as well as semen price in addition to genetic merit. Neither the most expensive nor the cheapest genes are the best value.

3) Computer programs are available to rank bulls by net present value to list the best semen buys for individual management situations. These can be accessed through DHIA-DART or extension personnel.

4) Computers can not breed cows. Computers can help us in our attempt to calculate the best genetic evaluations possible and match individual dairymen goals with the sires most likely to help them achieve their goals.
Figure 1. Average PDS and semen price for top twenty sires ranked by NVS at 30% conception rate.
Figure 2. Relationships between PD$\$, conception rate, and PDT:PDT for top twenty sires ranked on NV$\$. 

![Bar chart showing relationships between PD\$, conception rate, and PDT:PDT for top twenty sires ranked on NV$.]
Figure 3. Average NV$ and PD$ for top 5 NV$ sires at different semen prices.
Figure 4. Sample listing of top 20 sires ranked on Net Present Value from DHI-DART using 40% conception rate and production type as 10:1.

<table>
<thead>
<tr>
<th>BULL</th>
<th>CODE</th>
<th>% DIFF</th>
<th>USCA SIRE SUMMARY</th>
<th>** **</th>
<th>BREED ASSC. TYPE</th>
<th>**</th>
<th>NET</th>
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<td>PREDICTED DIFF.**</td>
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<td>HL</td>
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<td>RU</td>
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<td>+.03 +.03 +123</td>
<td>L</td>
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<td>-</td>
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<td>+221</td>
<td>+.28 +.02 +134</td>
<td>L</td>
<td>P</td>
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<td>-</td>
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<tr>
<td>AVERAGES (120 BULLS)</td>
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<td>+.00 - .03 +134</td>
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</table>
Figure 5. Sample listing of MAXBULL output.

MAXBULL
ABCD

MINIMUM # BULLS = 10. MAXIMUM % LOW R BULLS = 20. MAXIMUM % PER LOW R BULL = 5.

BULL EDITING

MISS.

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<th>PRICE</th>
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SUGGESTED BREEDING PROGRAM FOR MAXIMUM PMILK

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<th>RU</th>
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<th>TT</th>
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<td>0.00</td>
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</table>

BULL

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<tr>
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<th>PRICE</th>
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<tr>
<td>341012</td>
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<td>8</td>
<td>86</td>
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<td>178 0.18</td>
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<td>LUCK E</td>
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<td>1</td>
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<td>1126</td>
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<td>QUICK SHOT</td>
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<td>1</td>
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<td>1595</td>
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WEIGHTED AVERAGES

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<th>PRICE</th>
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</thead>
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BONUS (AVERAGE MINUS GOAL)

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<th>PD</th>
<th>PRICE</th>
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</thead>
<tbody>
<tr>
<td>71</td>
<td>0.00</td>
<td>0.04</td>
<td>81</td>
<td>112</td>
<td>90</td>
<td>63</td>
</tr>
</tbody>
</table>

Milk Change from Relaxing Each Goal One Unit

<table>
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<tr>
<th>UNITS</th>
<th>R</th>
<th>PMILK</th>
<th>CONF</th>
<th>PDFA</th>
<th>PD</th>
<th>PRICE</th>
</tr>
</thead>
</table>
| 26 / 0.01% | 0 0 0 0 0 0 0 0 0 0 12
HEALTH CONSIDERATIONS IN REPRODUCTIVE MANAGEMENT

Dr. J.K. Shearer, Extension Veterinarian
Department of Preventive Medicine
College of Veterinary Medicine
University of Florida

Reproductive performance in dairy cows is influenced by a multitude of factors including the level of milk production, nutrition, management, housing, climatic conditions, and herd health. It is for this reason that finding solutions for herds experiencing reproductive problems can be challenging, particularly where accurate reproductive records are not available for review. Suboptimal reproductive efficiency can be the cause for severe economic loss in dairy herds. Maximum profitability from the dairy enterprise simply cannot be achieved without implementation of a successful reproductive health and management program.

