PROCEEDINGS
of the Eighth Annual

FLORIDA DAIRY
PRODUCTION CONFERENCE

UNIVERSITY OF FLORIDA
GAINESVILLE
MAY 11 and 12, 1971

EFFICIENT DAIRY PRODUCTION AWARD WINNERS

"Producing Quality Milk"

SPONSORED BY
DEPARTMENT OF DAIRY SCIENCE
COOPERATIVE EXTENSION SERVICE
AGRICULTURAL EXPERIMENT STATION
OF THE
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES
WITH COOPERATION OF STATE DAIRY ORGANIZATIONS
TO: Florida Dairymen and Those in Related Enterprises

SUBJECT:

PROCEEDINGS

EIGHTH ANNUAL FLORIDA DAIRY PRODUCTION CONFERENCE

May 11-12, 1971

Dear Dairy Cooperator:

The Eighth Annual Florida Dairy Production Conference brought together authoritative speakers on topics of current major interest to the progressive minded dairymen and agri-business friends in attendance. Use of dairymen who have carried out specific practices successfully along with college men and other speakers assured a practical approach to the problems and information on their solution.

Appreciation is expressed to all who participated in making it a successful Conference. We think the Proceedings with resumes on the different topics will serve as a reminder and source of information for reference.

Special appreciation is expressed to the three major milk producer associations who contributed to the planning, financing and publicity of the Dairy Conference.

Sincerely yours,

Barney Harris, Jr.
Extension Dairy Nutritionist
and Conference Chairman

BHjr:bp

The cover picture — (Lto R) H. B. Gassaway, Dan Gerber, Judson Minear, Don Hanson and the Perry Brothers.
CONTENTS

Aims and Goals of the University of Florida Dairy Science Department........................................... 1-2
Progress Report and Current Concepts Dairy Waste Disposal Research and Design Procedures....................... 3-4
Current Status of Pesticides.................................................................................................................. 5
The Role of Large Coops in Marketing Milk.......................................................................................... 6
Quality Milk Panel (Arthur Graden)...................................................................................................... 7-8
Producing Quality Milk on Our Farms.................................................................................................. 9-10
Quality Milk Panel (Val Massey)........................................................................................................ 11
Quality Milk Production (Don Hanson)............................................................................................... 12-13
Milk Quality Concerns at the Farm Level............................................................................................ 14-18
Recent Developments in Milking Equipment and Current Recommendations. 19
Recent Developments and Current Recommendations in Milking Equipment........................................ 20-23
Milking Management for Maximum Profit.......................................................................................... 24-25
Sugarcane Bagasse Pellets and Cottonseed Hulls As Roughage Sources in Complete Rations for Lactating Cows......... 26-27
Postpartum Changes in Reproductive Status and Management to Maximize Reproductive Performance............. 28-46
Computer Assistance for Management Decisions............................................................................. 47-55
Genetic Trends in Milk Yield in Florida DHIA Herds........................................................................ 56-57
Names and Addresses of Those Attending Florida Dairy Production Conference........................................ 58-64
AIMS AND GOALS OF THE UNIVERSITY OF FLORIDA
DAIRY SCIENCE DEPARTMENT

by H. H. (Jack) Van Horn, Chairman

Like dairymen, the faculty of the Dairy Science Department are working to improve the efficiency of the food production. This involves conducting research for new information and distributing this information through teaching and Extension Programs so that it might be used. Our immediate and long range goals might briefly be summarized by the one word - excellence. More than any other thing we need to excel in the things that do so that we know we are contributing to new information and at the same time providing the kind of educational program so that students and producers can benefit from them.

The 13 faculty in the Dairy Science Department are the key people of this unit. These 13 include five faculty in our Dairy Foods section, seven faculty in the Dairy Production section and the Chairman. Of the total faculty time that is spent in the department, approximately 55% is spent on research, 25% Extension, and 20% teaching. This number of 13 includes two new faculty that will be joining the department during the summer of 1971. Dr. Dan Webb has been hired as an Extension Dairy Specialist and will assume many of the duties previously handled by Clarence Reaves. He is from Mississippi and obtained a M.S. degree from the University of Florida and a Ph.D. degree from Kansas State University. His responsibilities will be primarily in the area of dairy cattle management including the use of records in managing cows and the overall dairy enterprise, and reproductive physiology.

The other new faculty member will be Dr. Kermit Bachman who will be in the Dairy Foods section of the department and will lead a research program in a new area for us, protein chemistry. The other members of the faculty are:

Dr. Charles Wilcox - Dairy Genetics
Dr. Sidney Marshall, Dr. Jim Wing - Nutrition
Dr. Herb Head - Animal Physiology (Nutrient Metabolism)
Dr. Bill Thatcher - Animal Physiology (Reproduction)
Dr. Ken Smith, Dr. Leon Mull - Dairy Microbiology (Dairy Foods)
Professor Walt Krienke - Dairy Chemistry (Dairy Foods)
Dr. Barney Harris - Dairy Production Extension
Dr. Bronson Lane - Dairy Foods Extension

This is a group of dedicated people that have had much to do with many excellent dairy programs in Florida. However, none of us are really satisfied with where we now are. We think improvements are needed at all levels in order to keep pace with expanding and improving dairy industry in Florida.

In research, we feel we have to develop a strong basic research program that produces new information on the principles of how animals function and principles of food product development and distribution. Applications from this information can be developed quite rapidly once a new principle is understood. Research is also needed that applies directly to producer problems. Our research herd at the University of Florida is a good herd but we expect to improve the performance so that our research can be done at a level performance more nearly at that being strived for by Florida's dairymen rather than at a level many are already achieving. Much of the research will be

designed to help improve the environment or overcome environmental handicaps that currently limit milk production.

One of the main goals of the Dairy Science Department is to improve our undergraduate program. There is an excellent future for an undergraduate student in Dairy Science. This is true primarily because there has not been enough students available to fill positions that people would like to fill with Dairy Science graduates if they were available. Florida is fairly unique in having its dairy industry completely centered around large herds that function primarily with hired labor. Thus, the capable students that are able to manage people as well as cows should be able to find very profitable employment in managerial positions within the herd. We have made some advancements in this area. We currently have a nucleus of about ten students that have been quite active in the revitalization of the Dairy Science Club starting in January of 1971. This represents a great increase in student interest over previous years and makes us all feel optimistic about the potential for the Dairy Science Department obtaining a more realistic share of the Agricultural students and also of Agriculture getting a more realistic share of the total student population.

Extension programs also will be looked to for advancement. For example, Florida has had a strong dairy records program but one of the challenges we have given Dr. Webb as he comes into his new position in Extension, is to work with dairymen until we are satisfied that we have a record keeping that is helpful to them in cow selection and management then work to expand participation in this program in order to bring the benefits to as many dairymen as possible.

All of the programs of the Dairy Science Department center around people. There are many people besides the faculty that are vitally involved in the programs we offer. For example, John Boggs, Herdsman at the Dairy Research Unit, is a key person in all of our production programs. The secretaries, research technicians and all of the rest of the help contribute to this effort.

In addition to the goals already mentioned, there are a few long range goals that directly affect all of us. We feel that one of the main needs of Dairy Production programs in Florida is in the area of improving environmental conditions that affect large dairy herds. Thus, we have proposed that a new research position be added to the Dairy Science Department that would work in the area of Environmental Physiology. Some of the areas that might be worked on through this position would be such things as heat stress for lactating cows, etc. Other needs for faculty exist in Dairy Production Extension and Dairy Marketing. IFAS is continually requesting new positions and if IFAS is granted new positions, we hope we will be fortunate enough to gain one or more of them in the Dairy Science Department.

Another long range goal is an addition to the Dairy Science building. Currently four of our faculty are housed at the Dairy Research Unit. They function very efficiently in this setting. However, there would be much to be gained in having all faculty housed together. We are also without any classroom space that is available in our own building. Thus, we do not get the student traffic through our area that might be beneficial. We know that justification for such a building will depend upon our own productivity. However, advancements are being made. We feel we are planning the kind of programs that will help in the justification to this addition to the Dairy Science Building in the future.
Current emphasis on environmental quality has brought many industries face to face with the need to improve their waste handling methods. Agriculture is no exception. The misuse of pesticides is the most widely discussed agricultural transgression; however, the most common agricultural pollutants are non-toxic, potentially beneficial, wasted nutrients. In small amounts, nutrient wastes are seldom a problem, but when drainage from heavily fertilized fields, large dairies, or other livestock operations is discharged into a waterway, there is likely to be a rapid growth of aquatic weeds, fish kills, or even odor and visible evidence of pollution in the water. The public and regulatory agencies have become aware of this. Fortunately, much of agriculture's problem can be alleviated by returning to some of the practices of a generation ago - the practice of recycling so called "wastes". Most agricultural "wastes" are misnamed. They are simply resources out of place. This is particularly true with animal waste.

Agricultural Engineering and other Departments of the Institute of Food and Agricultural Sciences are conducting research on many aspects of systems to handle, treat, and disperse animal wastes. Research projects include a multiple lagoon system on a large commercial dairy from which final effluent is spread over pasture by shallow ditches, and a study at the University's Dairy Research Unit to determine the effect on the soil-plant system of applying manure slurry, by sprinklers, to various crops. These systems show great promise as economical and effective means for handling animal wastes. Papers describing these projects and some findings and conclusions are available.

In 1970, the USDA provided incentive money for animal waste lagoon construction through the Agricultural Conservation Practices Program. It became desirable to formulate some criteria for the design of waste management systems without the benefit of research under Florida's climatic conditions with sandy soils and high water tables. A committee of representatives from the University and the Soil Conservation Service undertook this task early in 1970, and an Engineering Standard for Animal Waste Treatment Lagoons in Florida was devised, based upon research in other states adapted to this State's conditions. During the past year, thirty or more approved lagoons have been constructed by Florida Dairymen using this design standard.

1/ Assistant Agricultural Engineer, (Assistant Professor) Agricultural Engineering Department, IFAS, University of Florida, Gainesville.
The Florida Department of Air and Water Pollution Control has approved lagoons designed in accordance with the standard discussed above. Also, they will accept other well planned systems provided final effluent is dispersed to the soil. Lagoons are not always the best method for handling animal wastes, however, they generally are the most economical when large volumes of wastes with high water content are involved.

The Department of Air and Water Pollution Control was created by action of the 1967 legislature (Chapter 403). The agency is headquartered at Tallahassee, with six regional offices located over the state, and has ultimate authority in matters pertaining to air and water pollution control. Several counties have local pollution control programs and agencies which prescribe rules and standards; however, all locally administered regulations must be compatible with, or stricter or more extensive than those imposed by DAWPC. At present, most agricultural waste systems will come directly under the jurisdiction of DAWPC, with local agencies being fully informed of planned construction.

We are gathering operational data as more lagoons are put into service, together with extensive data being collected at the multi-stage lagoon system in Manatee County. Observations which are not as yet statistically supported indicate the following:

**Odor:** Anaerobic lagoons in Florida require sixty to ninety days to stabilize after construction and first loading. Unpleasant odors are more noticeable during this period. Older lagoons produce some odor which is usually not detectable a few hundred feet from the lagoon. Anaerobic bacteria remain active throughout the year.

**Loading Rates:** Lagoon size established by the Standards appears conservative. Several lagoons with higher loading rates have been observed to operate acceptably, however sludge accumulation is more rapid.

**Natural Sealing:** This factor is very critical to the continued use of unsealed lagoons. Dairy waste lagoons appear to be self sealing even in sandy soils. Several large lagoons have been filled to levels above groundwater and continue to produce effluent constantly. This situation has been observed during the past few weeks with lagoons in the drought area of South Florida.

Our research and current recommendations are directed to the ultimate return of animal wastes to the soil. On this basis, animal waste management amounts to the application of efficient handling techniques that do not create odors or other nuisances - or pose a pollution threat. The establishment of pollution control laws, agencies, and regulations need not be viewed with alarm by agriculture. We are developing methods to handle most wastes economically and effectively. Honest efforts to hold pollutants from agricultural sources to acceptable levels will earn the respect and cooperation of regulatory agencies.
CURRENT STATUS OF PESTICIDES

John R. Strayer
Assistant Extension Entomologist
IFAS, University of Florida

ABSTRACT

All pesticides must now have either a negligible residue tolerance or a regular residue tolerance. Negligible residue tolerances were established for residues of DDT, DDE or TDE in milk several years ago. Several pesticides have also recently been granted tolerances for their residues in milk.

Regulation of pesticides is changing rapidly. All pesticide registration is now regulated by the Environmental Protection Agency. Registration of new pesticides has become more stringent and the new agency has cancelled registration of some pesticides (DDT and 2, 4, 5-T) and asked for extensive review of other persistent pesticides. There is a proposed revision of pesticide regulations which if passed would bring sweeping changes to pesticide regulations.

Florida has also added new regulations. In 1970, the Restricted Pesticide Law and in 1971 the Persistent Pesticide Law. The Restricted Law makes it necessary to have a permit to sell, purchase, use, store and dispose of certain "restricted" pesticides. The Persistent Law further restricts the use of the persistent insecticides. Proposed legislations currently being considered would ban persistent pesticides and establish a Custom Application Law in Florida.

In view of recent registration cancellations, the dairyman has been fortunate in not losing any critical materials. Rotenone is no longer registered for use on dairy animals. Methoxychlor is recommended in place of rotenone for use in grub control on lactating animals. To avoid grubs it is suggested young stock be treated with a systemic grub insecticide.

Horn flies continue to be a major problem. Dust bags have proven highly successful for horn fly control. Place a dust bag containing a recommended insecticide in an alley leaving the milk room or milking parlor.

If mosquitoes, deer flies or horse flies have been a problem for dairy animals on pasture it is suggested a ULV aerial application of malathion or naled (Dibrom) be used.

Consult the Insecticide Use Guide for Dairy Farms, External Parasites of Livestocks, or the Insect Control Guide for latest insecticide recommendations. Continue to keep aware of problems areas, read and adhere to pesticide labels, and in producing grain and forage use only those materials cleared for use on dairy farms.

THE ROLE OF LARGE COOPS IN MARKETING MILK

by William A. Powell
Mid-America Dairymen, Inc.
Princeton, Missouri

I believe you were interested in more than just marketing when you asked me to speak to you today. If marketing alone was your interest we have our Vice-President of Marketing, Mr. Gary Hanman and his whole staff that could cover the subject much better than a dairy farmer like me. So I'll tell you a little about Mid-America Dairymen, Inc., our marketing, our problems and some of our philosophy.

