AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
BATCH #18

1. SUBJECT CLASSIFICATION

A. PRIMARY
Agriculture

AL00-0000-G302

B. SECONDARY
Animal production--Latin America

2. TITLE AND SUBTITLE
Livestock and poultry in Latin America

3. AUTHOR(S)
(101) Conf.on Livestock and Poultry in Latin Am. 4th,Univ.of Fla.,1970

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1970	138p.	ARC LAT636.0063.F636

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Fla.

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

10. CONTROL NUMBER
PN-RAB-065

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Dairies
Latin America
Livestock
Meetings

13. PROJECT NUMBER

14. CONTRACT NUMBER
CSD-2498 Res.

15. TYPE OF DOCUMENT

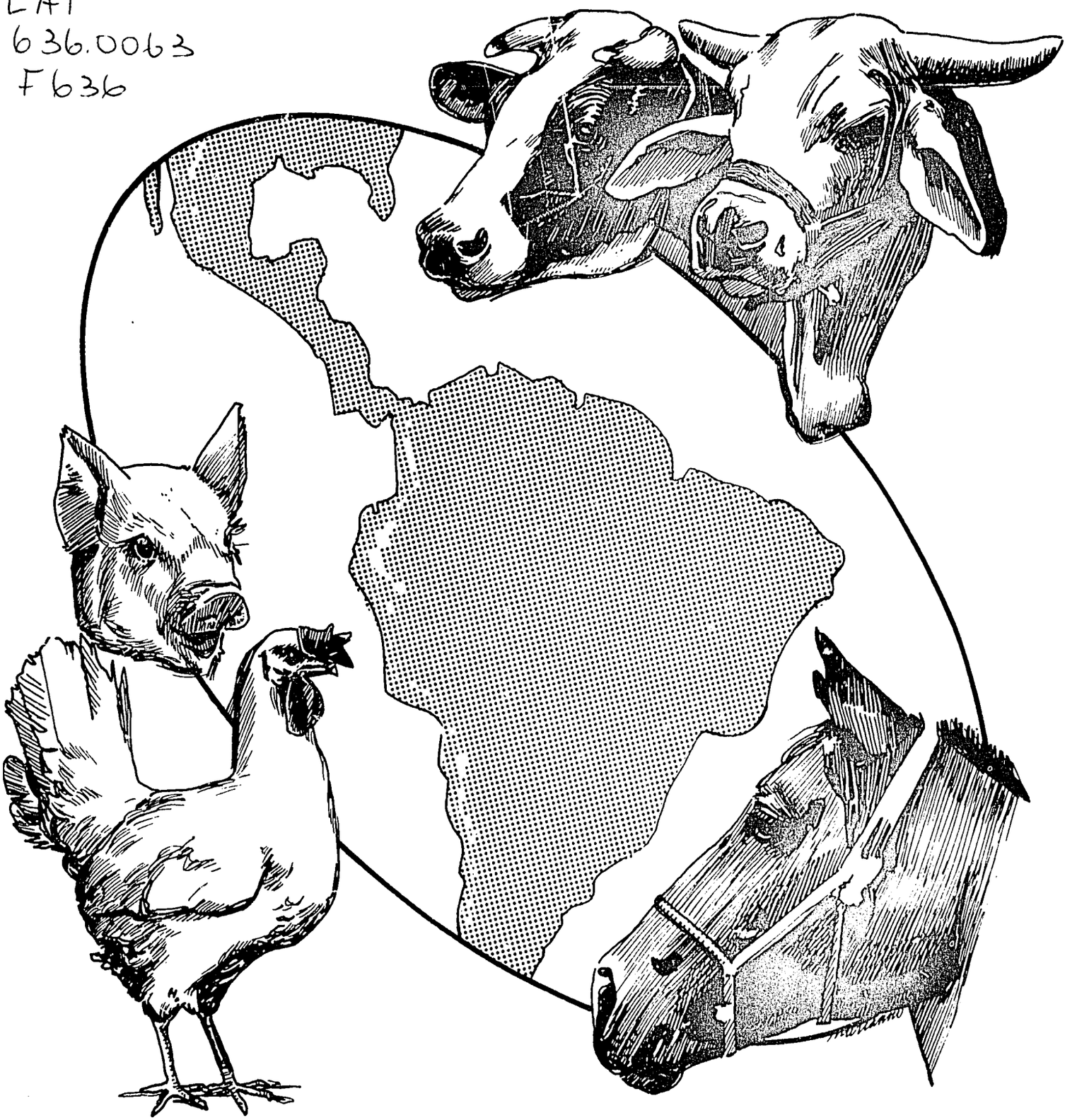
AID 590-1 (4-74)

Cod 2498

May 11, 12, 13, 14, and 15, 1970
4th Annual Conference on

Livestock and Poultry in Latin America

LAT
636.0063
F636



Sponsored by
Institute of Food and Agricultural Sciences
Cooperative Extension Services
and Center for Tropical Agriculture
University of Florida, Gainesville

Refer[illegible]ntor
Room 1656 NS

UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

COLLEGE OF AGRICULTURE AGRICULTURAL EXPERIMENT STATIONS AGRICULTURAL EXTENSION SERVICE SCHOOL OF FORESTRY

GAINESVILLE, FLORIDA 32601

OFFICE OF THE PROVOST
1008 McCARTY HALL

DISTINGUISHED LIVESTOCK AND POULTRY PRODUCERS:

On behalf of the Institute of Food and Agricultural Sciences, we wish to extend a most cordial welcome to the Fourth Latin American conference on Livestock and Poultry Production. We are always pleased to have Latin American visitors here at the University of Florida.

This conference is another indication of the interest of the University of Florida in collaborating with our Latin American neighbors, an interest which is also indicated by the exchange of professors, students and information during the whole year.

We hope that your visit will be agreeable and of value to each of you.