APPLICATION OF VETERINARY SERVICES TO HERD HEALTH PROGRAMS

Over the years veterinary services provided to dairymen have changed in emphasis from the individual cow to the whole herd. This shift to a "herd health" approach has greatly improved the usefulness of veterinarians to dairy producers and has helped to make them a more integral part of the total health management and production team.

The veterinarian is an animal health specialist. In order to be effective he/she must be involved (as much as practical) in the physical examination and treatment of health disorders on the dairy. However, if left to manage health affairs strictly from the salvage (treatment) end the veterinary service-dairy relationship takes on an image more like that of a parasite-host relationship. Encouragement of the veterinarian to assist in an advisory capacity to the total health management program potentiates the opportunity for the veterinarian to become a profitable investment to the dairy operation.

Frequently, the use of veterinary services by dairies is confined to specific aspects of the herd health program. Problems arise because there is too much overlap between the various segments of a herd health program. For example, the implementation of an effective reproductive program without consideration of the requirements of growing healthy replacements negates the efforts on reproduction. This brings us full circle and back to a realization that successful reproduction in dairy herds is served by working toward the overall goal of a healthy herd.

ECONOMICS OF REPRODUCTIVE HEALTH PROGRAMS

A study was performed to evaluate the effects of a reproductive health program on reproductive and economic performance. In this study, 144 cows were divided and observed through 184 calvings. There were 94 in the reproductive health group and 90 in the control group. The reproductive health group received regular post-calving, pregnancy, and infertility exams.
The control group did not receive routine examinations. Instead, cows were examined and treated on an as needed basis. Significant differences were found between the 2 groups for services/conception, days to first breeding, and days open (see table 1).

<table>
<thead>
<tr>
<th>Group</th>
<th>Service/Conception</th>
<th>Days to 1st Service</th>
<th>Days Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>2.37</td>
<td>86.8</td>
<td>140.0</td>
</tr>
<tr>
<td>Reproductive Health</td>
<td>1.73</td>
<td>73.1</td>
<td>99.2</td>
</tr>
</tbody>
</table>

The actual receipts and expenses were accounted for during the trial. Differences in overall income were not significant, however, the total reproductive expenses were lower for the herd health group which yielded an economic advantage to this group of $0.16/cow/day or $58.40 annually for each cow in the herd.

The financial impact of extended days open can be further appreciated from estimates that dairymen lose $3.00/cow for each day open beyond 116 days (approximately 13 month calving interval). Applying this to Florida we calculate a loss to the state's dairy industry of approximately 9.7 million dollars annually. In a 500 cow dairy with an average days open of 133 (the current state average for herds on DHI) this calculates to a loss of $25,500.00 per year. These losses are the result of reduced milk production, fewer calves for sale or replacement, and increased breeding and veterinary costs.

**RECORDS FOR REPRODUCTIVE MANAGEMENT**

Records are indispensible in the evaluation of reproductive performance. Knowledge of just a few basic parameters can provide some very important clues to reproductive problem areas in herds.

1 - Average Days Open/Calving Interval
2 - Days to first breeding
3 - Services/Conception
4 - Option Interval

(1) **Average Days Open** - is the average number of days from the most recent calving to conception. This is probably the most important parameter for evaluating reproductive efficiency. Projected minimum calving interval is preferred over average days open by some, however, they are measurements of essentially the same thing. Calving intervals are determined for each cow using the last calving date and projecting from that date the due date for all cows with breeding dates.

(2) **Days to First Breeding** - is the average number of days from the most previous calving to first service for all cows in the breeding herd.

(3) The number of **breedings per conception** is self explanatory.
(4) The Option Interval or Voluntary Waiting Period is the number of days from the most previous calving to the time in which the herd manager decides (at his option) to begin rebreeding.

Table 1 lists the reproductive parameters for Florida DHI herds for January 1984. By incorporating this data into a linear model starting with calving at day zero and ending with the succeeding calving 421 days later (140 days open + 281 days gestation) we can visualize what factors may be contributing most to days open (Figure 1). From this model days lost from delayed rebreeding, missed heats, and/or failure to conceive can be determined. If the problem is identified as poor conception further evaluative efforts can be directed toward factors that particularly influence fertility, and so on.