Mid-Am is now 39 coops all merged into one. We have about 21,000 members in 13 mid-western states with 7 billion pounds of milk annually. We have about 80 plants, offices and locations to service members. In our plants we make every thing you can name that has to do with dairy products. We make butter, powder, cheese of every kind, flavored drinks, puddings, yogurts even baby formulas in the bottle and special diet foods. We bottle and sell milk, some in our own grocery stores called "Stop and Go" stores. It seems to me one market advantage to being large is diversification. If one price of one product line is low another product is going to be high so its good profit insurance for members. We all share in the manufacturing pool in relation to our participation. Our Grade A pricing is determined by the Federal order we supply.

Diversification is just one advantage to being a good sized cooperative. We feel you can have a more highly qualified staff and it costs less per member. I feel there is another phase of marketing that we dairy farmers are only beginning to learn how to use. This is called politics. Some of our members pay into a political trust fund, on a volunteer basis, to help their friends in government while they are running for office. I feel there is a real opportunity in this field if we use this marketing tool in proper balance with federal orders, good bargaining and sound operations.

One of our universal problems whether large or small is communications. It's so important we communicate properly with our members, our customers, our consumers, our handlers and especially with our sister coops. It is not an easy task but all of our cooperatives need to do a better job of relating to those around us.

The greatest chance for achievement in the 20th century is not in planes, rockets, machines or computers. The greatest chance for achievement in the 20th century is in the minds of men. We need to train the minds of our members to think "WE", "US" and "OURS". They must think cooperatively. There are so many outside our coops who are trying to destroy us that we should certainly be united in selling our coop movement.

We live in a great country and our cooperatives are the very model of democracy. We elect representatives who meet, discuss, debate, vote, then the majority rules. This is democracy in action. We need to strengthen this kind of democracy and we can do it by building strong cooperatives, this in turn will build a stronger America.

QUALITY MILK PANEL

Arthur P. Gradon, Mgr.
Roberts Dairy, Inc.

The purpose of a panel-topic discussion, I assume, is to relate to others our personal ideas of this topic, 'Quality-Milk' and how each of us strive to produce milk of such a quality that the public is willing to use. Therefore, I will try to discuss some of my personal management experiences as Manager of Roberts Dairy, Inc. and how they affect the quality of milk which we produce.

There is no one important part or step which will enable you to produce good quality milk or control mastitis, but many phases must be considered such as: Physical facilities, Equipment and Care, Handling Milk Cows in large numbers, Milking procedure and Practices, Supervision and Control of labor force.

I feel it is necessary to have a milking parlor adequate in size to milk the number of cows desired with the proper kind and size of equipment to do an excellent job.

When designing our new double twelve milking parlor I kept in mind three things. First, design a parlor which will be comfortable for our women milkers. Second, be able to do a good job milking cows. Third, design the facilities to enable us to conveniently handle at least 1000 milk cows.

In our operation we operate two of three vacuum pumps that pull over 100 C. F. M. of air each for the twelve milking units with a double three inch stainless steel milk line and a three inch looped galvanized vacuum line. This enables us to have very little fluctuation in vacuum level which is very important in milking equipment. I believe it is essential to correct equipment malfunctions and keep equipment in proper condition as a major part of a quality milk control program. Milking machines, milk lines, milk tank, etc., should be properly cleaned and sanitized in order to preserve milk quality by preventing increase in number of bacteria.

A refrigeration system should be designed to properly cool the milk immediately when taken from the cows. Milk of good quality when produced can be of poor quality in several hours without proper refrigeration. Therefore, we should strive to maintain the quality of the product we produce. At Roberts Dairy we bring our milk to about 70°F with the use of a plate cooler and well water before entering a 6000 gallon milk tank with two ten horsepower compressors attached.

Another part of physical facilities which is important on large herds, with limited area, is the use of concrete to keep cows from wading in mud and a sufficient supply of water. Both of these items are essential in producing high quality milk.

Our cows are grouped according to production. This enables us to do a better job of milking and also allows us to feed more in accordance with production. Beginning with each milking crew at 7 a.m. and 7 p.m. we milk our number four herd, all of our slow milking cows that need additional attention for proper milking, the number three herd, the number two herd and the number
one herd respectfully. These herds are grouped according to their production. Then we milk the zero herd. This herd consists of all cows and heifers, freshened during the past two months. By grouping the cows like this we can give better care and attention to the herds during milking, feeding and breeding practices.

We have made excellent use of the old milking parlor using it for our fresh cows and health problem cows. When a cow shows any abnormal milk, she is removed from the regular milking herds and enters this herd. A dependable, well trained individual cares for this herd twice each day. He checks each cow and treatment is given when necessary. All fresh and health cows remain here until milk is ready to save. The California Mastitis Test is used routinely. I personally feel the attention given this herd is one of the most important phases of our operation. We usually have from one half of one percent up to one and one half percent of the total milking herd in this health problem herd because of mastitis. This ranges from five to fifteen cows out of our milking herd of approximately 1000 cows.

The value of good practiced milking procedures is unlimited in any dairy operation. When Mr. Q. I Roberts, owner of Roberts Dairy, Inc., and I decided to increase the herd size and build a new milking parlor and feeding barn I did a lot of thinking on the design of the building and equipment needed in order to accomplish the best, that I knew, in milking procedures. The milking procedure applied at Roberts Dairy consists of the cows coming through a rainbird sprinkling system which holds 74 cows and they remain here for about one half hour before entering a drip area outside the milking parlor. When the twelve cows come into one side of the parlor, the women milkers wash the udder with a tempered water supply containing a sanitizing solution with the udder wash hose and their hand. The use of a strip plate helps assure milk quality before drying the udder with a disposable paper towel. The milking machines are then applied, machine stripped and removed when cows are milked out. The teats are then dipped with bovadine, this I feel is probably the most important individual step in our milking procedure in controlling and preventing mastitis.

I feel the use of women milkers is of great value to our operation. Since we have employed women they appear to be more dependable, honest, and sincere in their work than men. They are more easily trained to do a good job milking cows, cleaner in milk habits and are more sympathetic toward swollen or injured udders. They are more gentle toward the cows and usually are quieter during work.

I have mentioned some of the milk management factors I consider important in producing good quality milk. I feel that dairymen must evaluate their own milking systems and practices, be willing to make changes for improvement in facilities, equipment, feeding, breeding, milking procedure and people management. Dairymen who strive to improve in these areas will increase profits and produce good quality milk.
PRODUCING QUALITY MILK ON OUR FARMS

by L. E. Larson
Larson Dairy, Inc.
Delray Beach, Florida

Some years back when I started dairy farming, I think I was too involved with trying to get started, pay my bills and to get some production to really care very much about quality except that we stayed within the legal bounds of quality.

As time went by, and there became a surplus of milk in our market, I began to recognize the fact that the handlers, or bottling plants appreciated the better quality producers with a consistently low bacteria, good flavor, low sediment and normal fat test for the market. It was about this time that I started to try to produce milk that we could be proud of.

I guess I was like one of two country boys at the county fair. They approached a stall containing a shooting gallery with a row of little colored balls bobbing up and down on a stream of water jets. One of the boys took the gun and tried his luck. He tried and tried several times without hitting the first little colored ball. Finally the other fellow took the gun, laid down his quarter and dropped all the balls with one shot. The first boy said, "Wow, I have never seen anything like that, How did you hit all the balls in one shot?" "Easy," said the second boy, "I just took a pot shot at the guy working the water pump and scared the daylights out of him."

I feel that producing high quality milk is kinda like this. You have to hit all the possibilities to maintain a good product. If you have clean healthy cows, clean equipment, and good refrigeration you should have a product you can be proud of.

We, at our farms try to build team work on the part of all the people connected with producing our milk because we feel it takes team effort to maintain a high quality milk.

Sometime back I had an employee to ask me why we should go to the extra bother to try to maintain good or high quality production because as he said you do not get paid any more for your milk as long as it is legal. His attitude was one of just getting by and after using as much patience in explaining to him the benefits of being proud of a good product, he still kept his old attitude and I suggested he look for another job somewhere else.

We try to blend all of the information, knowledge, know how, and common sense we can into maintaining our quality. We use our Coop's quality control program to evaluate what we are doing. Our Coop Lab samples all loads of milk we send in. We get a weekly report showing bacteria count, leucocytes, coli, antibiotic pos. or neg., butterfat and etc. I post these reports so all employees can see them and sometime give them an explanation of the reports. Brag on the report if its good — or tell them what we must do to improve any one aspect of the quality.
I find the attitude of our employees toward the milk inspectors to be an important factor. We as dairymen and our employees need to remember that these men, "The Milk Inspectors" may not always agree with us, but that they are "The Inspectors" and are charged with the enforcement of the Milk code and protection of the consumer.

I know of one instance, when one of a dairymen's employees wanted to be a little funny with an Inspector when the talk first started about leucocytes. The inspector was trying very seriously to explain to this man what a leucocyte was and how to look for one. The employee replied that he saw some running across the pasture that morning. The inspector drew back and said "Where?" The employee pointed his finger toward some of those white African Cattle birds you now see so often in cattle pastures. The Inspector just dropped his head, turned, and walked out.

Several years ago, we set out to improve our production per cow by improving our over all herd health. We use a vaccination program for the virus complex disease, routinely worm and fluke our cows as we dry them off, use teat dip on a routine basis, proper milking procedures, pre-strip, isolate any cows that are unhealthy and keep them isolated till we consider them well. If we do not get a response to mastitis treatment, we slaughter the animal. We use a dry cow treatment for all cows as we dry them off. We have a vet who we consult with on our herd health program and helps us set up our program, but we at the farm must carry it out.

We use the services of the feed companies and Extension Service to try to maintain good nutrition because I feel good herd health begins with proper nutrition, not just economical production. We use the manufacturers representatives of the various soap and chemical companies to outline and carry out our clean up program. We also use manufacture representatives to check out our milking system to be sure it is maintained in proper operation.

I feel we have at our disposal the knowledge and know how from the many people who are involved and interested in dairymen's well being, that if we use this information we can produce a good high quality product.

The most important aspect of it all though is to have people working with you who have a desire to produce a product that we all can be proud of.

I feel that, as far as telling anyone how to control quality is a tough assignment. It is to me, kinda like one of the students here at the University who sat in a class under a professor that always tried to teach the importance of honesty. He required each of them to give a pledge that they had neither given or received any help on their final examination. As the papers were turned in, the teacher noted one in particular. On it was written this pledge, "I ain't had no help on this exam and God knows I couldn't give any."

I feel this way about this talk, because the problems we are dealing with are very complex and the best of us will make mistakes and occasionally have a quality problem — The important thing is to DO SOMETHING TO CORRECT IT.
Nearly eight years ago we moved into a side opening stall parlor that had low level pipelines, plenty of vacuum reserve and I think we followed fairly good milking practices. I thought this would solve all bacteria problems and really help the mastitis problem.

I think it did help some but every so often we had a bacteria problem. Not real high counts but persistently too high to suit most people. We spent money and hours cleaning and looking for the trouble, with the help of the sanitarians and quality control people.

Lab work didn't show us to have a high mastitis count nor were leucocytes excessively high.

At this time we were using a siphoning type iodine dispenser in the water line for washing the udder and a spray type system for sanitizing the inflations. These work good sometimes.

We replaced this with a positive pump type dispenser that works most of the time.

Also as a last resort, more or less, we started post dipping the teats with iodine. Within one month the bacteria count was down to a respectable level and for the last seven or eight months has been below 10,000 count. The leucocyte count runs below 500,000 most all the time.

This has been good as far as the production of high quality milk and this is what we are supposed to talk about.

But let's just take a little time to talk about something that gets to you and me real quick and that's the pocketbook.

In the last eight to ten months, we have had very few new cases of mastitis. I believe I could count them on one hand.

We also use a dry cow treatment program. This has been a big help. We still have some old cows that have reoccurrence problems but they are much less than ever before.

I had a little problem starting the teat dip program as the men thought it would take more time to milk. This wasn't the case. In fact now it takes less time to milk, because they seldom have a bad quarter to milk.

These men would give you an argument now if you tried to take the iodine out.

Of course this has given us a higher production rate and a much lower replacement rate. This I think we all like.

I heard one fellow say teat dipping was the greatest thing that had happened to dairymen since Pangola Grass came about. But who has any Pangola Grass now?
QUALITY MILK PRODUCTION

by Don Hanson
Bassett's Dairy Farm
Monticello, Florida

I. Employee Training and Education

All employees are given regular training and refresher sessions in equipment use and care. This includes proper operation and correct sanitation and cleaning procedure. Correct cow preparation and proper milking techniques are also taught.

II. Equipment Care and Use

It is essential that all milking equipment and milk storage facilities be properly maintained and used to insure that a quality product is produced. Proper maintenance and use of the milking equipment is needed to keep the udder healthy. You should be sure that adequate vacuum and milk lines are used for the number of milking units to be operated. Enough vacuum reserve should be available to insure a stable vacuum supply. Avoid fluctuations in vacuum. Vacuum pumps are checked for proper operation and are serviced daily.

The milking equipment (machine) is checked for proper pulsation on a regular basis and all rubber parts are checked daily for wear and damage. Inflations are changed every 10 days and are disposed of.

The bulk storage facilities are checked frequently during and between milkings to be sure that the milk is being cooled rapidly and maintained at 34-36 degrees F.

All milking and storage facilities are cleaned with CIP units and manufacturer recommendations are followed. Our bacterial plate counts usually vary between 2,000 and 10,000.

III. Cow Preparation and Sanitation

We use sprinkler type cow washers in the holding pens to remove most of the dirt from the cows stomach, udder, feet and legs. The cows are then moved forward to the parlors where they have adequate time for most of the water to drip off before entering the milking parlor. Once in the parlor the cows are checked on a strip plate for mastitis, washed with warm water, sanitized and dried. After milking each cow is sprayed with an iodine solution (Bovadine). Also teatcups are flushed not dipped after each cow.

IV. Mastitis Control and Treatment

A. Cows showing signs of mastitis are pulled from the milking herd and are isolated and treated. We routinely take sensitivity tests to aid in the selection of medications or antibiotics. After the cow is cleared up-
showing no signs of mastitis - she is returned to the regular milking herd.

8. We keep all 1st calf heifers in separate herds, and they are milked first. This keeps down their exposure to mastitis and to older cows which have had mastitis.

C. It has been proven that cows in late stages of lactation have higher leucocyte counts than other cows. We dry off cows that go below a certain level of production. On the large breeds - Holsteins and Brown Swiss, this level of production is 20 lbs. per day and on the small breeds the production level is 17 lbs. per day.