With my personal regards, I remain

Sincerely yours,

E. T. York, Jr.
Provost

Gainesville, May 11, 1970

UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

COLLEGE OF AGRICULTURE AGRICULTURAL EXPERIMENT STATIONS AGRICULTURAL EXTENSION SERVICE SCHOOL OF FORESTRY

INTERNATIONAL PROGRAMS
CENTER FOR TROPICAL AGRICULTURE

2001 MCCARTY HALL
GAINESVILLE, FLORIDA 32601
TELEPHONE: (904) 392-1965
CABLE ADDRESS: CENTROP

DISTINGUISHED LIVESTOCK AND POULTRY PRODUCERS:

We are pleased that you have honored us with another visit to the University of Florida.

This conference is one of the most important of the many offered by the Center for Tropical Agriculture in collaboration with various specialized departments in the IFAS. The goals of these conferences are to keep you up to date in knowledge of agriculture, to promote understanding between the University of Florida and yourselves and of course to know better your problems and ideas.

This past year we began in cooperation with the Department of Animal Science a project to obtain data from Latin America on the nutrition composition of forages, grains and by-products with the goal to publish bulletins of great value to you in your farms and ranches. Thus we are complying with our responsibility and desire to collaborate with you in the development of agriculture in Latin America.

Welcome to Gainesville and the University of Florida.

Sincerely,

Hugh Popenoe

Hugh Popenoe
Director
Center for Tropical Agriculture

Gainesville, May 11, 1970

UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

COLLEGE OF AGRICULTURE AGRICULTURAL EXPERIMENT STATIONS AGRICULTURAL EXTENSION SERVICE SCHOOL OF FORESTRY

DEPARTMENT OF ANIMAL SCIENCE

253B McCARTY HALL
GAINESVILLE, FLORIDA 32601

May 11, 1970

Dear Friends,

The Departments of Poultry Science, Dairy Science and Animal Science offer you a most cordial welcome to the Fourth Latin American Livestock and Poultry Conference.

Since last year approximately one-half of the professors of these departments have visited, between them, practically all of the countries of Latin America and to some various visits have been made. They have visited universities, ministries and ranches collaborating in research, short courses and in solving problems at the ranch level.

Thus you can see that although we feel that this conference is one of the most important functions of the University, since there is a valuable interchange between personnel of the University and yourselves; the conference is only one part of the continual collaboration that we have with the Livestock and Poultry producers of Latin America.

We hope that your visit to Gainesville will be of value and that you will give us your ideas as to how we might improve this conference. All of the professors and students participating are completely at your service in whatever way we might be of service.

Sincerely yours,

T. J. Cunha
Chairman of
Conference Committee

J. C. Glenn
Tropical Livestock
Program Leader

UNIVERSITY OF FLORIDA
Gainesville, Florida

19th Annual Beef Cattle Short Course
May 7, 8 and 9, 1970

and

Fourth Latin American Livestock and Poultry Conference
May 11, 12, 13, 14 and 15, 1970

Official List of Translators

Name	Country	Department	Degree working on
Ernesto Asturias	Guatemala	Animal Science	B.S.
Byers Bertram	Nicaragua	Animal Science	M.S.
Fernando Calderon	Costa Rica	Animal Science	B.S.
Vladimir Cruz	Cuba	Animal Science	Ph.D.
Carl Fick	Honduras	Animal Science	M.S.
Olga Fresnillo	Mexico	Animal Science	Ph.D.
Jaime Flores	Venezuela	Animal Science	B.S.
Arturo Gil	Colombia	Animal Science	Ph.D.
Diego Gimenez	Cuba	Animal Science	Ph.D.
Ruben Jaramillo	Colombia	Animal Science	M.S.
Jim Nation	Venezuela	Animal Science	B.S.
Humberto Olarte	Colombia	Animal Science	M.S.
Carlos Rios	Venezuela	Animal Science	M.S.
Rafael Rodriguez	Puerto Rico	Animal Science	Ph.D.
Jorge Roman	Ecuador	Dairy Science	Ph.D.

Official List of Translators

Name	Country	Department	Degree working on
Juan Salazar	Colombia	Animal Science	Ph.D.
Raul Silvestre	Venezuela	Veterinary Science	M.S.
Marcelo Velez	Colombia	Animal Science	B.S.
Gladys Verde	Venezuela	Dairy Science	M.S.
Carlos Zometa	El Salvador	Animal Science	B.S.

I N D E X

Page

Sanitation and Milk Handling Procedures for Maintenance of Quality and Prevention of Diseases.
..... K. L. Smith 1

The Influence of Supplemental Concentrate Feeding Upon Milk Production.
..... S. P. Marshall 7

Selection of Breeds and Management Practices for Maximum Profit.
..... C. W. Reaves 15

Maximum Use of Molasses in Dairy Cattle Rations.
..... J. M. Wing 21

Problems on Diseases and Parasites.
..... C. F. Simpson 26

Development and Management of Bulls in the Tropics.
..... M. Koger 45

Results of Cattle and Management Programs on Ranches in Nicaragua.
..... G. Moore 51

Recommendations on Establishing and Managing Improved Pastures in Latin America.
..... D. E. McCloud 64

The Development and Management of Replacement Heifers in the Latin America Tropics.
..... J. C. Glenn 69

How to Decrease From A Year-Around Breeding Season to a 90-120 Day Breeding Season and The Problems Involved.
..... A. C. Warnick 74

I N D E X (Cont'.)