Table I.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Average Days Open</td>
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</tr>
<tr>
<td>Calving Interval</td>
<td>14</td>
</tr>
<tr>
<td>Days to First Breeding</td>
<td>83</td>
</tr>
<tr>
<td>Services/Conception</td>
<td>2.5</td>
</tr>
<tr>
<td>Voluntary Waiting Period</td>
<td>60</td>
</tr>
</tbody>
</table>

Figure I. Partition of Days Open For Florida DHI Herds

<table>
<thead>
<tr>
<th>Calving 421 Days (14 Months)</th>
<th>Conception 140 Days</th>
<th>Calving 0 Days</th>
<th>1st Service 83 Days</th>
<th>Voluntary Waiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>281 Days</td>
<td>31.5 Days</td>
<td>10 Days</td>
<td>Average missed days to first service</td>
<td>Days lost owing to conception services failure, 1.5 additional services</td>
</tr>
<tr>
<td>25.5 Days</td>
<td></td>
<td>13 Days</td>
<td>Missed heats</td>
<td>Missed conception services</td>
</tr>
</tbody>
</table>

In this example the option interval is 60 days. The average time necessary to observe heats in the herd after this waiting period will be equal to about one-half the number of days in a normal estrus cycle. It is obvious that all cows will not be in heat on day 61. Since the "average days to first service" is 83 we can calculate a loss of 13 days due to missed heats prior to the first service. Days lost due to failure to conceive are 31.5 based on services/conception of 2.5. The 31.5 day figure is calculated by multiplying 21 (number of days in a normal estrus cycle) by 1.5 which is the number of additional services (after the first one) to achieve conception. By summation of the option interval (60 days), average days to the next heat (10), days lost due to missed heats prior to the first service (13), the days lost due to
a failure to conceive (31.5), and subtraction of this total (114.5) from the average days open (140) calculation of days lost due to missed heats between services is 25.5 days. The gestation period of 281 days plus the 140 days open results in a total of 421 days (14 month calving interval).

In this example the total number of days lost due to missed heats is (13 + 25.5) 38.5. Remember that this assumes a 60 day waiting period. If, however, the voluntary waiting period were 40 days as it is in many Florida dairy herds, the days lost due to missed heats would be 33 + 25.5 = 58.5 (about 2.8 heat periods).

Inadequate heat detection is a major cause for extended days open in many herds. Studies by Morrow indicate that the first post-partum estrus occurs in most cows around day 15 following calving. It was also observed that silent estrus occurred in 77.1% of the 1st postpartum ovulations, in 54.4% of the 2nd ovulations and in 35.8% of the 3rd ovulations. Several have noted a higher incidence of silent estrus associated with high milk production. In Florida heat stress provides an additional complication to estrus detection efficiency. Considering these factors and their influence on heat detection ability it is still reasonable to expect a 70% heat detection rate. This coupled with rebreeding at 40-45 days post-calving makes a goal of 65 average days to 1st breeding achievable. Assuming no serious conception problems (breedings/conception of 2.5) then a 13 month calving interval (115 days open) is attainable. Evidence is accumulating that this is a profitable reproductive goal.

This model demonstrates how such information can be used for analysis of reproductive performance in dairy herds. Keeping days open to a minimum is important and for most herds can be improved by earlier rebreeding and improving estrus detection.

SPECIFIC HEALTH CONCERNS IN REPRODUCTIVE HEALTH MANAGEMENT

Health concerns in reproductive management begin with proper care of the dry cow, calving area and calving problems. Dry cows should be neither too fat nor too thin as they approach calving. Overconditioned cows are subject to a higher incidence of calving difficulties, reproductive problems, and metabolic disorders. They have more retained placenta, endometritis, cystic ovarian disease and usually cycle later following calving. The overly thin cow is likely to be unable to sustain high levels of milk production during early lactation because of inadequate body reserves. The development of severe negative energy balance is believed by many to be the most important nutritional determinant in reproductive health.