D. We follow a dry cow treatment plan which is essentially as follows:

1) Every quarter on every cow is treated when she is dried off even though she may not have had mastitis. During the drying off period (2 weeks) cows are checked daily for mastitis and are milked out and treated if needed. At the end of this 2 weeks all cows are treated for mastitis by intramammary injections and are vaccinated for mastitis. The main advantage of vaccination on our farm has been a definite reduction in the number of gangrene cases when compared to the time prior to the start of vaccination. When dry cows are moved to the freshening pens - 4 weeks before calving - they are watched for signs of udder problems and treatment starts if a cow shows any signs of mastitis even though she may not have calved.
MILK QUALITY CONCERNS AT THE FARM LEVEL

by C. Bronson Lane, Ph.D.
University of Florida
Gainesville, Florida

Florida dairy products are of the highest quality when delivered to the retailer and consumer. All of Florida's products are Grade A and are produced and processed under sanitary standards established by the United States Public Health Service and the Florida Department of Agriculture and Consumer Services.

The long shelf-life of milk is remarkable, when one considers the fact that milk is perishable food and that addition of preservatives is prohibited by law.

On occasion, consumers inadvertently purchase milk that is seemingly not at peak-flavor, texture, and appearance. Until recently, most of these dairy product dropouts (edible, but not enjoyable) were blamed solely on dairy producers and processors. However, current studies are showing that retailers and consumers are sometimes responsible for mishandling of the product — with a subsequent loss of milk shelf-life and off-flavor development.

For instance, research conducted by the University of Florida Dairy Science Department showed that milk shelf-life can be decreased if the product is exposed to high temperatures for short time periods.

Hence, milk that is left in closed cars by shoppers during the hot summer months can be subjected to temperatures above 120°F. Even a thirty minute storage at these temperatures can affect product "freshness" and palatability.

Recent surveys of dairy case temperatures have indicated that many grocery stores are holding the milk above 45°F. This, too, can significantly decrease product shelf-life should psychrotrophic (cold-enduring) bacteria be present. Generally, the number of psychrotrophs in freshly pasteurized milk is very small; less than 100/ml and often less than 10/ml.2/ Nevertheless, these bacteria double in number every eight hours at 45°F, and multiply even faster at higher temperatures.

At 45°F, one bacterium would require 7 days to increase to one million, while 100 bacteria would require only five days to reach the million mark. Flavor defects such as fruity, bitter, putrid, stale, and unclean can occur at psychrophilic concentrations of one million or more.

Then, too, increased marketing through retail stores, use of fluorescent lighted dairy sales cases, and greater utilization of single service plastic bottles have re-introduced an old off-flavor nemesis — light induced oxidized flavor.

At Penn State University, researchers purchased samples of pasteurized, homogenized milk from more than 300 supermarkets, corner groceries, and dairy stores in Pennsylvania over a 27-month period. The 957 samples were checked at the time of purchase for temperature, bacterial concentration, and flavor. More than 55 percent of the samples were in an acceptable to excellent category
with another 28 percent rated as fair. However, the scientists felt that most consumers would object to the flavor of almost 17 percent of the samples. Oxidized flavors (cardboard or metallic taste) accounted for most of the 17 percent consumer rejects. The oxidized flavor defect was present in all types of packages — more in plastic than in glass, and more in glass than in paper.

Of 104 samples in blow molded plastic containers, 79 percent showed the defect, as opposed to 49 percent of the milk in glass and only seven percent in plastic coated paper cartons.

The light intensity, measured in foot candles, that reaches the milk by penetrating the carton barrier, has been shown to be directly associated with the oxidized flavor defect. It also causes partial or complete loss of certain vitamins (A, B, and C).

These Penn State dairy scientists concluded that the responsibility for milk flavor and keeping quality rests, to a large degree, in the hands of distributors in charge of merchandising practices carried out in store dairy cases.

Another study at the University of Kentucky validates this conclusion. Some 600 samples of homo milk, skim milk, low-fat milk, chocolate milk, half & half, and whipping cream were purchased from retail stores. The samples were placed in 40°F storage and checked for flavor on the 4th, 7th, 10th, and 14th days. Bacterial and taste analyses were made initially and after seven days of storage.

A few shocking facts from this study point up the severe shortcomings with dairy product keeping quality. Half of the whipping cream samples failed to keep seven days after purchase. Half and half was nearly as bad. Low-fat milks and skim milk kept somewhat longer, but even some of these spoiled before a week was out. Homogenized milk had the lowest keeping quality. Almost seven percent of the milk samples had a flavor score of less than 36 (edible, but not enjoyable) when brought into the laboratory for initial analyses.

Translating some of their findings into a consumer quality gamble, we learn that except for low-fat milks, the housewife has 1 chance in about 20 that the dairy product she buys won't be edibly enjoyable when she reaches home, and 1 chance in 8 that her milk won't keep more than 4 days in the refrigerator!

What's more, it has been shown repeatedly by extensive flavor surveys that 20 percent or more of the fluid milk on the market has recognizable off-flavors.

Realistically, not all dairy product dropouts are the result of consumer carelessness, supermarket stupidity, and processor passivity.

Producers are sometimes responsible for consumer rejects in the marketplace. It must be emphasized that the finished dairy product, be it homogenized milk, cream, or ice cream, is no better than the raw ingredient that went into making that product.

Superior quality begins on the farm. In spite of the tremendous amount of educational work on sanitation carried out during the past decade, far too much milk has been rejected at the farm and in the market place. Someone
has said that it is a strange anomaly, that the milk producer, who has perhaps the greatest stake in the dairy industry, is, in general, the least concerned about the flavor and quality of the product he has to sell. Frankly, such a premise for Florida producers is indeed questionable.

Clean milk is being produced by the majority of you, and can be produced by any dairymen having the will to succeed, the proper training and motivation in sanitation principles, and the fixed determination to get the job done.

My purpose for addressing this conference is to introduce myself and let you know that the Dairy Science Department is available to help you with milk quality problems which may plague you on occasion.

You've no doubt heard the following milk quality problems discussed on numerous occasions — and are aware of their causes and cures. Awareness, unfortunately, is not synonymous with motivation, involvement, or correction. Florida producers are still confronted with the following:

I. MILK OFF-FLAVORS

1. Rancidity - Rancid flavor in market milk often seems to follow a seasonal trend. It is usually more prevalent in late fall and early winter months, possibly owing to late stages of lactation and an increase in the percentage of dry feed in the ration.

This off-flavor, described as "dirty socks" and "goat smell", results from the attack of the enzyme lipase on milk fat triglycerides. The liberated short-chain free fatty-acids, particularly butyric, are responsible for the off-flavor found in market milk.

Pasteurization in the processing plant destroys the lipase enzyme for all practical purposes. Hence, the prevention of rancidity is primarily a matter of handling the raw product properly.

Rations containing high levels of dry feed are more prone to cause spontaneous rancidity than rations with a good proportion of green feed. In addition, conditions which favor rigorous agitation and foaming of warm raw milk contribute to the rancidity problem. Chief equipment offenders are pipeline milkers with risers in the line, and combinations of pumps and milk level activating devices which promote foaming.

This off-flavor can be minimized with proper installation of pipeline milkers, removal of cows from milking line which produce rancid milk, and properly balanced rations.

2. Oxidized - This off-flavor, described as cappy, oily, or cardboard is not only a retail problem, but it can, and frequently does, occur in raw milk on the farm which has been exposed to sunlight or contaminated with copper.

To prevent the occurrence of this off-flavor, it is best to keep milk covered at all times, use only stainless steel, glass, plastic or rubber on milk contact surfaces, and supplement rations with a vitamin E additive if the problem persists.
II. **BULK TANK PROBLEMS**

Bulk tanks, if operating properly and efficiently, provide an inexpensive means of cooling and storing milk until picked up by the hauler for delivery to the processing plant.

Bulk tanks have eliminated some problems but they have introduced others. The tendency toward longer storage, greater transport distances, and increased refrigeration for raw milk have given an opportunity for a group of cold enduring organisms to gain tremendous importance in milk quality control. These are the psychrotrophs (or psychrophiles) which plague our products at the retail level.

The main sources of psychrophilic bacteria are soil and water, but they are also found to a significant degree in dirty equipment and raw milk.

To prevent psychrophilic spoilage of raw milk, it is imperative that the bulk tank unit be cleaned and sanitized properly. The five steps necessary for proper hand cleaning and sanitizing of bulk milk tanks are: rinse tank with tepid water as soon as the milk is removed; wash tank with alkaline cleaner (chlorinated foaming type) — non-foaming cleansers should be used with CIP systems; rinse residual detergent from tank with acid cleaner (if necessary); sanitize prior to placing milk in tank; make sure tank is clean before using again.

Bulk tanks must also have an adequate cooling capacity to minimize milk spoilage problems. The 3A standards for bulk milk cooler operations state that: A cooler designed for "every-other-day" pickup must cool 25 percent of the rated volume of the tank from 90°F to 50°F within one hour after it has been filled to 25% of its rated capacity. The cooler must cool this volume from 50°F to 40°F within the next hour. (The refrigeration capacity of a cooler for "every-day" pickup must be doubled).

Another nemesis which occasionally occurs in bulk tanks is fat clumping or churning. Look for these factors if you are experiencing the problem: agitator set at too high speed; air leaks and risers in line; excessive agitation when propeller isn't covered with milk; malfunctioning compressor; refrigeration not in operation before milk is added; operation of agitator at 70°F temps.; running agitator backwards; improper functioning of the controls on centrifugal pump.

III. **HIGH BACTERIA COUNTS**

Inordinately high bacteria counts generally arise from improper cooling of the milk and inadequate cleaning and sanitizing of milking equipment.

Successful circulation cleaning of milking systems depends on the adoption of a complete cleaning program, based on cleaners and sanitizers correctly matched to the water supply. Obviously, an adequate supply of hot and cold water is essential for circulation cleaning. The water should be checked with a test kit or by a technical soap and sanitizer representative for mineral content, pH, and hardness. If the water tests more than 10 grains hardness, it should be softened or used with hard-water cleaners.
The IAMFES Dairy Farm Methods Committee has reported that the four factors which are generally considered necessary for satisfactory circulation cleaning are:

- Adequate velocity.
- A 5-minute minimum circulation time with a 10-minute optimum.
- A solution of adequate strength.
- An endpoint temperature above 100°F. (Redeposition of the cleaning solution and the minerals from water and milk will occur if the temperature drops too low).

Frankly, we can't afford to market any dairy product dropouts for the following reasons:

- Declining dairy product consumption.
- Increasing consumerism activities. Buyers are vocally claiming their rights to safe, wholesome, palatable, and nutritious products at a reasonable price.
- Eroding of our markets by substitutes. Readers' Digest, in an article titled, "Is That Really Milk You're Drinking?", had this to say: "Understandably, the imitation milks have the dairy industry in a turmoil. Dairy farmers have already lost one-fourth of their butterfat market to substitutes in the last 25 years. Imitations have stolen 35 percent of the coffee cream market and 80 percent of the whipping-cream market. Margarines outsell butter almost two to one."

"A basic reason for all this is that in the past, the dairy industry so shackled itself by laws designed to protect it from competition that it can no longer compete effectively by tailoring its products to consumer demands and improved technology."

- Misleading and fraudulent attacks on our products by certain segments of the medical profession.

- Poor funding for advertising, promotional programs, and new product development by our industry.

All of the preceding industry problems can be rectified with a unified effort on behalf of producers and processors. More monies must be spent on promotional programs and research activities to increase dairy product consumption and to offset the spurious negatives and vindictives hurled at our products.

And by all means, let's eliminate dairy product dropouts by keeping milk clean, cool, and free of off-flavors.


RECENT DEVELOPMENTS IN MILKING EQUIPMENT
AND CURRENT RECOMMENDATIONS

by Robert C. Dawson
Babson Bros. Co., Oak Brook, Illinois

Equipment that has been introduced recently or that will be introduced in the near future, which affects the established milking practices, basically falls into the following categories:

A. Mechanized equipment for controlling cow movement.

B. Automated prep systems for stimulating milk let down.

C. Automatic take-off units.

The affect this equipment will have on milking practices is primarily saving the operator time that he has been spending driving cows, opening and closing doors and gates, washing udders, and removing teat cups; thereby allowing him to devote that time to a more thorough performance of his part of the milking routine and to the operation of more milking units.

The procedure in an automated milking parlor is as follows: A cow moving into the Prep Stall automatically starts the mechanical sequence that shuts her in the stall, feeds her if desired, and sprays the udder with warm water to stimulate milk let down.

The timing and length of the spray period can be adjusted to conform with the circumstances of each individual installation so that milk let down is at its peak by the time the operator is ready for the cow in a milking stall.

To receive a cow in the milking stall, the operator hits a demand switch which releases her from the Prep Stall. As the cow moves out of the Prep Stall, this automatically starts the mechanical sequence for the Prep Stall to receive another cow and prepare her for milking.

The cow that was released from the Prep Stall moves into the milking stall where the operator's procedure will be to dry the teats and udder, strip the fore milk, attach the automatic take-off unit without delay and properly adjust it.

After this, the operator will not need to return to the cow until the teat cup has been automatically removed from the last quarter. Upon returning to the cow, the operator will check the udder, dip the teats with an approved bactericide, and release her from the milking stall. At the same time, the Prep Stall demand switch would be activated starting the cycle over again.

The use of automatic prep systems and take-off milking units, along with automatic sequencing of each phase of the milking procedure allows a good man to produce more pounds of milk per hour while adhering to milking practices that promote top production, good udder health, and expanded herd life of the cows.

There is presently more than one approach being used toward the automation of milking systems; however, regardless of which approach to automation is used, the basic steps for proper milking do not change. Therefore, it makes no difference how highly automated the system is...the first pre-requisite is still a good man following time proven milking practices.
RECENT DEVELOPMENTS AND CURRENT RECOMMENDATIONS IN MILKING EQUIPMENT

R. L. Severson
De Laval Separator Company
Chicago, Illinois 60646

The Dairy Industry, nationally, as well as here in Florida, has undergone many changes during the past 10 - 20 years. It appears now, that we are entering a new era of automation and I believe we can expect changes at an even more rapid rate during this next decade.

Nationally, the total number of milk cows has decreased to about 11 million, which is less than half of the number in 1940, yet our total milk production remains rather constant. Herd sizes are undergoing a very rapid change, the very small herds are disappearing, the number of 30 - 49 cow herds remaining relatively stable but we see a rapid growth in the number of herds of 50 cows or more. Here in Florida for example, in 1964, there were 1463 herds of all sizes and 67% of them were of 50 cows or more. In 1970, there were only a total of 469 herds with 85% of 100 cows or more.