Page

Recommendations on the Value and Use of Minerals in Latin America.
..... T. J. Cunha 78

Artificial Insemination in Swine.
..... F. W. Bazer 88

Comparison of Swine Carcass Values.
..... R. L. Reddish 94

Suwannee County Swine Improvement Program.
..... R. N. Whitty 97

How I Would Finish Hogs for Greater Returns.
..... H. D. Wallace 112

How I Operate my Swine Program.
..... H. L. Howes 118

Reproductive Problems in Horses.
..... F. W. Bazer 125

Sanitation and Milk Handling Procedures for Maintenance of Quality and Prevention of Diseases

Kenneth L. Smith, Assoc. Prof.
Department of Dairy Science
University of Florida
Gainesville, Florida

Milk is usually defined to be the lacteal secretion, practically free from colostrum, obtained by the complete milking of one or more healthy cows, which contains not less than 8.25 percent milk solids-not-fat and 3.25 percent milkfat. In the udder of healthy cows milk is practically free of bacteria. This milk will also be free of off odors except for flavors imported from the feed the cow has eaten or from odors that she has inhaled. There are apparently a few bacteria in the teat cistern and also in the teat orifice because, regardless of the precautions taken, milk freshly drawn from the udder will always contain some bacteria. The first milk drawn from the udder contains the highest number of bacteria and the number decreases throughout the milking process. Milk drawn under asceptic conditions from healthy cows will have a bacterial plate count, on the average of approximately 1000 per ml. Although the bacterial count varies considerably as the disease progresses, cows having mastitis tend to produce milk having a higher bacterial count than those animals not having the disease. It can be seen from these observations that milk produced under the most strict sanitary

conditions contains some bacteria but the number of bacteria present is normally very small.

Sources of bacteria other than from the interior of the cow's udder can cause very high bacterial counts. Hair and dirt from the exterior of the cow (the cow's coat) have bacterial counts ranging from a few hundred thousand per gram to as high as several billion per gram. This is the reason for recommending that the cow be brushed and cleaned prior to milking. It is recommended that the hair be clipped on the cow's udder to make it easier to clean. The use of small top pails is advocated to prevent material from the cow's coat from falling into the milk. Research has shown that washing the cow's udder prior to milking results in a lower bacterial count in the raw milk and also aids in stimulating milk let-down. Another recommended practice is the dipping of teats in a sanitizing solution immediately after milking to help control mastitis in the herd. It is apparent that the person doing the milking plays a very important role in determining the extent of contamination in milk coming from the exterior of the cow. The milker may actually add to the bacterial count if his hands are not kept clean or if he coughs or sneezes while milking or handling the milk. Organisms that are pathogenic to man may find their way into the milk supply in this way.

The most important single source of bacteria in raw milk is the equipment used to harvest and handle the milk. This equipment includes buckets, milking machines, pipe lines, coolers, cans and any other equipment that comes in contact with the milk. If equipment is in good repair it can be maintained in a clean and sanitary condition by following a few simple procedures. All

equipment used in handling milk should be rinsed with cool or luke-warm water immediately after use to remove as much of the milk as possible before it has time to dry. The rinsed equipment is then washed using an alkaline detergent. The detergent will function properly only if used at the temperature recommended by the manufacturer which is usually 50-60° C (120-140° F). However, there are detergents available for use in cold water. After draining the detergent, a hot water rinse 70-80° C (160-180° F) is used to remove all traces of the detergent and to heat the equipment. The heat from the final rinse will kill most of the remaining bacteria and the hot equipment will dry very rapidly which prevents further bacterial growth. The clean equipment should be stored in an inverted position to protect it from dust and other materials which might settle on it from the air and to allow the drainage of any remaining moisture. All inverted equipment including cans should be stored with the lids or covers removed to insure that they will stay dry and that unpleasant off-odors will not develop. Just prior to use at milking time, all equipment should be sanitized to kill as many of the remaining bacteria as possible. Chlorine sanitizers are commonly used and should be at a strength of 100 to 200 parts per million and be in contact with the equipment for two minutes to do an effective job. In milk that has been properly cooled, dirty equipment is the first suspected cause of high bacterial counts.

Dust may contribute some bacteria to milk but is not usually considered a serious problem. A milk house or milking barn should not be located close to a heavily travelled dusty road. Care

should be taken to insure that dust from hay and grain feeding is kept to a minimum at milking time.

Insects can be a source of contamination on dairy farms but they can usually be controlled by removing their breeding places. It is recommended that manure stored on the ground be removed from the barn area every four days and that stored on concrete slabs removed once every seven days to control flies. The manure should be spread on the fields where the sun and drying will destroy the fly eggs and larvae.

Straining or filtering milk has little effect on its bacterial content but it does remove any large foreign material that may have found its way into the milk. Straining is a recommended procedure in our attempt to produce as clean a product as possible.

After taking all practical precautions in withdrawing the milk from the cow's udder and in handling it to insure its high quality, one further technique may be used to maintain quality in raw milk. It is known that it is impossible to produce raw milk containing no bacteria but by using accepted sanitary practices, milk can be produced having a very low bacterial count. Bacterial growth in milk may be prevented or at least greatly slowed down by cooling milk promptly after it is drawn from the cow. Most people believe that if milk is cooled within two hours after milking, the bacterial quality will be maintained. In general, the colder the milk is kept (without freezing), the longer the milk may be stored. The following table is a summary of data on page 239 in "Market Milk and Related Products" by Hugo H. Summer (The Olsen Publishing Co., Milwaukee, Wisc. 1952).

Growth of Bacteria in Milk at Various Temperatures

Average number of bacteria per cc

Temp.	Fresh	24 hours	40 hours
4°C (40°F)	4,295	4,138	4,566
10°C (50°F)	4,295	13,961	127,727
16°C (60°F)	1,295	1,587,333	33,011,111

Storage at both 4°C and 10°C did a fairly good job of maintaining bacterial quality for two days but when the holding temperature was above 10°C the bacterial count increased very rapidly. These data confirm the fact that proper and prompt cooling of milk cannot be overemphasized.