The proper calving environment limits post-calving uterine infections, mastitis and the incidence of neonatal calf disease. Well drained grass lots or pastures are preferred and when possible these should be located to accommodate frequent observation of cows near calving.

The incidence of dystocia (difficult birth) in cattle is reported to be 3-4 percent. Normal delivery can be impaired by an improperly positioned calf, an extremely large calf or undersized cow, or a cow with milk fever. Whenever
labor is prolonged the cow should be examined. Good hygiene and lubrication of the arms and other instruments are essentials for proper examination and assistance with calving difficulties.

POST-CALVING REPRODUCTIVE DISORDERS

One of the most common problems after calving is retained placenta. The incidence can be 30 percent or higher, but in most herds is less than 10 percent. The placenta is considered to be retained whenever it has not been expelled within 12 hours following birth. Causes for retained placenta are many; hormonal, nutritional, abortion, premature birth, twinning, dystocia, and milk fever. The result of retained placenta is uterine infection, delayed involution (returning of uterus to normal size), and subsequent reduced fertility.

Ideas on managing retained placenta are varied. One thing there is agreement on, however, is that retained placental tissues should not be manually removed (see table 2). In this study the conception rate at 1st service was much lower for cows treated by manual removal of the placenta irrespective of antibiotic therapy. The 1st service conception rate was best for cows receiving treatment with intra-uterine oxytetracycline at 72 hours post-calving, placenta not removed. Another study in California which observed 129 cows with retained placenta to subsequent conception found reduced services per conception and a shorter days open interval (93 days compared with 111 days for controls) for cows receiving oxytetracycline boluses intra-uterine every other day until 1 treatment after the placenta was expelled. Results of these trials would support the use of intra-uterine therapy in cows with retained placenta.

Table 2.

Results of Various Treatment Regimes for Retained Placentae (from Banerjee)

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Conception Rate at 1st Service %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oxytetracycline 2 intra-uterine at 72 hours, placenta not removed</td>
<td>70.0</td>
</tr>
<tr>
<td>2</td>
<td>Oxytetracycline intra-uterine, placenta removed</td>
<td>38.9</td>
</tr>
<tr>
<td>3</td>
<td>No medication, placenta left</td>
<td>50.0</td>
</tr>
<tr>
<td>4</td>
<td>No medication, placenta removed</td>
<td>38.5</td>
</tr>
</tbody>
</table>

1 123 cows divided into the four groups.
2 Terramycin. Pfizer Canada, Montreal, Quebec.

Researchers at the University of Illinois have conducted several investigations on uterine versus systemic therapy for uterine infections. They have found that absorption of antimicrobial agents is influenced by disease of the uterine lining (endometrium) and therefore systemic administration of antibiotics may be superior to intra-uterine infusion.
techniques for certain uterine infections. Cows with systemic signs of illness associated with retained placenta (such as fever or toxemia) should be treated accordingly. Intra-uterine infusion of such cases without treatment of systemic disease is not likely to be maximally effective.

Endometritis results from a variety of complications associated with calving. In fact, studies show that infection is almost universal in the early post-calving period even in cows that calve normally and do not retain their placentas. The use of antimicrobial infusions have shown mixed results in the treatment of these uterine infections. Studies on infusion agents which have a tendency to be irritating to the endometrium (inner lining of the uterus) have been shown to alter the length of the estrus cycle in cows. In one study infusion of dilute iodine on day 15 of the estrus cycle was observed to prolong the cycle, whereas, infusion on day 3 or 4 shortened the cycle. In contrast, the infusion of non-irritating substances had no effect on length of the estrus cycle.

In recent years with the discovery of prostaglandins new methods for uterine therapy have emerged. These compounds work by causing luteolysis (resorption of the corpus luteum), relaxation of the cervix and expulsion of the uterine contents. In the presence of a mature corpus luteum the response to treatment is dramatic and rapid causing the cow to come into heat which results in the evacuation of uterine contents usually within 2-5 days following administration of the drug. Evidence is mounting that prostaglandin therapy may be more effective in therapy of endometritis than uterine infusion where a corpus luteum is present. Prostaglandin is the drug of choice for pyometra. Estrogenic compounds should be used with caution in dairy cattle.