As the herd size increases, it brings with it many accompanying problems. Just the physical handling, feeding, moving, milking, record-keeping of large numbers of cows, presents many problems which were nonexistent with the small herd. Use of "outside the family" labor, obtaining and training this help, then utilizing them to a maximum advantage, imposes requirements for much greater managerial skills.

The theme of this conference is "Producing Quality Milk" so let's talk about some of the problems directly connected with milk harvesting. This steady, twice-a-day chore, makes recruitment of, and keeping of, good help, rather difficult. There is also a necessity of providing them with training on how to milk cows properly, in order to insure a profitable dairy operation.

Some milker operators are better than others - what makes them better? Isn't it true the good operators share a common characteristic? They are knowledgeable in good milking techniques and apply these techniques in their work? They know how and when to stimulate the milk letdown - they know how and when to attach and remove the milker unit for maximum production.

What are the recommended milking techniques?

1 - Wash udder and teats with warm water with germicidal udder wash.
2 - Forestrip each teat - detect abnormal milk - open streak canal.
3 - Attach milker unit - about 1 minute after starting the wash.
4 - Check the udder and remove the unit when cow is milked out. Usually 2½ - 3 minutes after attachment on healthy udder.
5 - After removal of unit - dip teats in "after milking teat dip.

The above techniques will produce the maximum amount of milk, when followed consistently. Timing, however, is of extreme importance - because once the
letdown has been triggered, - it only lasts for 4 - 6 minutes - and if milker unit is not applied at proper time, you will not obtain all the milk she is capable of giving.

Our own Dr. Mettler has prepared a graph showing typical flow rates - in relation to time elapsed since stimulation was started.

**Typical Flow Curves**

Dr. John S. McDonald of National Animal Disease Lab, of Ames, Iowa, says that if the milker is attached within a minute of stimulation of letdown, you will get 95% of milk - if you delay the attachment of milker, you will get a linear decrease in amount of milk, and also you will leave more residual milk in udder.

Timing of attachment of milker, therefore, is of great importance to full production.

Once the milker is attached to cow, we come to a rather critical part of the milking act. When should the unit be removed? Since every cow is different - they give varying amounts of milk, they respond to letdown differently, their flow rates vary - this really poses quite a problem for the operator doesn't it? If he is conscientious, he will want to remove it as soon as she is milked out. As he will know that overmilking is recognized as one of the major predisposing causes of mastitis.

These are some of the problems associated with the milking act on commercial dairies.

**What has De Laval done about them?**

As early as 1959, De Laval started research on automated milking system. In 1965, U. S. farm paper editors were given a preview of our concept of the automated milker at that time. Our work up to this point centered around a mechanical, unit-removal system, automatic feeding, washing and record-keeping. All of this designed to make the job of milking cows more appealing to the man.

After several years of research in this direction, we re-evaluated our work and realized that we were not fully taking into account the normal, physiological characteristics of the dairy cow herself.

We then altered our objectives and proceeded to develop a milking machine which is capable of utilizing all the forces affecting the cow at milking time.

Finally, in October, 1970, we introduced the De Laval Model 200 Milker - the first milker that is controlled by the cow herself!

**How the 200 functions**

The 200 is very similar in appearance to our Model A Weigh Jar System.

The 200 goes through 3 phases in milking an individual cow -
Phase #1 - soft, gentle stimulation phase. The vacuum is only 10", pulsation rate only 30, and ratio 30/70, i.e., liner closed 70% and open 30%.

This mechanically stimulates the letdown and assures constant, uniform stimulation. Operator only washes teat, dries, forestrips and attaches unit.

When milk flow from 4 quarters reaches 1/2#/Min., unit automatically shifts to Phase #2.

Phase #2 - provides the same fast, gentle "soft touch" milking as our Model 100, introduced in 1962, for the modern dairy cow. In Phase #2, a light comes on, visually informing the operator, this cow is now milking - Vacuum 15", pulsation rate 60, ratio 70/30. As soon as cow is milked out, and flow rate drops below 1/2#/Min., a 10-15 second time delay is activated to provide for milking out uneven quarters, before the unit shifts to Phase #3 and light goes out.

Phase #3 - is post-milking massage phase same as Phase #1 - i.e., 10" vacuum, 30ppm and 30/70 ratio, but for a different reason. This soft, gentle massage, now stimulates circulation of blood to teats and also helps to close sphincter muscle. Unit stays in Phase #3 until operator removes - which can be at his leisure - as it has no ill effect on cow.

That's how the 200 operates - what benefits can be derived from its use?

From the operator's standpoint -

1. make many decisions for him.
2. permit him to work in parlor in routine manner.
3. relieves the pressure on him to remove units at proper time.
4. less fatigue.
5. enable him to milk more cows per hour.

From the cow's standpoint -

1. uniform stimulation - better response.
2. faster milking - unit in place - full advantage of peak let-down pressure.
3. more complete milking - less residual milk.
4. lower CMT - better production.
5. improved teat ends - less new infections.
   a. Dr. Philpot¹ - "teat end-focal point of all Mastitis Control Programs."
6. possibly 1 or 2 more lactations - (and possibly 1 or more heifer calves).
   a. culling rate
   b. cow reaches full production 3 and 4 lactations.

From the owner's standpoint -

1. increase production - increase profits -
   a. lower CMT = more milk
      (1) Dr. Philpot¹ CMT
      T - 3%
      1 - 9%
      2 - 27%
      3 - 46%
2 - less vet expense - more profits.
3 - produce better quality milk - more profits.
4 - attract better calibre labor.
5 - greater utilization of labor.
   a. more cows/man/hr.
6 - retain good help
   a. easier, more pleasant working conditions.
7 - peace of mind - assured good returns on investment.
   a. 200 doesn't require skilled operator.
   b. assured of protecting udders.
8 - permits expansion - yet retains good control.
9 - production records - easy to obtain.

Many Dairymen are faced with a decision - either expand or get out of dairy business. We believe the Model 200 makes it possible for him to expand to an economic-size unit and yet retain good control of the operation.

I appreciate this opportunity to present information on De Laval's Model 200, our latest contribution to the U. S. Dairy Industry, designed to enable the Dairymen of the 70's to operate profitably.

References:

MILKING MANAGEMENT FOR MAXIMUM PROFIT

by Aubrey Wisdom
Ross-Holm Automated Milking Systems
Petaluma, Calif.

The cow is an affectionate, intelligent animal, doing her best to co-operate, sometimes under the most difficult conditions.

She can be trained through habit to do a variety of things; but if we want the maximum from her, we must accommodate her likes and dislikes with the least compromise. If we give her half a chance, she will likely pay us better than any other activity.

Observation of milk cows shows some definite likes and dislikes:

1. SHE WOULD ALWAYS PREFER to stand or eat with her head uphill. In fields note how cows standing or lying almost invariably lie with their head uphill.

2. SHE DOESN'T LIKE TO turn or back up — would prefer to walk straight ahead. A cow alongside the road is much more of a hazard when facing into the road than parallel to or facing away.

3. IN MOVING A GROUP of cows, they would prefer to follow their sisters or lead cow, usually behind one another. It's difficult and requires training to split off small groups.

4. SHE REACTS WELL TO quiet-controlled areas, and continual step-by-step movement.

5. IN A GROUP OF COWS, like other animal groups, a pecking order must be established, and certain cows are established as "boss." Cows are disturbed each time this has to be re-established.

6. COWS ARE HESITANT to go from light to dark.

The less we compromise with a cow's nature, the lower the stress factor.

Management is often hampered by obsolete facilities, worn-out or inefficient milking stables that induce stress and prevent the dairyman from attaining results.

The dairyman must adhere to a strict routine for best results in the preparation, stimulation and milking of the cow — same time, same method, same person as much as possible.

Since no two cows are identical, each animal should be handled as an individual. A modern system should accept reasonable variables, providing production is at profitable levels.
First we must have a man — either owner or manager — with the proper
cow know-how and the desire to do a good job of handling, feeding, breeding
and housing cows and to respect cows enough to insist they are handled gently,
carefully and kindly. Every effort toward greater comfort and well-being
of this animal will pay off handsomely in more milk, higher profits and less
udder trouble and disease.

The preparation and stimulation of the udder is important to save milk-
ing time, get more milk, and reduce teat and udder irritation: Follow a
routine that the cows can expect at each milking. Handle them gently so they
will associate milking with a pleasant experience.

1. SET UP A SITUATION so cows will want to enter parlor. Design a
holding pen of reasonable size, with a positive slope to the rear, and no
wall between the holding pen and milking area. Cows will face in and be
better prepared to move in.

2. CLEAN THE UDDER with cool water. Under difficult conditions, a
detergent should be added.

3. PREPARE FOR LET-DOWN by spraying the udder with warm water and feed-
ing a small amount of high concentrate feed. Let-down is a mental or psychol-
ogical reaction to some signal (environment, hot water, music, etc.), caus-
ing a hormone release through the blood stream, in turn causing contraction
of the alveoli or milk-producing cells, expelling the milk into the teat
clsterm. If this doesn't occur, all the milk cannot be taken from the udder.
Milking machine attachment before let-down may cause udder injury. Incomplete
harvest or holdup causes premature drying up and low production.

4. USE STRIP CUP. Inspect udder for abnormalities.

5. ATTACH MILKING MACHINE after let-down. It's important that this
be at least one minute and not more than three minutes from time of let-down
procedure. Attach gently. The time interval and routine should be kept con-
sistent.

6. FEED ACCORDING TO PRODUCTION, with feed available during entire mil-
kmg. Even in the limited time the cows are in the parlor, significant savings
may be made in grain without lowering production. Grain consumption is no
longer at the mercy of the cow's appetite.

7. REMOVE THE MILKING MACHINE in an average of 2 1/2 to 5 minutes. Dip
teats in bactericide solution prior to leaving. Undivided attention should
be given to the milking procedure.

Note: There may be exceptions to the 2 1/2 to 5 minute average, with
slow milking cows. However, if average time is excessive, milking practices
or equipment may need to be improved.

8. GUIDE THE COW from the parlor. She will probably leave without coax-
ing if feed is taken away from her.

Since it is important the man give his undivided attention to the milking
operation, there is very little question that one man should be in each milking
area without outside influence or other people to talk to or "visit" at the ex-
pense of the milking routine.
SUGARCANE BAGASSE PELLETS AND COTTONSEED HULLS AS ROUGHAGE SOURCES IN COMPLETE RATIONS FOR LACTATING COWS.

by S. P. Marshall
Dairy Science Department
University of Florida

Florida dairymen generally use a single mixed feed to supplement the available roughages such as pasture, green-chop, silage or hay. When these forages are in short supply some roughage may be incorporated into the mixed feed. Cottonseed hulls have been the principal ingredient roughage used because acceptable results have been obtained with them and their physical form is suitable for mechanical handling.

In 1969, sugarcane bagasse pellets were manufactured commercially in Florida for use as a roughage source in cattle rations. These pellets are produced by drying the sugarcane residue after juice extraction, grinding the dried bagasse, adding about 10% of blackstrap molasses and pelleting through a 3/8-inch dye. These pellets were compared with cottonseed hulls as the roughage source at 7.5 and 15 percent levels in steer fattening rations at the Range Cattle Station and found to be satisfactory.

Dairymen became interested in the use of these bagasse pellets as roughage sources in rations of lactating cow so an experiment was designed to study their suitability as a roughage source for complete rations in terms of animal health, maintenance of milkfat test, feed intake and milk production. For this purpose a complete ration containing 25% of bagasse pellets, and one with 12.5% bagasse plus 12.5% cottonseed hulls were compared with a basal ration containing 25% cottonseed hulls. Ingredient composition of the rations are shown in Table 1. These experimental rations were designed to compare the roughage sources under rigorous conditions and did not contain any pasture, green-chop, silage or hay as is generally fed in Florida. After 2-week standardization period on the complete ration containing 12.5% pellets and 12.5% hulls, 12 Holstein and 6 Jerseys were divided into three comparable groups of 6 cows each. Each of the three rations were assigned by random to a group of cows. All rations were fed ad libitum and records were kept on each cow for daily feed intake and production was recorded at each milking. Milk-fat and solids-not-fat tests were made at weekly intervals.

A summary for 10 weeks on the experimental rations is given in Table 2. The daily dry matter intake of 3.9 to 4.1 percent of body weight is quite high when compared with 3.0 to 3.2 which is the upper level expected on most dairy rations. Since these data were collected in the cooler period of January through March and when the lactation stage was near peak production one would logically anticipate some reduction in intake level during the warmer months and as production declined.

Average daily production of milk ranged from 47.8 pounds on the ration with pellets to 49.6 on that with cottonseed hulls. When production was converted to solids - corrected milk containing 340 kilocalories per pound (about 3.5% fat milk) average daily yield figures ranged from 56.2 for the ration
containing bagasse pellets to 52.0 on that with cottonseed hulls.

Milk fat test appeared to be maintained well on the ration with sugarcane bagasse pellets. On the ration with cottonseed hulls, fat test declined about 45% with one cow, 21% with another and a small amount with a third. Test was maintained by the other three cows. The ration containing pellets and hulls maintained test with all cows with the possible exception of one near the end of the 10-week period.

There were occasional cases involving all rations where the appetite of cows would decline and then recover, usually within a period of one week. There were a few cases in all rations where individual cows went off feed. Most recovered within a few days without treatment. Feeding some forage plus infusions of Ketosol gave prompt favorable response to those so treated. Some stiffness was noted in a few cows. If there was any ration difference with respect to health, animal numbers were too small to detect it.

The results to date indicate that sugarcane bagasse pellets may be used as a substitute for cottonseed hulls in rations for lactating cows. Bagasse pellets appeared to maintain milk fat test better than did the cottonseed hulls. Additional research is needed to determine optimum levels for bagasse pellets and cottonseed hulls in dairy rations.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Cottonseed Hulls</th>
<th>Hulls and Bagasse</th>
<th>Bagasse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed hulls</td>
<td>25</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Pelleted Bagasse</td>
<td>--</td>
<td>12.5</td>
<td>25</td>
</tr>
<tr>
<td>Citrus Pulp, S.D.</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Corn, ground</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Soybean Meal, 49%</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Duophos</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Urea, 281</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Salt, TM</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

*Vitamin A - 25,000 IU per pound

<table>
<thead>
<tr>
<th>Ration</th>
<th>Dry matter intake Lbs/cwt/day</th>
<th>Ave. Daily Production (lbs)</th>
<th>Ave. Daily Solids-corrected milk (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed Hulls</td>
<td>4.1</td>
<td>49.6</td>
<td>52.0</td>
</tr>
<tr>
<td>Hulls Plus Bagasse Pellet</td>
<td>4.1</td>
<td>48.5</td>
<td>54.5</td>
</tr>
<tr>
<td>Bagasse Pellets</td>
<td>3.9</td>
<td>47.8</td>
<td>56.2</td>
</tr>
</tbody>
</table>
Postpartum Changes in Reproductive Status and Management to Maximize Reproductive Performance

W. W. Thatcher

Department of Dairy Science
University of Florida
Gainesville

A 12 month calving interval should be the goal of dairymen who want to maximize both breeding and milk production efficiency. This goal is justifiable economically because about one-half of the yearly milk production (305 days) is produced in the first 120 days of lactation. Consequently, the greater percentage of a cow's lifetime spent in early lactation, the more profitable the cow will be to the dairyman. Cows calving every 12 months will have a higher yield per day for the interval between calves then will cows with a calving interval of more than 12 months. There are numerous factors such as postpartum reproductive function, herd health programs, nutrition, level of milk production and management that contribute to the actual calving interval obtained in dairy herd operations. Each of these factors must be considered in attempts to reduce or optimize the calving interval to 12 months.