Milk does not have to be cooled if it can be pasteurized within about two hours after it is drawn from the cow. Pasteurization is a process which was developed to prevent the spread of disease through milk and to insure that milk is safe to drink. Two common methods of pasteurization used in the United States are the holding method and the high temperature short time method. In the holding method milk is heated to 63°C (145°F) and held at this temperature for 30 minutes. High temperature short time pasteurization consists of subjecting the milk to a temperature of 72°C (161°F) for 15 seconds. Both methods are effective in destroying all known human pathogens found in milk. In addition to destroying all pathogens in milk, pasteurization also destroys many of the other organisms present and consequently prolongs the shelf-life of the milk. Pasteurization does not destroy all bacteria in milk and pasteurized milk must be properly cooled and handled or it too will spoil.

In summary it has been stated that milk produced under good sanitary conditions will contain only a small number of bacteria. Bacterial growth can be controlled by prompt cooling and proper storage. Pasteurization is a further safeguard to insure that milk is safe to drink.

The Influence of Supplemental Concentrate Feeding Upon Milk Production

S. P. Marshall, Nutritionist
Department of Dairy Science
University of Florida
Gainesville, Florida

The amounts of nutrients required by milking cows have been determined with good precision and tables containing this information have been published widely. Factors that affect requirements include size of cow (maintenance), amount of milk produced, richness of milk and needs for further growth and for reproduction.

The amount of nutrients that a cow will consume per day may vary widely and is influenced by a number of factors including the availability of feed, rate of passage through the digestive tract (composition), concentration of digestible nutrients in the feed, nutritional adequacy of ration and environmental factors.

If a cow consumes daily more nutrients than are needed to meet her total energy requirement, then she will gain weight. On the other hand, if the nutritive requirements for maintenance, milk production, etc., are greater than the nutritive intake, the cow will lose weight and production will drop until the nutritive input and output come into balance or the animal dies. In high-producing cows, a period of nutritional deficiency followed by a period of excess generally occurs during

each lactation cycle. Although the amount of milk that a cow will produce on a ration is a good measure of its nutritive worth, production level for a short period in early or late lactation may be a misleading index of ration quality because the animal may be losing or gaining weight.

Well-bred, high-producing dairy cows cannot obtain the nutrients needed to support maximum production from pasture or forage alone because it is too bulky or too low in digestible nutrient content. However, cows with the inherent capacity for high production have greater appetites, will eat more forage and will produce more milk on forage alone than animals of lower producing ability. The amount of nutrients that a cow will obtain daily from a forage depends upon its quality and the intake level. Many trials have been conducted at experiment stations in the United States to compare the production level by cows capable of good production when they are changed from a ration of good roughage plus concentrates fed at a ratio of about 1 kilogram per 3 kilograms of milk produced to good quality of roughage alone fed in abundance. These investigations have shown that the cows produce about 75 percent as much milk and fat on good roughage alone as compared to the roughage supplemented with concentrate. Had the cows been continued on roughage alone for consecutive lactations, their milk yield probably would drop still further because body reserves of nutrients were being depleted further.

A group of cooperative experiments were conducted at nine experiment stations in the United States to study the relation-

ship of nutrient input to milk output of cows when fed different levels of concentrates. The cows averaged 518 kilograms in weight. Their yields of milk averaged 4,046 kilograms of 4 percent fat-corrected milk during the previous lactation when they were fed roughages free choice plus concentrate at the rate of about 1 kilogram per 3 kilograms of 4 percent milk. From the results of these experiments, careful estimates were made of the effects on milk production and forage consumption by successive additions of concentrate to cows fed all the roughage they would consume. Analysis of the results revealed three important factors affected the amount of milk produced per kilogram of concentrate fed. These were:

1) level of concentrate fed
2) quality of cows and
3) quality of forage offered free choice

The results, shown in Table 1, reveal that as increasing amounts of concentrates are added to a plentiful supply of roughage, milk yield by good cows increased but that the additional amount of milk produced per unit of concentrate fed diminishes with successive additions of concentrate. Also, the feeding of concentrate caused a decrease in the amount of pasture or roughage that the cows consumed in a year. The consumption of total hay equivalent, including pasture, decreased by about 0.5 to 0.8 kilograms per kilogram of concentrate fed. This reduction in forage consumption, expressed as hay equivalent, generally increased slightly as the level of concentrate feeding was elevated.

Table 1

Effect of adding increasing amounts of concentrates to dairy rations (Morrison, F. B., Feeds & Feeding)

Conc. fed/yr.	Hay equiv. fed/year	Est. yield of 4% milk	Additional Milk/kg. conc. add.	Decrease in equiv./kg. conc. add.
kg.	kg.	kg.	kg.	kg.
0	5,142	2,920	. . . .	. . . .
204	5,011	3,184	1.3	0.6
408	4,877	3,410	1.1	0.7
612	4,739	3,605	1.0	0.7
816	4.598	3,773	0.8	0.7
1,021	4,453	3,918	0.7	0.7
1,225	4.306	4,044	0.6	0.7
1,428	4.155	4,153	0.5	0.7
1,632	4.000	4,248	0.5	0.8
1,837	3.842	4,332	0.4	0.8
2,041	3.681	4,403	0.4	0.8
2,082	3.517	4,467	0.3	0.8
2,449	3.350	4,523	0.3	0.8

The inherent productive capacity (quality) of cattle also affects output of milk per unit input of concentrate on an adequate forage ration. In Table 2 are shown estimates of the increase in production that were found at different levels of concentrate feeding for cows of different production capacities when fed by conventional methods for the United States. Not only did cows of high-producing capacity yield more milk per kilogram of concentrate fed but the decline in production per kilogram fed was less as the level of concentrate feeding was increased. This superior performance by the cows of higher producing capacity was due in part to two factors. First, nutrient demands created by production requirements stimulated keener appetites and the animals consumed more forage in addition to the concentrate. Secondly, the animals probably lost weight

during the lactation in which the experiment was conducted whereas the lower producing cows may have gained weight at the high levels of concentrate feeding. Loss of weight by the high producing cows could not continue for successive years and ultimately milk production would decline to the amount supported by nutrient intake.