ANESTRUS:

Anestrus is the absence of observed heat. Primary causes are; failure to observe, pregnancy, cystic ovarian disease, uterine infection (pyometra), and stresses associated with extreme heat and high milk production. In most herds, better than 90 percent of cows not pregnant will be cycling. Cows not observed in heat by 40 days post-partum should be examined. Palpation of anestrus cows can be a valuable heat detection aid.

INFERTILITY:

Infertility in cows is usually associated with one or more of the following: 1) disease of the ovary and/or uterus; 2) failure of the fertilized egg to implant; 3) death of the embryo; 4) faulty heat detection and insemination technique. A high percentage of the infertility cases commonly observed in dairy cows are a result of implantation failure associated with uterine infections. When such problems arise a thorough examination of affected cows is indicated. Some information is available which indicates that the practice of post-breeding infusion is helpful in repeat breeder cows. This can be conveniently performed at 12 to 24 hours following breeding. Care should be taken to utilize a non-irritating type of infusion product to avoid the potential effects of altering the normal estrus cycle as described earlier.

In herds where bulls are used the venereal diseases, trichomoniasis and vibriosis, must be ruled out as predisposing causes. Trichomoniasis is
characterized by early death of the embryo which is exhibited in the cow as infertility. Less frequently, abortions and severe uterine infections may occur. Cows most commonly become infected when bred by infected bulls. The period of infertility continues until immunity develops. This varies between cows but is usually 2-6 months. Bulls show no evidence of infection. The control of trichomoniasis may be accomplished by: 1) eliminating the infected animals; 2) breeding cows by artificial insemination; 3) separation of infected and exposed animals from the herd; 4) allowing a period of sexual rest for cows bred to suspect or infected bulls; 5) selective culling of infected and suspect bulls and introduction of young virgin bulls that have been tested and are known to be free of the disease.

Vibriosis is characterized by temporary infertility in cows with the primary clinical sign being a return to estrus. Cows which become infected will develop immunity, however, it is short-lived. There is a vaccine available for use and in herds where bull breeding is practiced, vaccination may be advised. The vaccine must be given at least once and preferably 2 times yearly. A more efficient method for control of vibriosis is the absolute use of artificial insemination.

Table 3 lists the primary diseases affecting reproduction and suggests some control procedures. These diseases can have a devastating impact when they occur. A good vaccination program incorporating these vaccines is cheap insurance and a worthy investment.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Control Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brucellosis</td>
<td>Vaccination. Purchase replacements only from a disease-free herd. Dispose of aborted fetuses and placentas. Slaughter infected animals.</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>Annual (or preferrably 2x yearly) vaccination, but several species of organisms are involved. Control rodent population. Fence cattle from stagnant water where urine from carrier cattle or wild animals may accumulate.</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>A.I. using antibiotic-treated semen will give almost 100% control. Dispose of infected bulls and cows. Infected bulls may be treated with antibiotics, but recovery is slow. With sexual rest, many cows recover spontaneously.</td>
</tr>
<tr>
<td>Trichomoniasis</td>
<td>Use A.I. to prevent. Treat or, preferably, eliminate infected animals.</td>
</tr>
</tbody>
</table>
IBR (Infectious Bovine Rhinotracheitis):

Vaccinate only calves and nonpregnant adults using modified live virus. Live virus can cause abortion in pregnant animals. Intranasal vaccine or killed virus vaccine (safe for pregnant animals).

BVD (Bovine Virus Diarrhea):

Vaccinate only calves and non-pregnant adults using modified-live virus vaccine. Killed virus vaccine is safe for pregnant animals.

In summary, the veterinarian is an important component in the dairy herd's health program. Just as the dairy monitors its production and makes necessary adjustments for improvement, so must the veterinarian. Records are the means by which this can be accomplished. Any program which does not continually and regularly re-evaluate its progress may not progress. The potential for loss from inefficient reproduction in the dairy herd justifies making a solid commitment toward achievement of optimal reproductive goals.
<table>
<thead>
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