The postpartum period in dairy cattle is an extremely important period with regard to the normal hormonal and reproductive tract changes involved in the restoration of complete reproductive efficiency. Studies by Morrow (1966) and Marion and Gier (1968) indicate that the interval from parturition to gross involution of the uterus is approximately 25 to 30 days. Increased ovarian follicular activity is present by 10 days following calving and the average interval to first ovulation is 14 to 16 days. Figure one compares the rate of uterine involution in the previously pregnant horn and nonpregnant horn and the percent of ovulations occurring in either the opposite or adjacent ovary of the previous pregnancy.

The observed frequency of first ovulations is significantly different (P<.001) from the expected frequency of 55 and 45 percent from the right and left ovaries, respectively. Of the 101 ovulations between 11 and 15 days after parturition, 93 ovulations or (92%) occurred from the ovary opposite the previous pregnant horn. The frequency of ovulations from the ovary adjacent to the previous pregnant horn increases as the diameter of the horn decreases. When the uterine horn diameter reaches approximately 60 mm, the local influence of the previous pregnant horn is no longer evident (30 days). The uterus appears to exert a local affect on the ovary and as the diameter of the uterine horn returns to near normal, which occurs first in the previous nonpregnant horn, ovulation occurs. The interval between the first and second estrus is significantly shorter than the interval between the second and third estrus, 17 vs 21 days, respectively (Morrow, 1966). A factor to be considered during this time is that LH content from the pituitary gland increases from parturition to 30 days postpartum (Saiduddin, et al 1964), (Saiduddin et al, 1968). Consequently, the low postpartum levels of LH may be responsible for the deficient formation and maintenance of the corpus luteum, resulting in a short cycle. Whereas, the

*Presented at the Dairy Production Conference, University of Florida, Gainesville, April 11-12, 1971.*
subsequent higher hormone levels, later in the postpartum period, may aid in normal corpus luteum function and re-establishment of normal estrous cycle lengths.

Figure 2 shows the normal changes in plasma progestin levels during the estrous cycle of 5 cycling heifers (Thatcher et al, 1970). The progestin levels were lowest at day zero through day 2 and did not rise steadily until about day 5. Progestin levels continued to rise steadily to a peak of 9.2 ng/ml at day 17 or 4 days prior to the next estrus, then declined precipitously. The decline is associated with the regression of the corpus luteum and is followed by standing heat on day zero. These normal cyclic changes in progestosterone do not usually occur routinely during the early postpartum period, as illustrated in Figure 3 (Donaldson, et al, 1970).

The incidence of silent or unobserved estrus decreases with each successive ovulation during the postpartum period. Morrow reported in 1966 that the frequency of silent heats at the first three estrus periods was 79.0%, 55.0% and 35.0%, respectively. Likewise, the frequency of cystic ovaries decreased from 22.3% at the first postpartum cycle to 6.2% in the second. A majority of the follicular cysts (81.8%) resulted in anestrus and constituted the most important factor for the delay in first estrus and ovulation.

Cows which have abnormal parturitions (classified by either abortion, dystocia, twins, retained fetal membranes, metritis, milk fever, acute mastitis or ketosis) have a delay in the interval to first estrus and a greater incidence of cystic follicles compared to normal cows (23.4% vs 8.3%). Animals with high production levels are more prone to parturient diseases and these cows also have longer calving intervals (Morrow, 1966).

Workers at North Carolina (Johnson et al, 1966) reported that animals with follicular cysts produced significantly more milk than non-cystic herdmates, and that circumstances associated with the cystic condition appear to be responsible for increased milk production. In addition, anestrous cystic animals had higher milk production than those with nymphomanic tendencies.

These alterations in reproductive function characterize clearly the expected changes in postpartum reproductive status of the dairy cow.

The usual breeding recommendation has been to inseminate cows no earlier than 60 days after calving (Salisbury and Vandemark, 1961). This is based on optimum fertility at this time and desirable calving intervals. Insemination after calving should be related to the postpartum condition of each cow as determined in a sound herd health program. Cows examined at 30 to 45 days after calving and considered normal or reproductively competent could be bred prior to 60 days. A Kentucky study (Olds, 1969) has shown that for each 10 days prior to 60 days that cows were inseminated, the calving interval was reduced 8.8 days.

In other research, we have evaluated the reproductive performance of 577 dairy cows at the Florida Station for the period 1959 to 1968 (Thatcher et al, 1970). The objective of the study was to determine, under routine herd management conditions, whether the frequency of estrus within a 60 day postpartum period was related to subsequent reproductive performance. The analysis was comprised of 1398 postpartum periods of which 1209 resulted in pregnancies (Table 1).
Of the total 1209 postpartum intervals, 294 intervals or 24.3% occurred with no detectable estrus during the 60 day postpartum period and 38.0%, 29.9%, 7.4% and 0.3% expressed 1, 2, 3 and 4 heats, respectively. The incidence of postpartum heats within 0-60 days was associated with the number of services per pregnancy. The overall mean for services per pregnancy was 2.46. A significant linear decline was detected from a mean of 2.59 for cows experiencing zero or one heat to a mean of 2.29 for cows experiencing either 2, 3 or 4 heats. This represents a 12% difference in reproductive efficiency. Cows experiencing no heats during the first 30 days postpartum required more (P<.01) services per pregnancy than cows experiencing 1 or 2 heats during this period (2.63 vs 2.32 and 2.13). In contrast, there was no relationship between the incidence of heat periods and services per pregnancy during the second 30 day period. These results indicate that early estrus activity, during the period of uterine involution, is important in the re-establishment of fertility in the postpartum dairy cow.

Systematic monthly veterinary examination helps prevent and control reproductive problems in high producing dairy cattle and makes a 12 month calving interval possible. Many dairymen are utilizing such a herd health program in close cooperation with a veterinarian. Morrow (1970) recommends the following veterinary examination schedule for reducing infertility, and maximizing return from veterinary services (Table 2):

1. Cows with retained placenta should be examined and treated 24 to 72 hours postpartum. They should be re-examined once or twice prior to breeding, to ensure that the uterus is free of apparent infection and has returned to normal size.

2. Cows with a purulent or fetid discharge from the vulva at 15 days postpartum should be examined and treated. The discharge is usually secondary to a dystocia, retained placenta, or other calving complications and may originate from either the uterus, cervix, vagina, or all three areas. If infection is not localized early by veterinary diagnosis and treatment, it can spread to adjacent genitalia, making treatment more difficult and recovery prolonged.

3. Cows with an abnormal discharge or cloudy mucus during estrus should be examined to determine if infection is present.

4. Cows should be examined at 25 to 40 days after parturition and prior to breeding to make sure that the reproductive tract is free of gross infection and undergoing involution at a normal rate. Treatment of most postpartum problems is easier and less costly when it is begun at this time.

5. Cows with abnormal estrous cycles at 45 to 60 days postpartum should be examined. Cystic follicles and silent or unobserved estrus are important causes of apparent anestrus at this stage.

6. Cows should be examined for pregnancy at 30 to 45 days after breeding, and re-examined at 60 to 90 days to reconfirm pregnancy.
The dairyman cooperates closely with the veterinarian by maintaining a simple, complete and accurate record on the health and reproductive status of each cow in the herd. These records provide valuable assistance to the veterinarian in diagnosing and treating infertility.

The nutritional status of the lactating dairy cow is indeed important in maximizing breeding efficiency. However, there appears to be no evidence that any single nutrient is required specifically for reproduction. In general, if the nutritive requirements for milk production and general health of the cow are met, then the cow's nutritive requirements for reproduction should be sufficient. Low phosphorous intake and wide calcium: phosphorous ratios are reported (Hignett, 1960) to reduce reproductive performance of cows. Some dairymen believe that feeding urea will reduce conception rates. However, numerous experimental results fail to reveal any infertility associated with feeding urea at recommended levels (Boyd, 1970).

The key to obtaining a 12 month calving interval is dairy herd management. It has been my experience and that of others that inadequate estrus detection and inseminating cows at the wrong time are the main management problems that reduce breeding efficiency. Nearly 90% of undetected heats result from the dairyman's failure to observe the cow's estrus, and only 10% due to abnormal conditions in a cow's reproductive tract (Zemjanis, 1963). Animals should be observed carefully for standing estrus at least twice daily (early morning and late afternoon) at times other than during milking or feeding. Close records should be made on detected heats so that a dairyman will know within a day or two when a cow is expected in heat. Fertility is highest when cows are bred from the middle to the end of standing estrus (Hafs and Boyd, 1964).

The managerial problem of estrus detection increases with increases in herd size and with greater automation of dairy herd operations. Consequently, less time is spent on a per cow basis in checking for estrus. We have compared two systems of estrus detection, Ka Mar detector and Visual observation, and evaluated subsequent reproductive efficiency in the Florida Agriculture Experiment Station Dairy Herd. The experimental design is illustrated in Table 3A.

The heat detector consists of an oval of canvas 11 x 5 cm to which is attached a plastic dome 8 x 15 cm in size. Inside the dome is a plastic tube containing red dye. Sustained pressure for 3 seconds or more releases the dye from the internal tube and the dome becomes entirely red. The detector is fixed to the sacral region of the animal by an adhesive.

At 8:15 AM and 4:30 PM, and at other random times during the day, animals were observed for standing estrus and for changes in detector color (white to red). In the detector group either of these observations was regarded as estrus, and all animals were bred by artificial insemination. In the visual observation group, of course, only animals in standing heat were bred.

The following responses were evaluated: accuracy of heat detection, frequency distribution of estrous cycle lengths, interval from the beginning of the experiment to first detected estrus, interval from first insemination to conception, and total reproductive days.
Of the 169 detected heats (Table 3B), 164 or 97% were identified with a red detector; and 46 or 27% of the total heats were identified with a red detector but no visible signs of standing heat. Of the total 123 standing heats (118 red-standing and 5 white-standing) 96% or 118 resulted in a red detector. These results indicate that an animal with a white detector has almost certainly not been in heat. The remaining 46 heats, in which there was a red detector without standing heat, could be the result of unobserved standing heat or due to pressure applied to the detector in some way not associated with standing estrus.

The distribution of estrous cycle lengths classified on the interval between red detectors was significantly different from the distribution based on the interval between standing heats (Table 4). The 20 percent incidence of total cycle lengths less than 18 days for cycles classified on the basis of a red detector was significantly greater than the frequencies of 4 and 7% for cycle lengths classified by standing estrus in groups I and II, respectively. Several workers have estimated that the percentage of the cycles less than 17 days in length vary from 2 to 8%. Consequently, our frequency value of 20%, based on intervals between red detectors, is partially due to pressure applied to the detector in some way not associated with estrus. Crowding of cows into closely confined groups, as in the holding area of the milking parlor, could have partially accounted for some of the false detected heats. In this situation, non-estrus animals would not have complete freedom to escape from being mounted. Boyd et al, 1968 have also reported greater incidence of short estrous cycles as detected by Ka Mar detectors in heifers.

Decreases in both the interval to first detected estrus and the conception period were observed for the detector group I compared to group II but neither were statistically significant (Table 5). The conception period is defined as the interval from first insemination to conception. The average number of reproductive days, which is comprised of the interval to first detected estrus plus the conception period, was significantly reduced from 74 days for group II to 57.8 days for group I. This represents an average decrease of 16 reproductive days per animal by utilizing the heat detector patch. This agrees with the observation that the number of actual estrous cycles observed for group I was reduced compared to group II (66 vs 112), since animals with detector patches (group I) were observed for a shorter period of time during the study due to the reduced number of reproductive days.

In this experiment, all cows with a red non-standing classification were inseminated regardless of whether or not it was thought that the detected estrus was false. Of the 34 inseminations made to animals with a red non-standing classification, 10 or 29% resulted in conception. Consequently, some of the red non-standing heats were true heats. Based on these 10 conceptions, which would not have occurred without the use of a detector, a reduction of at least 210 reproductive days was accomplished in group I. For the 57 animals in group I, the average decrease of 16 reproductive days per animal resulted in a total decrease of 912 fewer reproductive days (57 x 16) when compared to group II.

It is recommended that inseminations should not be made indiscriminately to all red detectors with non-standing heats, as we did for research purposes, but that these observations be utilized along with records of previous heats in making a decision to inseminate. This would reduce the number of inseminations made to false heats.
Any system which truly improves estrus detection will improve a herd’s breeding program. I am very optimistic about the possibilities of utilizing estrus and ovulation control in the future, through the treatment of dairy cows with synchronization compounds in a reproductive management system. Such a system would hopefully eliminate the failure to detect cows in estrus as a major source of infertility. In addition, certain of these compounds may hasten the return to normal reproductive status during the 60-day postpartum period.

Dairymen have available, through Dairy Herd Improvement Association Records, a computerized reproductive record system to evaluate herd reproductive status monthly. The Herd Reproductive Status (HRS) system (Johnson, 1964) has proved effective in measuring current reproductive performance because it is quantitative and includes all breeding animals in the herd. The system requires accurate individual cow records and must include results of palpation for early pregnancy. A qualified person can determine pregnancy status of animals by 34 days after insemination. An evaluation date is established each month. When information is processed, results of inseminations and other reproductive activities (culling, abortion, calving, etc.) can be summarized for the month preceding the evaluation date. A low HRS value indicates reproductive troubles for the herd. In addition to a calculated HRS value a detailed listing is made which summarizes reproductive information for the herd as well as for individual animals. Such a detailed analysis aids the dairymen to identify reproductive problems and effectively improve management of reproductive performance.

The average days open for cows conceiving and the monthly percent of the herd open over 100 days decreased from 125 to 105 days and 13 to 8 percent, respectively, for the North Carolina Institutional Breeding Association herds over a 9 year period using the HRS system (Table 6). Simultaneously, increases in production per day occurred with decreases in average days open for cows conceiving and increases in HRS status (Britt and Ulberg, 1970) (Figure 4).