Table 2

Additional quantities of milk produced when variable quantities of concentrate plus good quality roughage (corn silage) was fed to three qualities of cows. (Hogland, Michigan State University)

Total concentrate fed	Additional kg. milk produced for each additional 45 kg. concentrate fed		
	Average cows (3,175 kg.)	Good cows (4,536 kg.)	Very good cows (5,897 kg.)
227	46	70	80
454	35	52	63
680	27	43	54
907	22	36	45
1,134	16	30	40
1,361		25	34
1,588		21	29
1,814		16	25
2,041			20
2,268			17

The quality of roughage fed to cows of good producing capacity also influences the increase in production obtained per kilogram of concentrate fed. For example, Jersey cows at the West Tennessee Experiment Station in the U.S. produced

2,269 kilograms of milk and 155 kilograms of fat in one lactation when grazed on top quality pasture all year and also fed alfalfa hay and silage. Similar cows on the same forage program were fed 877 kilograms of concentrate and they produced only 445 kilograms more 4 percent milk during the lactation. On the other hand, if these lactating cows had been on poor forage programs that provided nutrients which would have supported only their maintenance requirements, it is estimated that feeding the 877 kilograms of concentrate would have increased production by about 1400 kilograms of 4 percent milk. Cattle will consume less dry matter from poor quality forage than from good quality forage. Therefore, the feeding of concentrates as a supplement will have had less affect on the intake of this forage than if it were of excellent quality and being consumed at a higher intake level. Since the poor quality forage is lower in digestible nutrient content, a reduction in intake due to supplemental concentrate feeding would result in a smaller loss of digestible nutrients than an equivalent amount of excellent quality forage.

The preceeding discussions of feed input to milk output have been based on the premise that the forage rations were balanced in nutrients prior to the addition of supplemental concentrate. Should the forage ration have been deficient in protein, minerals or vitamins and the deficiency were having an adverse effect on utilization of the other nutrients present or on feed intake, then the correction of such a deficiency by feeding a concentrated source of the limiting nutrients should

have resulted in an increase in production in excess of that indicated for the concentrate in the above examples.

Determining the amount of concentrate to feed cows in addition to the forage they are consuming in order to maximize profits may be one of the most important problems in dairying. The answer will depend upon the relative costs of nutrients in forages and in concentrates, the price received for milk and the increase in milk yield that one may anticipate per kilogram of concentrate fed. The major factors influencing the increase in milk yield per unit of concentrate fed are the level of concentrate feeding, quality of cattle being kept and the quality of roughage being fed. As an example, let us assume the feeding of an additional 100 kilograms of concentrate would result in the production of 120 kilograms more milk and that the feeding of this 100 kilograms of concentrate would result in a decrease in forage intake of 70 pounds of hay equivalent. If arbitrary values are assigned of 9 cents per kilo for the concentrate, 10 cents per kilo for the milk and 2 cents per kilo for the forage, then we could determine if it were profitable to feed the additional concentrate. The cost of 100 kilograms of concentrate at 9 cents would be 900 cents; the savings of 70 kilograms of roughage at 2 cents per kilogram would be 140 cents and the net increase in feed cost would be 760 cents. The increased production of 100 kilograms of milk at 10 cents per kilogram would be 1000 cents. Therefore the net difference between price of additional milk produced and net cost of additional feed would be 240 cents. If the 240 cents would defray the

non-feed costs of production and marketing of 100 kilograms of milk and leave a profit, the investment would be beneficial. After feed input-milk output ratios have been estimated for your dairy conditions, the estimates must be tested under your dairy farm conditions to determine whether they are valid for your conditions.

SELECTION OF BREEDS AND MANAGEMENT PRACTICES FOR MAXIMUM PROFIT*

by

C. W. Reaves, Extension Dairyman
Department of Dairy Science
University of Florida

The objective of operating a dairy is profit. Improvements in breeding and management are to maximize profits over both the short and long run. The breed of cattle and your management practices will and should vary according to your own situation as to:

1. Amount and value of land, altitude, water.
2. Forage quantity and quality (present and potential).
3. Whether you are primarily a milk producer or whether beef is an important part of the income from the same herd.
4. The price of milk in your area.

In many areas of the Caribbean, Central and South America, milk production is becoming a specialized business with good markets and profit potential. In these areas, major attention should be given to rapid improvement of the herd's genetic ability for milk production.

About 99 per cent of all dairy cattle in the United States are of one of five major dairy breeds. These major breeds of the United States came from Europe and have been developed by intensive effort for milk and butterfat production in this country, aided by vast numbers of animals and the large amount of DHIA record keeping.

---

*Talk given at the Fourth "Latin American Livestock and Poultry Conference" held at the University of Florida, May 11-15, 1970.

Data for Florida may be interesting as it is the most southern of the states of continental United States. The average yearly production, feed cost and other factors of our major breeds in Florida follow:

HERDS GROUPED ACCORDING TO BREED
(Florida DHIA Records)

Breed	Milk Lbs.	% Test	Fat Lbs.	F.C.M.*	Total Feed Cost	Income Above Feed Cost	Feed Cost per CWT. 4% FCM
B.S.	10,915	3.7	408	10,480	$291	$477	$2.78
Hol.	11,748	3.4	397	10,454	311	452	2.91
Jer.	7,805	5.0	389	8,957	234	369	2.61
Guer.	7,896	4.4	347	8,364	220	352	2.62

*F.C.M. = fat-corrected milk

It is apparent that the two breeds of largest body size (Holstein and Brown Swiss) produce the larger amounts of milk and also of pounds fat-corrected milk. Likewise, their income above feed cost per cow is considerably greater. The feed cost of producing 100 pounds of fat-corrected milk (last column) is slightly in favor of the Guernsey and Jersey breeds, to be considered if the amount of feed available is a limiting factor. The amount may be limited in what can be secured, exceptionally high cost of feed, or in pasture that is frequently too sparse for large cows to graze enough for body maintenance and milk flow.

Florida's per cow production was very low thirty-five years ago:

	Yearly Production per cow Kept for Milk
1935	2960 pounds milk
1948	3930 pounds milk
1958	5910 pounds milk
1968	8540 pounds milk

In 1935 our production was comparable to many of the less developed dairy countries today. Since 1935, production per cow increased 5,580

pounds or 188%. In the last 20 years, it increased 4,610 pounds or 117%. This indicates that higher production can be secured by better breeding and management.

Yearly Per Cow Averages of 7 Caribbean Herds

(Listed in Order of "Income Above Feed Cost" Per Cow)

Herd	No. Cows	Income Above Feed Cost	Cost of Feed and Pasture	Feed Cost per 100 lbs. milk produced	Lbs. Concen-trates	% ENE from Conc.	Lbs. Milk	% Test	Lbs. Fat
A	156	$313	$168	$2.07	4,173	52	8,122	4.7	382
B	112	224	146	2.26	3,018	45	6,462	4.8	312
C	99	220	157	2.37	3,127	47	6,631	4.8	323
D	12	208	109	1.65	2,061	30	6,600	4.7	313
E	10	133	87	1.95	1,406	22	4,471	3.9	177
F	57	118	80	1.97	1,650	27	4,066	3.8	155
G	61	72	65	2.46	1,171	25	2,644	4.9	131

The herds were under varying conditions, as prevail on different farms, hence precise conclusions are not possible from the data. It will be noted that the pounds concentrates fed and milk production were in rather close correlation with income above feed cost per cow. It should be pointed out that while the per cent of the cows' total intake of ENE (estimated net energy) coming from concentrates was higher in the high producing more profitable herds, yet the pasture was responsible for more pounds of milk in these herds than in the lower producing herds. (Actually milk from pasture was not much different from Herds B, C and E with D showing extra good results from pasture.) The feed cost per "100 lbs. milk produced" did not vary greatly except it was high for the very low producing herd.

How to Get a Higher Producing More Profitable Herd

Feed for Production and Profit

To produce well, cows must receive large amounts of feed nutrients. Excellent grazing of high quality forage provides a basis for profitable production. Additional nutrients in the form of concentrates give higher

production and usually more profit. This varies with lots of land, low taxes, and good pasture. Maximum production requires supplementary concentrates. With average pasture, a pound of concentrates may return two pounds milk as the cow utilizes the additional feed. On excellent forage, when a pound concentrates replaces a pound dry matter in forage, it will produce only about one pound milk. It will pay if the milk price is higher than the feed price.

Better Cows

If high producing females are imported, they should be given good care and proper feed including minerals, especially enough calcium and phosphorus. Otherwise, they may not survive or breed regularly.

Will AI Fit Your Situation?

Breeding up a herd by the service of high production sires is the most profitable for most. Native herds or those with some Criollo and Zebu may be mated with the specialized dairy breed of your choice. Frozen semen in liquid nitrogen canisters is maintained at minus 320 degrees Fahrenheit and makes shipping and storage feasible. A man can be trained in the techniques of artificial insemination and heat detection for proper timing. Florida bred 153,697 dairy cows and heifers by artificial insemination in 1968 (81% of all cows kept for milk). Many dairymen have no bull on the farm.

The United States National Sire Program provides the "proof" on the transmitting ability of bulls from many DHIA records. The "proof" is expressed in the "Predicted Difference" of pounds milk and butterfat of the sire's future daughters over their paternally unrelated herd mates.

What About Dairy Beef?

Few dairymen in America milk dual purpose cows. Yet here and in all

countries, dairy cattle contribute to the beef supply. Half the calf crop is bulls. They offer a sizeable potential for supplementary income of the dairy herd. Calves of the larger dairy breeds are of large frame, make rapid rate of gain and have a good ratio of lean meat to the fat. The following table shows results of an Iowa trial.

180-day Weights Representing 394 Animals

Sire	Dam: Angus	Hereford	Holstein	Brown Swiss
Angus	376	387	478	446
Hereford	404	349	466	444
Holstein	405	398	458**	483*
Brown Swiss	438	423	491*	457**

(From Iowa State University trials)

*Note: The heaviest calves were out of Holstein cows sired by Brown Swiss bulls. The next heaviest were out of Brown Swiss cows sired by Holstein bulls. The straight bred Holstein calves at 458 lbs. and straight bred Brown Swiss calves at 457 lbs. average were considerably heavier than calves from Angus and Hereford dams. It shows straight bred Brown Swiss or Holstein calves have an excellent potential for beef. Crosses also do well for beef, whether the large dairy breeds are bred to milking cattle or beef cattle. Crossbreeding gives beef gains in birth weights, vitality and rate of growth. It does not give gains in milk production, and should only be used in upgrading the present dairy herd. There is no antagonism between milk production ability and rate of growth.

SUMMARY

Some important factors for a more profitable dairy operation are:

1. Use dairy sires of high transmitting ability.
2. Get cows bred. (Dairy losses are greatest from long calving intervals.)

3. Develop ample pasture of best quality possible, to fit your land and cattle operation.
4. Determine program to capitalize on beef potential of dairy bull calves.
5. Control parasites and diseases.
6. Feed to meet cows' needs for production and reproduction.
7. Grow out heifers and condition them before calving.
8. Acquaint heifers with milking barn by feeding there two weeks before calving.
9. Use good milking methods.
10. Cull by records.