Summary

The postpartum period is characterized by certain physiological and endocrine alterations of the reproductive system which precede the return of normal fertility. Cows which have abnormal parturitions and/or high levels of milk production have a greater incidence of reproductive abnormalities in the postpartum period. A reproductive veterinary herd health program is recommended as an effective means to reduce herd infertility and maximize returns from veterinary services. Inadequate estrus detection is considered as a management problem responsible for a great reduction in herd breeding efficiency. Two systems of estrus detection have been compared under routine herd management conditions and related to subsequent fertility. The merits and effectiveness of a computerized reproductive record system (Herd Reproductive Status) have been discussed as to its role in dairy cattle management systems.
References


POSTPARTUM OVARIAN ACTIVITY

Figure 1. Relationship between regression of uterine horns of cows from parturition to 55 days, and ovary from which ovulation occurred during that time. Each dot on the graph represents the mean diameter of the uterine horns of 250 clinically normal dairy cows as determined by palpation twice weekly. Percentages of ovulations after parturition that occurred in the ovary opposite or adjacent to the previously gravid horn are illustrated by the bar graph. Numbers within the bars for the first two periods include only first ovulations; after 20 days they represent total ovulations. Marion, G. B. and Cier, H. T. J. Animal Sci., 27:1621, 1968.
FIGURE 2.

Bovine Peripheral Plasma Progestins during Estrus
Figure 3. Plasma progesterone concentrations postpartum prior to first estrus

C = calving, u = uterine involution complete, F = follicle present, O = first observed postpartum estrus, CL = corpus luteum present.

Table I. Incidence of postpartum heats and number of services for cows becoming pregnant

<table>
<thead>
<tr>
<th>Number of heats</th>
<th>Intervals resulting in pregnancy</th>
<th>Services per pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>294</td>
<td>24.3</td>
</tr>
<tr>
<td>1</td>
<td>459</td>
<td>38.0</td>
</tr>
<tr>
<td>2</td>
<td>362</td>
<td>29.9</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>7.4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.3</td>
</tr>
<tr>
<td>Overall</td>
<td>1209</td>
<td>99.9</td>
</tr>
</tbody>
</table>

1  Significant linear decline (P<0.01) between 0 and 4 heats  
2  Significant differences (P<0.01) among the three 0-30 day groups  
3  No significant difference (P>0.05) among the three 31-60 day groups
Table 2. Systematic Monthly Veterinary Examination Schedule

1. Cows with retained placenta should be examined and treated 24 to 72 hours postpartum.

2. Cows with a purulent or fetid discharge from the vulva at 15 days postpartum should be examined and treated.

3. Cows with an abnormal discharge or cloudy mucus during estrus should be examined to determine if infection is present.

4. Cows should be examined at 25 to 40 days after parturition and prior to breeding to make sure that the reproductive tract is free of gross infection and undergoing involution at a normal rate.

5. Cows with abnormal estrous cycles at 45 to 60 days postpartum should be examined.

6. Cows can be examined for pregnancy at 30 to 45 days after breeding.

Table 3A. Experimental Design of Heat Detection Study

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Number of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group I: Heat detector</strong></td>
<td><strong>57</strong></td>
</tr>
<tr>
<td>Cows</td>
<td>41</td>
</tr>
<tr>
<td>Heifers</td>
<td>16</td>
</tr>
<tr>
<td><strong>Group II: Visual Observation</strong></td>
<td><strong>59</strong></td>
</tr>
<tr>
<td>Cow</td>
<td>42</td>
</tr>
<tr>
<td>Heifers</td>
<td>17</td>
</tr>
</tbody>
</table>
Table 3B

Distribution of Detected Heats Utilizing the Ka Mar Heat Detector

<table>
<thead>
<tr>
<th>Type of Estrus Detected</th>
<th>Number of heats Detected</th>
<th>Percent of Detected Heats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red detector</td>
<td>164</td>
<td>97%</td>
</tr>
<tr>
<td>(a) Red detector - standing heat</td>
<td>118</td>
<td>70%</td>
</tr>
<tr>
<td>(b) Red detector - non-standing heat</td>
<td>46</td>
<td>27%</td>
</tr>
<tr>
<td>White detector - standing heat</td>
<td>5</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>169</td>
<td>100%</td>
</tr>
<tr>
<td>Category</td>
<td>Percentage of Total</td>
<td>Number of Cycles</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>1st</td>
<td>8 (7.1%)</td>
<td>67 (59.8%)</td>
</tr>
<tr>
<td>2nd</td>
<td>37 (33.0%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group I</th>
<th>Standing to Standing Ears</th>
<th>Standing to Standing Ears</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>27 (26.0%)</td>
<td>27 (26.0%)</td>
</tr>
<tr>
<td>66</td>
<td>57 (53.4%)</td>
<td>44 (66.7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group II</th>
<th>Standing to Standing Ears</th>
<th>Red to Red Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>21 (20.4%)</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>55 (53.4%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&gt;18-23</th>
<th>24 &gt;17</th>
<th>18-23</th>
<th>&gt;17</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Frequencies Distribution of Errors Cycle Length Related to Certain
Table 4.
Note: 13.5 + 34.3 ≠ 57.8, because cows which did not conceive were represented in the first value but not in the second.

<table>
<thead>
<tr>
<th>Group</th>
<th>Visual Observation</th>
<th>Heat Detector</th>
<th>Interval to First Reproductive Erection</th>
<th>Reproductive Erection (days)</th>
<th>Conception (days)</th>
<th>Period (days)</th>
<th>Period (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>74.0</td>
<td>61.0</td>
</tr>
<tr>
<td>Group II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>57.8</td>
<td>34.3</td>
</tr>
</tbody>
</table>

Table 2. Effect of Heat Detector Erections on Reproductive Performance.
Table 6. Average number of cows observed, average days open (ADO) data and average Herd Reproductive Status for North Carolina Institutional Breeding Association herds from 1959 through 1967.

<table>
<thead>
<tr>
<th>Year</th>
<th>Average number of cows</th>
<th>ADO for cows conceiving</th>
<th>Avg monthly percent of herd open 100 days</th>
<th>ADO for problem cows</th>
<th>HRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959a</td>
<td>264</td>
<td>125</td>
<td>13.2</td>
<td>180</td>
<td>58</td>
</tr>
<tr>
<td>1960b</td>
<td>304</td>
<td>126</td>
<td>11.5</td>
<td>174</td>
<td>65</td>
</tr>
<tr>
<td>1961</td>
<td>367</td>
<td>126</td>
<td>10.6</td>
<td>185</td>
<td>65</td>
</tr>
<tr>
<td>1962</td>
<td>463</td>
<td>119</td>
<td>10.7</td>
<td>180</td>
<td>66</td>
</tr>
<tr>
<td>1963</td>
<td>890</td>
<td>115c</td>
<td>10.2</td>
<td>181</td>
<td>68</td>
</tr>
<tr>
<td>1964</td>
<td>1005</td>
<td>107</td>
<td>8.7</td>
<td>179</td>
<td>73</td>
</tr>
<tr>
<td>1965</td>
<td>914</td>
<td>114</td>
<td>9.1</td>
<td>180</td>
<td>71</td>
</tr>
<tr>
<td>1966</td>
<td>862</td>
<td>116</td>
<td>9.0</td>
<td>185</td>
<td>71</td>
</tr>
<tr>
<td>1967</td>
<td>844</td>
<td>105</td>
<td>8.4</td>
<td>174</td>
<td>74</td>
</tr>
</tbody>
</table>

a Data for two months only.
b Data for six months only.
c Data not available for March to June.

COMPUTER ASSISTANCE FOR MANAGEMENT DECISIONS

Kary Mathis
Assistant Professor
Department of Agricultural Economics

I. Introduction
   A. The computer is a management resource.
   B. Deciding to use computers and EDP should be handled like any other
      management decision.

II. What Do Managers Do?
   A. Plan
   B. Organize
   C. Direct
   D. Coordinate
   E. Control

III. What Can Computers Do?
   A. Calculating machine that can also store information.
   B. Two computer developments:
      1. Time sharing
      2. Remote access
   C. Terminology
      1. Hardware--electronic and mechanical instruments
      2. Software--programs
   D. Three ways computers are used:
      1. Records and accounting
      2. Data analysis
      3. Management decision assistance (forward planning techniques)
         a. Linear programming
         b. Simulation

IV. What Are Computer Limitations?
   A. Hardware hangups
   B. GiGo
   C. Information overkill
   D. The 'jutane' syndrome

V. Where Do We Go From Here?
   A. Computer-based management aids can help in important decisions.
   B. Computer technology for dairy management is still limited to elec-
      tronic farm records and a few other applications.
   C. Limited availability due to difficulty and high cost in adapting
      software.

*Presented at Eighth Annual Florida Dairy Production Conference, University
Each year the advent of new technology requires farmers to re-adjust their thoughts about farming. Eight- and twelve-row planters are available to replace four-row equipment; mechanical harvesters to replace human labor; new feed and manure handling systems to replace old methods; new crop varieties to replace old varieties. All these developments can be seen and their advantages understood fairly readily. These items are purchased and put to use.

Today's computer systems offer potentially very useful kinds of new technology for agriculture. In time, they may become as important to farmers as pickup trucks, depending upon how willing and ingenious farmers and those who work with farmers are in putting this new equipment to work. Though relatively new, computer capabilities already are greater than agriculture's current capacity to use them. Extending the benefits of computers to large numbers of farmers involves high costs of acquiring and operating computers and problems of getting large numbers of farmers to agree to use computers and share costs. In turn, this means that it is important to choose computer work which has high payoff to large numbers of farmers, so that demand for computer services is sufficient to maintain computing centers to serve agriculture.

The computer, then, is a management tool and a management resource. In your positions as managers, you don't select the tools until you know several things: what job you want done; what you expect in the way of production; what you want in quality, quantity, cost and so on. Thus, we should view the computer and the whole area called 'electronic data processing' just as we view any other management decision.

**What Do Managers Do?**

To put computer assistance to dairy management in perspective, we need to look at what a manager does. When we specify what functions managers perform, we can identify where computer technology can be applied. The five generally accepted functions of management are: Planning, Organizing, Directing, Coordinating, and Controlling.

A manager is concerned with one or more of these functions when he performs his duties. They are the broad categories by which managers combine people and resources into a successful business.

Planning is deciding in advance what is to be done, when, and by whom. It is a process requiring thoughtful consideration of all factors necessary to achieve the objectives of the business. Viewed in this manner, planning is preparing for action, not actually carrying out the work.

Organizing is the grouping of activities necessary to 1) organize work units, and 2) define the relationships among the owners, managers, and workers.

in such units. The objective of organizing is to group activities, people, and other resources for the effective and economic accomplishment of plans.

Directing is the process of getting plans carried out and projects initiated and completed by effective instructions to people. Directing is a part of supervision, which refers to the day-to-day relationships between a manager and his assistants.

Coordinating is the fitting together of the components of an organization, including people, facilities, and other resources.

Controlling is the process of getting plans followed according to specifications, evaluating results, and taking remedial action to prevent unsatisfactory results.

Now, this sort of textbook classification is somewhat abstract, but all management activities are covered in one or more categories. Computers can assist in each category. Before pointing out specific examples, let's look at the way computers operate, and define some terms.

What Can Computers Do?

Basically computers are calculating machines with some important additional capabilities. Unlike conventional adding machines and desk calculators, computers can also store information within the computer system. This information can include numbers, words, and results of calculations. The information may also include instructions telling the computer what to do next. Furthermore, the computer can perform certain logical operations that parallel steps in human reasoning. Many of the mental tasks that thinking humans now do can be done by computers, providing the rules humans use in making decisions are known and supplied in a systematic manner to the computer.

A great deal of the promise for widespread usage of computers has come about as a result of two kinds of computer system developments. In one case, the newer computers can be used by a number of persons at once. As many as 25 or so individuals may all be using a computer simultaneously without realizing that others are using it. The second development allowing greater access is the transmission of information by telephone directly to a computer or from a teletype unit or other keyboard equipment utilizing telephone lines. In turn, information from the computer can be returned to the user either as a voice message, a typewritten message, or displayed on a television-like screen in the user's home or office.

Because computers can store and sort information, calculate, and follow instructions--all at the rate of thousands of instructions per second--they are now being used for many purposes. Businesses use these machines in billing, payroll preparation, and in keeping inventories. The Federal Government is a heavy computer user, particularly in the development of weapons and space systems.

Computer specialists may be called systems analysts, programmers or many other titles. They use a particular language and set of terms, some of which are defined below.

Hardware refers to the physical parts of the computer, such as the central processing unit to do the arithmetic, punch card or tape readers to read information and disc, magnetic tape or cell storage machines to "memorize" and
store information. Other hardware includes card and tape punch machines to transform data from written to punch form, verifiers to check accuracy, and reader-printers to transform data from punch to written form. Related pieces of hardware, such as sorting machines, optical scanners, and remote consoles, make the computer easier to use, but they are not necessary for its operation.

Instructions or programs telling the computer exactly what to do are called software.

Since the computer must have instructions in order to operate usefully, developing the instructions ("writing a program") is the most important part of computer technology.

How can computer technology help you as a dairy manager in planning, organizing, directing, coordinating and controlling your business? In answering this, let's look at previous experience with electronic data processing.

There seem to be three stages of development in a firm's computer use. A firm normally begins by using a computer for a particular job—e.g., cost accounting for a whole farm. As experience is gained, computer use becomes more sophisticated and efforts are made to attempt integrated data processing—combining individual operations. The third stage is to use computers to provide management decision-making information. We are not going to be able to pick up a computer one day and be instantly successful in solving problems with it. However, computer developments place farm management in a completely different environment than that which existed a few years ago.

Records and Accounting

One of the first computer applications in management was in assisting the control function through computerized records and accounting. Computerized information systems, or electronic farm records normally are more complete than other farm records or accounting. Because of the computer, it is practical to gather, process, and store monthly farm receipts and expenses (by enterprise as well as type); man and machine time; quantities of fertilizer, feed, water, and chemicals used and in storage, and so forth.

Most computerized farm management information systems provide supplemental services such as computing depreciation, listing checks by number and amount, listing charge account transactions, and computing payroll deductions. The Florida Farm Bureau Federation, Production Credit Association, and some banks offer electronic farm records systems that might be helpful to you. Some Florida dairymen are also using the DHIA computer-based system for individual cow production records.

Remember that the computer cannot do anything that cannot be done by man, but it is able to do these things much faster, if the time and dollar investment is made in writing the programs. Probably more important, the computer can be used to do jobs that the farm manager cannot (or will not) take the time to do himself.