Maximum Use of Molasses in Dairy Cattle Rations

by

J. M. Wing, Professor
Department of Dairy Science
University of Florida
Gainesville, Florida

BLACKSTRAP MOLASSES is an important feedstuff for cattle particularly in Latin America because so much is produced that it usually is the cheapest energy feed available. We particularly like it in Florida since mose of our cane is produced on organic soil which makes molasses relatively high in protein. Molasses is important everywhere as an appetizer particularly since many feed mixtures contain such additives as urea and medicaments which may impart unpleasant flavors. As little as 2.5% of molasses makes most rations acceptable.

As a source of energy, to the extent that it can be used molasses is worth 75-85% as much as corn. Research often has indicated, however, that it must be limited to about 10 percent of the concentrates because it can interfere with the digestion of other feedstuffs. Most previous research, however, was done with high-roughage rations rather than the presently popular high-grain systems. Thus new data were needed and besides it was thought that high molasses rations could affect fermentation processes in the rumen and thus indirectly result in abnormal milk.

This report concerns two new investigations with different amounts of molasses in rations similar to those now being used extensively in dairy herds.

In the first trial complete rations containing 0, 6, 12 and 18% of cane molasses in the concentrate portion were offered free choice to rumen fistulated steers. Energy and protein in the different rations

were made similar by adding molasses in place of corn and varying the content of cottonseed meal. The composition of the rations appears in Table 1.

Crude protein digestibility was approximately the same on all experimental rations. In other work, higher levels caused a decrease in protein digestibility but the rations contained less concentrates and more roughage than the ones we used.

Digestibility of dry matter, cellulose, and energy were depressed as shown in Table 2. You can see that most of the effect was on dry matter, cellulose, and energy. Protein was not affected significantly. The depression occurred at the lowest level and no additional effects were observed as the level of molasses was increased from 6 to 18%.

An additional feature of this experiment was the determination of the type of acids formed by rumen fermentation. The results shown in Table 3 indicate that such rations can be expected to result in milk of normal composition except that slight changes at higher levels seemed possible because of the change in the proportions of acetic and propionic acids.

In the second experiment only the low and the high molasses rations were compared to the control. This time we used milking cows. The records included changes in body weight, milk production, and percent of fat and solids not fat in the milk. Each feed was offered to groups free choice and the amount consumed was recorded also. The results are shown in Table 4.

All rations were consumed readily and there were no significant differences among them. A mathematical analysis of the data failed to show any effect of the low level but when data from all rations containing molasses were compared as a group to the controls their effects were significant. Yet it is obvious that all changes in milk production and composition were minor. Since no really abnormal milk was observed in the

present experiment, it appears that within the levels investigated, large amounts of molasses in high concentrate rations may be feasible when slight depressions in production can be offset by the cost of molasses which often is the least expensive source of dietary energy.

Table 1. Composition of experimental rations

Treatment	1 0% molasses	2 6% molasses	3 12% molasses	4 18% molasses
	(kg)	(kg)	(kg)	(kg)
Corn	15.56	13.33	11.11	8.89
Brewers grains	4.44	4.44	4.44	4.44
Cottonseed meal	8.89	9.29	9.60	9.96
Wheat bean	2.22	2.22	2.22	2.22
Molasses	--	1.87	3.73	5.60
Alfalfa hay[a.]	13.33	13.33	13.33	13.33

[a.] Hay was chopped and mixed into the concentrate ration.

Table 2. Summary of digestibility of nutrients and digestible energy

	Treatment means			
Treatment	Protein	Dry matter	Cellulose	Digestible energy
Control	74.92	75.21	68.42	75.41
6% molasses	73.45	68.06	61.58	67.93
12% molasses	72.91	69.17	57.81	69.01
18% molasses	72.47	68.66	60.15	68.52

Table 3
Summary of molar proportions of volatile fatty acids and pH of the rumen contents

	Treatment means						
Treatment	Acetic	Propionic	Butyric	Isovaleric	Valeric	Acetic/ propionic	pH
Control	62.21[a]	20.67[a]	12.74[a]	2.72[a]	1.54[a]	2.94[a]	6.54[a]
6% molasses	63.53[a]	19.55[a]	12.76[a]	2.58[b]	1.58[a]	3.27[a]	6.62[a]
12% molasses	62.72[a]	19.86[a]	13.11[a]	2.27[b]	1.62[a]	3.08[a]	6.61[a]
18% molasses	63.91[a]	19.42[a]	13.18[a]	2.38[b]	1.67[a]	3.38[a]	6.65[a]

[a,b] Values with different superscripts differ at $P<0.05$.

Table 4. Average daily milk composition and production, feed consumption and gain

Treatment	Feed kg	Milk kg	4% FCM kg	Fat yield kg	Fat %	SNF yield kg	SNF %	Gain kg
1	22.09	22.98	22.98	0.93	4.17	2.04	9.06	0.44
2	22.67	22.49	20.31	0.89	4.10	2.00	8.89	0.44
3	22.49	22.40	21.82	0.84	4.02	2.00	8.94	0.44

PROBLEMS ON DISEASES AND PARASITES

By

Charles F. Simpson
Department of Veterinary Science
University of Florida
Gainesville, Florida

Beef cattle producers know that keeping animals healthy is one of the major responsibilities of ranch management. Control of diseases is important to both the owner and his country because both parties have the duty of providing food for the population. Just as we do not yet know the cause and treatment of cancer in humans, there are a few animal diseases for which the cause and treatment are not known. But, for the most part, good methods of treatment or effective preventative measures are available to combat most disease situations.

Good nutrition is essential if the animal body is to combat disease-producing organisms. For example, vitamin A can contribute to resistance by maintaining the lining membranes of the body in a healthy condition. A deficiency of vitamin A, on the other hand, can cause night blindness, and abortion or birth of weak and blind calves. As another example, lack of adequate dietary iron, copper, and cobalt can make an animal more susceptible to parasites that attack red blood cells.