Much of the developmental work in computerized farm record systems has now been done and some new non-accounting applications are developing. In contrast to farm records projects, which are past history, these later develop-
ments assist management in the planning, organizing, directing and coordinat-
ing functions. Computer applications beyond accounting uses appearing now
fall into two main classes: (1) Data analysis syst-ems; and (2) Forward plan-
ing techniques.

Data Analysis Systems

Computer programs that calculate measures of economic efficiency, physical

efficiency, financial success, and financial condition are called data analysis

systems. Most of these measures could be figured by hand if the data were

available, but it is relatively easy to instruct or program the computer to
do the work (mostly division or subtraction).

Forward Planning

Forward planning is an attempt to look ahead and consider alternative
courses of action. A basic question being considered is, "What would happen
to my farming operation if I made certain changes?" For example, "How would
costs and returns be altered if the milking herd were doubled? Would there
be enough extra cash to pay ordinary expenses and principal payments on both
old and new debts? What would be left for family living expenses and new
investments?"

A number of people are thinking about how to use computers to answer these
questions. Approaches to forward planning differ, depending on the extent to
which farmers must supply information--whether the computer should simply add
up the effects of changes specified by the farmer, or whether the computer can,
in a very sophisticated manner, find a more profitable plan than the farmer
has suggested.

You may have read about "Cynthia the talking computer," that answers
questions on tax problems, equipment purchase, and four other types of farmer
problems. "Cynthia" is an audio-response unit connected to a computer that
records farm data, and answers farmer questions over the telephone. Also,
some decision problems can be analyzed by central computer units, with infor-
mation entered and answers sent through a remote teletype unit a hundred miles
away.

The electronic hardware of remote terminal or telephone handling and audio-
response or television transmission of information and answers is a major advance.
But you know as well as I do that the most expensive milking equipment or the
biggest, latest model tractor don't automatically ensure high production or large
profits. The human element is the key to useful application of computer technology.

Therefore, understanding something about the specific jobs these computer
services do will help you see how much information can help in management deci-
sions. Several forward planning techniques are discussed and some examples
are given.

Linear programming or LP is a budgeting technique adapted to the computer.
LP considers the resources available (land, labor, etc.), the restrictions present
(acreage, building capacity, etc.), and the enterprises that are to be considered
(dairy, citrus, vegetables, etc.). The program then determines the combination
of enterprises which will yield the highest possible return to the resources given.
An example of the use of a linear program is in corn production budgeting. A farmer can calculate costs and returns from planting corn in any of six time periods, which may be harvested in any of three time periods. There are thus eighteen separate corn production activities identified by planting and harvesting dates. The highest-profit combination is calculated and printed, with a profit-loss statement. A schedule of operations and activities is also supplied to indicate how the income is to be made. Linear programming, and its variations, can be used to calculate the least-cost feeding rations, minimum-distance or least-cost transportation problems, and many other kinds of problems.

Simulation. The computer also can be used to reproduce or simulate each step in the operation of an actual or make-believe farm business. This makes it possible for the farmer to have a "trial run" at managing his farm on the computer before actually committing his resources.

A flow chart for simulating a dairy herd replacement management process is illustrated below. A dairyman might provide dairy herd replacement information from his own operation for the simulation and have the experience of managing his herd using his own milk production figures, prices paid, and market conditions.

The simulation technique can also be used to aid many other types of management decisions. A proposed computer planning system for beef feedlots would provide information for decisions on buying, selling, and feeding. A price forecasting system predicts future monthly prices, a feed formulation system specifies the minimum cost feeding program, and an operations scheduling system determines the best timing for feedlot activities.

What Are Computer Limitations?

Large industrial corporations have used computers for years, with considerable success. Most large companies have successfully mechanized the bulk of their routine clerical and accounting procedures, and many have moved out into operating applications. Industry and non-farm firms have made such greater use of computer technology than has agriculture.

Yet, industrial users have experienced problems with their computers and programs. A recent study pointed out some major difficulties and some of the reasons for these problems. Agricultural computer users can profit from this experience.

Hardware hangups. Computer assistance to management is a service. True, we referred to computer technology as a management tool, but a tool in the sense of knowledge and judgment. Don't be led astray by fascination with computer hardware of remote terminals, touch-tone telephone access, time-sharing, flashing lights, and such. Computer assistance is information. If it costs more than it returns, or if it is no better than what you're already getting, you've wasted money, no matter how fancy the hardware.

Gi Go. This term, familiar to all who have used computers, means "Garbage in, Garbage out." Many persons still consider computers as magical devices that peer into the future, take hundreds of factors into account and come up with a perfect recommendation. This kind of thinking is justified--to the
Flow Chart for Simulation of a Dairy Replacement Problem

Start

Read and store data describing situation

<table>
<thead>
<tr>
<th>Compute net returns for each cow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine number and quality of replacements available this year</td>
</tr>
<tr>
<td>Compute net returns for each replacement</td>
</tr>
<tr>
<td>Determine casualty and old-age culls</td>
</tr>
<tr>
<td>Compute herd net returns and herd average production</td>
</tr>
</tbody>
</table>

Is this last year to be simulated?

No

Simulate passage of year's time

Estimate net returns next lactation for each cow

Make improvement cullings

Set up for first year of next replication?

Yes

Is this last replication?

No

Analyze and print results

STOP
extent that humans can successfully supply the needed factors for the computer to take into account. Thus, the manager using computer technology gets answers only as good as the basic information or "raw material" he supplies the computer analyst.

Information overkill. This problem is related to the "gigo" situation. Here, though, the technical capability of computer hardware and computer specialists to handle information is so great that the manager may be overwhelmed with computer output. Most of the information may be good—but there is so much he can't find the useful stuff. Concentrate on identifying the really important questions in your business and using computer technology to help answer those questions. Instant access to reams of data from an outmoded accounting system, for example, is at best a dubious blessing.

Computer technology is not a cure-all for management decision making. Computers can't make decisions—only people can. Managers can't abdicate their decision power in favor of computer printouts. The three problems with using computers just discussed should illustrate this point. There may be another problem associated with computer technology in a different way—the pitfall of not using appropriate computer management assistance.

The "jutane" syndrome. When liquified petroleum gas was introduced to the western Oklahoma range country right after World War II, one of my in-laws there would have nothing to do with it. He said that he didn't want any of "that old jutane" because he didn't understand and didn't trust it. A wood stove would do just fine.

None of you would try to get along without a telephone. Yet, when telephones first came out, they were regarded by many the same way my relative viewed butane. Unfamiliarity with a rapidly-changing technology may prevent us from making the best use of computer information for management decisions. Don't let my statement of computer problems, or the apparent complexity of computer application keep you from investigating the possibilities.

Where Do We Go From Here?

As farmers become involved in handling increasing sums of money, it becomes more important to make future plans and to know if the current plan is or isn't working out. It is also increasingly important to have this kind of knowledge in sufficient time to make changes when changes are needed.

Computer-based management aids can help with these decisions. The computer is a management resource that should be viewed in the same way as other resources. The decision to use computer technology should be made in the same way that farmers decide whether or not to expand the cow herd or purchase new equipment.

The elements of computer technology available to you are still relatively limited. I've mentioned the electronic farm records programs available from several sources. The types of computer assistance discussed as aids to forward planning are not generally available to most producers. IFAS personnel have developed some applications of linear programming. These may be adapted for some users in the not-too-distant future. In addition, the Department of Agricultural Economics has employed an extension specialist who will devote full time to developing computer-based management information systems. Due to begin
work this coming September, this specialist will concentrate his first efforts on applying computer technology in dairy and beef production enterprises.

One reason for the limited availability of computer programs to aid managers in forward planning is the cost of developing suitable software packages. The corn production budgeting package mentioned previously cost, by one estimate, $10,000 to develop and perfect for farmers' use. The more questions a forward planning technique will answer and the more complicated problems such packages will handle, the greater the development cost. Complex simulation techniques of the types described require several man-years and tens of thousands of dollars.

Although computer-assisted farm planning is still in developmental stages, it appears that farmers will soon be receiving more of their information directly from computers, and that they will be using computers to help them think through the consequences of many of the complex decisions that lie ahead.

Since what we see for tomorrow is likely to be inaccurate, it may be that the greatest value of forward projections will not be to give farmers "the answer" but to help them think about the future and to provide a better basis for determining how well the business is operating.
Genetic Trends in Milk Yield in Florida DHIA Herds

C. J. Wilcox
Department of Dairy Science
University of Florida
Gainesville

Though the theoretical upper limits of genetic change have been known for some time, it is only in recent years that reliable estimates of such change have been made. A major problem in the measurement of genetic progress is that environmental and genetic effects are confounded in such a manner over time as to make their separation extremely difficult.

The data used in our studies of milk production records of Florida DHIA first-calf heifers are shown in Table 1. We included only those sires with 10 or more daughters in two or more herds during the 10-year period 1958-1967. Even with nearly 5000 animals represented, our estimates of genetic trends were not as precise as we would have liked. Hopefully, as the DHIA program expands, we will be able to obtain more sensitive estimates. We were unable to use a large percentage of the DHIA data because the sires were not identified or the information was incomplete in some other way.

Estimates of trends are shown in Table 2. The total trend is what we actually see; the environmental and genetic portions when added together make up the total. The Holstein data were exactly as expected; we may have overestimated the genetic and environmental trends in Guernseys, though the total trend looks reasonable.

If we accept the negative environmental trends in Guernseys and Jerseys as real, possible explanations could be: increase in herd size, less individual attention per animal, and increase in the number of cows of larger breeds.


2 Results based on dissertation research completed at the University of Florida by Dr. Omar G. Verde, August 1970. Contributions of Professor C. W. Reaves and Dr. F. G. Martin are gratefully acknowledged.
Table 1. Description of data

<table>
<thead>
<tr>
<th></th>
<th>Holsteins</th>
<th>Jerseys</th>
<th>Guernseys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of records</td>
<td>1,250</td>
<td>2,031</td>
<td>1,498</td>
</tr>
<tr>
<td>Number of sires</td>
<td>40</td>
<td>61</td>
<td>54</td>
</tr>
<tr>
<td>Number of herds</td>
<td>58</td>
<td>54</td>
<td>69</td>
</tr>
<tr>
<td>Average age at calving (mo)</td>
<td>27.4</td>
<td>26.4</td>
<td>29.5</td>
</tr>
<tr>
<td>Milk yield (lb)</td>
<td>10,388</td>
<td>6,931</td>
<td>7,114</td>
</tr>
<tr>
<td>Fat yield (lb)</td>
<td>381</td>
<td>345</td>
<td>324</td>
</tr>
<tr>
<td>Fat percentage</td>
<td>3.70</td>
<td>4.99</td>
<td>4.57</td>
</tr>
</tbody>
</table>

Table 2. Annual trends in Florida DHIA first-calf heifer production (1958-1967)

<table>
<thead>
<tr>
<th></th>
<th>Genetic</th>
<th>Environmental</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk yield (lb)</td>
<td>+72</td>
<td>+126</td>
<td>+198</td>
</tr>
<tr>
<td>Fat yield (lb)</td>
<td>-1.5</td>
<td>+3.9</td>
<td>+2.4</td>
</tr>
<tr>
<td>Fat percentage</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.05</td>
</tr>
<tr>
<td>Jersey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk yield (lb)</td>
<td>+48</td>
<td>-23</td>
<td>+25</td>
</tr>
<tr>
<td>Fat yield (lb)</td>
<td>+2.8</td>
<td>-2.4</td>
<td>+0.4</td>
</tr>
<tr>
<td>Fat percentage</td>
<td>+0.01</td>
<td>-0.02</td>
<td>-0.01</td>
</tr>
<tr>
<td>Guernsey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk yield (lb)</td>
<td>+202</td>
<td>-50</td>
<td>+152</td>
</tr>
<tr>
<td>Fat yield (lb)</td>
<td>+6.2</td>
<td>-1.3</td>
<td>+4.8</td>
</tr>
<tr>
<td>Fat percentage</td>
<td>-0.05</td>
<td>+0.03</td>
<td>-0.02</td>
</tr>
</tbody>
</table>
NAMES AND ADDRESSES OF THOSE ATTENDING
FLORIDA DAIRY PRODUCTION CONFERENCE, May 11 & 12, 1971

Allison, Virgil
Allison Dist. Co., 6222 Norwood Avenue, Jacksonville, Florida 32208
Alvarez, Ray
Alvarez Jersey Farm, 13911 Alvarez Road, Jacksonville, Florida 32207
Alvarez, Warren
Holly Hill Dairy, 13923 Duval Road, Jacksonville, Florida 32218
Aprile, Jimmie
Maple Lane Dairy, 5701-15th Street, Tampa, Florida 33610
Ash, Joel
TUCO, Dir. of Upjohn Co., Route 2, Lawrenceville, Georgia 30245
Aukema, Author
Aukema Dairy, Route 1, Box 64, Chipley, Florida 32428
Baker, J. B.
Baker Farms, 521 Plumosa Drive, Sanford, Florida 32771
Baldwin, Barry
Ast. Agr. Engineer, University of Florida, Gainesville, Florida 32601
Barley, John
Dairy Specialist-USDA, Rt. 6, Box 271, Jacksonville, Florida 32223
Bass, Clint
Emerald Farms, Rt. 2, Box 438A, Vero Beach, Florida 32960
Baumeister, George
Jersey Jug Dairy, 4800 N. Orange Blossom Trail, Orlando, Florida 32804
Becker, Dr. R. B.
Retired, University of Florida, Gainesville, Florida 32601
Bennett, Orin
Clay Equip. Corp., 1234 Nightingale Circlé, Jacksonville, Florida 32216
Benson, Roy
Upper Fla. Milk Pro. Assoc., Manager, 8519 Burkhal, Jacksonville, Florida 32211
Black, John
U. S. Sugar Corp., 513 E. Avenida, Clewiston, Florida 33440
Blackwell, James
Blackwell Jersey Farm, 1805 Swan Avenue, Orlando, Florida 32804
Boardman, William
Dairy Farmers Inc., Exec. V. Pres., P. O. Box 7854, Orlando, Florida 32804
Boosinger, Jay
Dairy Division Asst Dir., 3418 N. Meridian Road, Tallahassee, Florida 32301
Bowen, Kent
Charles McArthur Dairies, 1705 Alabama Avenue, Okeechobee, Florida 33472
Bowman, Bill
Bowman & Sons Dairy, Rt. 1, Box 295, Delray, Florida 33444
Bowman, Jim
Bowman & Sons Dairy, Rt. 1, Box 297, Delray, Florida 33444
Boyd, Bruce
Bruce & Vi Boyd Dairy, 6608 Winegard Road, Orlando, Florida 32809
Boyles, C. R.
Florida Brown Swiss Cattle Club, 416 Riverside Drive, Okeechobee 33472
Braddock, Tom
Cooperative Extension Service, 409 Courthouse, Jacksonville, Florida 32202
Brown, Harvey
Brown Dairy, Rt. 2, Box 114, Hawthorne, Florida 32640
Burton, Gene
Curtiss Breeding Service, 120 Morrow Circle, Brandon, Florida 33511
Fry, David
Futch, M. C.
Gaiz, Buck
Galbraith, F. A.
Gassaway, Horace
George, Donald
Gephant, Alvin
Gerber, Daniel
Given, Mr. & Mrs. Robert
Glasscock, Paul
Gober, W. M.
Godwin, Russ
Goolsby, Wade
Graden, Arthur
Graham, A. E.
Gulledge, Ellis
Hall, Bob
Hammond, Mr. & Mrs. A. S.
Hansen, Howard
Hanson, Donald
Hanson, Murlin
Harris, Dr. & Mrs. Barney
Head, Dr. H. H.
Hebert, Jay
Hefner, Dick
Hite, James
Heitfield, Mr. & Mrs. Winton
Hindery, Dr. George
Hobbs, John
T. G. Lee Dairy, P. O. Box 2113, Orlando, Florida 32803
Sunshine State Dairymen’s Co-op., 3203 Jim Lee Road, Tallahassee, Florida 32301
Airport Livestock, Rt. 2, Box 299, Miami, Florida 33157
Emerald Farms, Inc., 3472 Haverhill Road, West Palm Beach, Florida 33401
Sealtest Foods, 5003 Puritan Road, Tampa, Florida 33601
Cooperative Extension Ser., P. O. Box 218, Bushnell, Florida 33513
Sunnyhill South, Inc., Box 553, Deleon Springs, Florida 32028
Gerber Dairy, Inc., P. O. Box 2116, Winter Haven, Florida 33880
Cloverdale Dairy, Myakka Star Route, Bradenton, Florida 33505
County Extension Agent, Courthouse, Tampa, Florida 33602
U. S. Sugar Corp., Clewiston, Florida 33440
Fla. Feed Mills, Inc., P. O. Box 2331, Jacksonville, Florida 32204
Triple ‘G’ Dairy, P. O. Box 907, Deer Field Beach, Florida 33441
Roberts Dairy, Inc., Rt. 1, Box 252, Palatka, Florida 32077
Fla. Division of Health, Box 210, Jacksonville, Florida 32230
Miller Machinery, 760 N. E. 145th Street, N. Miami, Florida 33161
L. & H. Meating Creek Dairy, Rt. 2, Box 610-A, Lake Placid, Florida 33852
Oak Lawn Dairy, Rt. 1, Box 351, Sorrento, Florida 32776
Hol. Friesian Ser. Inc., P. O. Box 572, Brattleboro, Vermont 05301
Bassett’s Dairy, P. O. Box 110, Monticello, Florida, 32344
Spring Valley Dairies, Rt. 1, Box 332, Riverview, Florida 33569
University of Florida, Gainesville, Florida 32601
Asst. Professor, University of Florida, Gainesville, Florida 32601
County Agent, 2350 East Michigan Avenue, Orlando, Florida 32806
Hughes Feed & Grain Co., P. O. Box 1285, Okeechobee, Florida 33472
Summer Fields Jerseys, Rt. 1, Box 492, Summerfield, Florida 32691
Heitfield Dairy, Inc., 1400 Tarpon Avenue, Tarpon Springs, Florida 33589
Dairy Division, Rt. 3, Box 312, DeLand, Florida 32720
TIDFA, Rt. 1, Box 294, Tampa, Florida 33612
Hogan, Riley
Holley, Bert
Hooper, Larry
Howard, Laurence
Hudson, Bert
Huff, Jim
Hufty, Jack
Jaquith, B.
Johnson, Doug
Johnson, Joe
Johnston, Arthur
Johnston, Emmy
Jones, Chal
Jones, Owen
Kidwell, Jack
Kirkley, Carey
Kondo, Francis
Lane, Dr. C. B.
Laney, William
Larson, Louis
Larson, Louis Jr.
Larson, Barbara
Lee, T. G.
Lekander, Paul
Lockand, James
Lovelace, Billy
McAmis, Tom
McNutt, Rollin

Tampa IDFA, P. O. Box 5011, Tampa, Florida 33605
Miller Machinery & Supply, P. O. Box 4039, Jacksonville, Florida 32201
Ocean City Dairy, 118 N. Swinton Circle, Delray, Florida 33444
Howard Feed Mills, P. O. Drawer H, Jacksonville, Florida 32203
Fla. Dept. of Agri. & Consumer Ser., Rt. 6, Box 127, Tallahassee, Florida 32301
Fla. Dept. of Agri., P. O. Box 205, Terra Ceia, Florida 33591
Rolling Hills Dairy, Inc., Rt. 1, Box 123, Archer, Florida 32618
Technical Industries, Inc., Pres., 2711 S. W. 2nd Avenue, Ft. Lauderdale, Florida 33315
Doug Johnson Dairy Equip. Sales, 811 E. Lumsden Road, Brandon, Florida 33511
Assoc. Milk Producers, 400 N. East Street, Arlington, Texan 76010
Sunnyhill South, Inc., R. D. 1, Umatilla, Florida 32784
Editor-Southeastern Dairy Review, P. O. Box 7854, Orlando, Florida 32804
Dairy Specialist-Farm, 4250 S. E. 38th Street, Ocala, Florida 32670
D.H.I.A. Supervisor, 6715 N. Main Street, Jacksonville, Florida 32208
IDFA, 2040 N. E. 54th Street, Ft. Lauderdale, Florida 33310
Imperial Livestock Supply, Box 273, Astatula, Florida 32705
Hughes Feed & Grain, 716 Westwind Drive, North Palm Beach, Florida 33408
Dairy Science Dept., University of Florida, Gainesville, Florida 32601
Plantation Dairy, Inc., 311 West Hanlon, Tampa, Florida 33604
Larson Dairy, Inc., Rt. 1, Box 767, Delray, Florida 33444
Student, University of Florida, Gainesville, Florida 32601
Fla. Dairy Princess, Student, University of Florida, Gainesville, Florida 32601
T. G. Lee Dairy, 315 N. bumby Avenue, Orlando, Florida 32803
L & M Dairy, P. O. Box 814, St. Cloud, Florida 32769
Security Mills of Tampa, P. O. Box 801, Dunnellon, Florida 32630
Fla. Feed Mills, 1915 Woodmere Drive, Jacksonville, Florida 32210
DeLaval Separator Co., 3464 O'Hara Drive South, Macon, Georgia 31206
County Agent, P. O. Box 338, Palmetto, Florida 33561
Mann, Gordon
Manter, George
Marshall, Dr. S. P.
Martin, Gerald
Martin, Phyllis
Massey, Val
Meyerholz, Dr. G. W.
Melear, C. R.
Minear, Judson
Morgan, Ed
Morrissy, James
Neff, Melvin
Nord, John
Norris, Joe
Oelfke, Walt
Palmer, John
Packett, C. P.
Peachy, John
Pearson, Betty
Platt, Donald
Platt, Kenley
Powell, Bill
Price, Kent
Putman, Paul
Reagan, R. D.
Reagler, George Jr.
Reaves, C. W.
Register, Bennie
Register, Lloyd
Riegler, Russell

Student, University of Florida, Gainesville of Florida 32601
American Breeders Service, 4138 Piper Drive, Jacksonville, Florida 32207
Professor, University of Florida, Gainesville, Florida 32601
County Agent, 3100 E. New York Avenue, DeLand, Florida 32720
Secretary, Extension Dairy Science, University of Florida, Gainesville, Florida 32601
Massey's Dairy, Rt. 2, Box 90, Palmetto, Florida 33561
Extension Service, University of Florida, Gainesville, Florida 32601
C. R. Milear & Son Dairy, Inc., 3088 Hypalxoe Road, Lake Worth, Florida 33460
Pennwood Farm, P. O. Box 362, Palm City, Florida 33490
Agpro, Inc., 527 Severn Avenue, Tampa, Florida 33406
Miller Machine, 601 Sudbury, Jacksonville, Florida 32210
Upper Fla. Milk Prod. Assoc., 6304 David Drive, Jacksonville, Florida 32210
Market Administration, Room 113, Professional Building, Sunrise Center, Ft. Lauderdale, Florida 33310
Lykes Pasco Packing Co., P. O. Box 97, Dade City, Florida 33525
NOBA, 3369 10th Avenue North, Palm Springs, Florida 33460
Palmer's Dairy, Box 1633, Basinger, Florida 33428
Dept. of Agriculture, 911 Maplewood Avenue, Tallahassee, Florida 32303
Peachy Dairy, Rt. 3, Box 102, Sarasota, Florida 33577
Secretary, Extension Dairy Science, University of Florida, Gainesville, Florida 32601
Platt Dairy, Box 2263, Orlando, Florida 32802
Platt Dairy, 6109 Holiday Hill Lane, Orlando, Florida 32808
Powell Agri-Industries, Inc., Rural Rt. 1, Princeton, Missouri 64673
County Agent, Box 365, Okeechobee, Florida 33472
Dairy Supply & Equip., P. O. Box 1168, Okeechobee, Florida 33472
Rt. 2, Box 327, Bradenton, Florida 33505
Flying Z Ranch, Satsuma, Florida 32089
Professor Emeritus, University of Florida, Gainesville, Florida 32601
Sunnyhill South, Box 713m N. Parkway, DeLand, Florida 32720
Hamp Register & Son, Sanderson, Florida 32087
O. J. Products, Tropicana Products, Inc, Box 338, Bradenton, Florida 33505
Robinson, D. D.
Romano, Sam
Rudy, Larry
Russell, Willard
Sampson, Hugh Jr.
Sanchez, Al
Scarborough, Jerry
Schmid, Arthur
Schmid, Charles Jr.
Self, Dewayne
Severson, R. L.
Shirey, William
Shreve, Dale
Simmons, Steve
Simmons, W. J.
Smith, Claude
Snyder, P. L.
Strayer, John
Strong, Kenneth
Steiert, Lenny
Sudduth, Jim
Syfrett, Charles
Taylor, John
Taylor, John
Thatcher, Dr. William
Toms, Jerry
Tucker, Cecil A. II
Utter, Dale
Van Horn, Dr. H. H. (Jack)
Walpole, Ed

T. G. Lee Farms, 5705 S. Conway Road, Orlando, Florida 32809
5207 E. Columbia Drive, Tampa, Florida 33619
Florida Feed Mills, N. Congress Avenue, West Palm Beach, Florida 33406
Hughes Feed & Grain, 5718 Souchack Drive, West Palm Beach, Florida 33406
Hilldale Dairy, P. O. Box 186, Mango, Florida 33550
Syfrett Feed Co., 310 Clark Street, Okeechobee, Florida 33472
County Extension Agent, P. O. Box 248, Dade City, Florida 33525
Student, University of Florida, Gainesville, Florida, 32601
Palmland Dairy, 3433 Monica Parkway, Sarasota, Florida 33580
NOBA Inc., 508 S. E M'ami Street, Okeechobee, Florida 33472
Sales Manager, De Leal Separator Co., 5724 N. Palaski Road, Chicago, Illinois 60646
Bartow Dairy Inc., Rt. 2, Box 150-B, Bartow, Florida 33830
L & M Dairy, Box 321, Brown Chapel Road, St. Cloud, Florida 32769
Wil-Win Farms, Inc., Orangedale Route, Green Cove Springs, Florida 32044
Simmon's Dairy, 6519 Firestone Road, Jacksonville, Florida 32210
Tampa Tribune, Box 191, Tampa, Florida 33601
Sunnyhill South, Inc., 6161 Silver Lake Drive, Leesburg, Florida 32748
Extension Entomologist, University of Florida, Gainesville, Florida 32601
Ralston Purina Co., 2107 E. Lumadren Road, Valrico, Florida 33594
Enrico Dairy, Rt. 1, Box 865, Pompano, Florida 33060
Florida Feed Mills, 6237 Ogden Road, Jacksonville, 32216
Syfrett Feed Co., P. O. Box 12155, Lake Park, Florida 33403
Taylors Dairy, P. O. Box 245, Coleman, Florida 33521
Student Assistant, University of Florida, Gainesville, Florida 32601
Assistant Professor, University of Florida, Gainesville, Florida 32601
The Graham Co., P. O. Box 660, Hialeah, Florida 33011
Baker Farms, Inc., Rt. 2, Box 536A, Sanford, Florida 32771
Sunnyhill South, Inc., Rt. 1, Box 592, Umatilla, Florida 32784
Dept. Chairman, Dairy Science Dept., University of Florida, Gainesville, Florida 32601
c/o Kent Price, Walpole, Inc., Box 344, Okeechobee, Florida 33472
Wekling, Mike
Whitty, Bob
Wilcox, Dr. C. J.
Williams, James
Williams, Stamie
Wiederkehr, Hans Jr.
Wiederkehr, Peggy
Wing, Dr. J. M.
Wisdom, Aubrey
Wolff, Jack
Wolff, Joe
Wright, Mr. & Mrs. Herbert
Yancey, Mr. & Mrs. Clyde
Yancey, Mr. & Mrs. Lester
Yant, Danny

Perry Ranch, Rt. 2, Box 250, Moore Haven, Florida 33471
Extension Agent, Pine Avenue, Live Oak, Florida 32060
Geneticist, University of Florida, Gainesville, Florida 32601
Twin Oaks Dairy, P. O. Box 136, Center Hill, Florida 33514
Pine Grove Dairy, 1668 Whitman Street, Jacksonville, Florida 32210
Hansdale Dairy Farm, 3011 57th Street East, Bradenton, Florida 33505
Hanadale Dairy Farm, 3011 57th Street East, Bradenton, Florida 33505
Dairy Research Unit, University of Florida, Gainesville, Florida 32601
Ross-Holm, 3254 Hollywood, Medford, Oregon 97501
Wolff Brothers Dairy, Rt. X, Box 175, Okeechobee, Florida 33472
Wolff Brothers Dairy, Box 190, Rt. 4, Okeechobee, Florida 33472
DHIA Supervisor, Rt. 2, Box W 40, Palmetto, Florida 33561
Clyde Yancey Dairy, Rt. 1, Box 26, Myakka City, Florida 33551
Cloverdale Farm, Inc., Myakka Star Route, Bradenton, Florida 33505
NOBA, Inc., Box 143 Hibernia Route, Green Cove Springs, Florida 32043