Diseases and parasites must be controlled for economical beef cattle production. The time is fast approaching in all parts of this competitive world when wasteful losses from diseases

and parasites will lead to financial doom of the owner of a ranch. Thus, it is imperative that all serious ranchers begin now to instigate ways of utilizing all known methods for the prevention and control of diseases and parasites.

Animal parasites are a universal hazard to livestock production. Parasitism is essentially a herd disease, and therefore control measures must be applied to the entire cattle population. Unfortunately, complete eradication of most parasitic infections is impossible.

Management practices, not treatment, are the first consideration in controlling worm infections and these practices consist essentially of creating unfavorable conditions for the development of parasites. Worm infections increase in a herd only if a new infection is picked up from the pasture, and the rate at which this occurs can be manipulated. Some factors which influence rate of parasitic infection in a herd include length at which herbage is maintained. When grass is long, cattle have access to fewer parasites because the parasites are concentrated near the soil surface. Overstocking of pastures is conducive to heavy parasitism because of access of cattle to increased concentration of infective larvae. Under pasture conditions, viable eggs are continuously excreted and infective larvae are repeatedly ingested. Rotational grazing of pastures aids in the control of internal parasites. In this system, cattle leave the pasture before the worm eggs on the pasture develop to the

infective stage, and cattle do not return to the same pasture until the majority of the infective larvae have died. A modification of rotational grazing is alternation of pasture between cattle and another kind of stock. The theory in this procedure is that few, if any, species of worms are common to both types of livestock. Another management practice to control parasitism is to raise feed bunks and waterers off the ground to prevent contamination from manure. There appears to be a correlation between state of nutrition and severity of parasitism; poorly fed animals suffer more from parasites.

Round worms are the most serious of the several types of parasites that infect cattle. The three most common stomach worms are the brown stomach worm, (Ostertagia), the barberpole or wireworm, (Haemonchus), and the bankrupt or small stomach worm, (Trichostrongylus). A small intestinal worm (Cooperia) also causes serious parasitism in cattle. These parasites do not multiply inside the cattle, but lay eggs which are passed out in manure. The eggs hatch and develop into infective larvae which are eaten by the animal while grazing. Severe injury to the animal results from the burrowing of larvae into the wall of the stomach or intestine before they return to the gut, in about 3 weeks. Here, they suck blood and interfere with absorption of nutrients. Some adult females may lay up to 10,000 eggs per day.

The pronounced signs of parasitism include rough hair coat, diarrhea, loss of weight, loss of appetite, swelling under the jaw (bottle jaw), anemia, and death. Such spectacular signs of parasitism are not seen in low levels of infections where, perhaps, only poor weight gains are seen. Thus, it is impossible to say the number of parasites that lead to unprofitable livestock production.

The treatment of cattle with drugs has two main objectives: To remove worms from the infected animal and to decrease the number of infective larvae on the pasture. Several drugs are available for removing worms from cattle. Phenothiazine (20 grams/100 pounds body weight) has been widely used for this purpose as a drench, capsule, or bolus. Particle size of the drug may influence its effectiveness. Recently, thiabendazole (4-5 grams/100 pounds body weight) has gained in popularity for the worming of cattle; being employed in the form of a drench or bolus or it can be added to the feed as pellets for top dressing. New broad spectrum wormers, for example Tramisol, are constantly being introduced. The worming program is based on evaluation of fecal samples (eggs/gram of feces), and this program is combined with pasture rotation. It has been found that parasites develop resistance to anthelmintics, and, if this be the case, it is wise to alternate anthelmintics. In any event, routine worming does pay off as has been shown in

trials in which wormed calves gained an average of 0.1 pounds per day more than unwormed calves.

Liver fluke disease in cattle is responsible for the condemnation of livers at slaughter houses, unthriftiness and poor utilization of food, and even death. Snails are the intermediate host of the disease, and cattle become infected by eating hay, grass or other vegetation which contain a developmental stage of the fluke released from the snail. The travels of fluke larvae destroy the liver tissue of cattle-- causing the organ to be irregularly shaped, hard, and to contain stone-like deposits. Diagnosis is made by examination of feces or identification of flukes in the liver. Cattle are generally treated for flukes 2 times a year, with an oral dose of hexachloroethane (10 grams/100 pounds body weight) or hexachlorophene. Control of liver fluke disease also involves the destruction of snails. This is a difficult task, but is attempted through drainage of wet pastures and ditches, and the spraying or treatment of ditches with copper sulfate (33 pounds/400 gallons of water), or other molluscacides.

Echinococcosis is a disease characterized by cysts or large blisters in various organs. These lesions result from the presence of tapeworms, and are seen in such places as the liver and lungs. The worm involved is the dog tapeworm, Echinococcus granulosus. Cattle seldom die from the disease,

but infected organs and sometimes whole carcasses are condemned at slaughter because of this parasitic disease. Echinococcosis is spread by cattle eating the feces of dogs parasitized with tapeworms. Control involves excluding infected dogs from pastures, and the routine treatment of dogs with a tapeworm remedy.

Lung worm disease of cattle is a most serious problem. The typical symptoms of the condition include violent coughing, pneumonia, difficult respirations characterized by an open mouth type of breathing, and marked loss of weight. Lung worms are found in the large and small air passages when animals which have died of the disease are autopsied. Cattle with lung worms generally are also infected with gastrointestinal parasites. Thus, when lung worm disease is diagnosed, animals are first treated for gastrointestinal parasites and, if necessary, they are fed a supplemented diet. An injectable product (cyanacethydrazide) used for 3 successive days at a rate of 15 mg/kg, has been used for treatment with variable results. The drug is supposed to expel the worms in the air passages.

External parasites including lice, ticks, horn flies, and horse flied are a problem wherever cattle are raised. Insecticides such as Co-ral, Malathion, and Ronnel control most of these parasites of cattle when properly applied as a dip or a spary, and at the proper time. However, horse flies and deer flies

can not be adequately controlled under the usual ranch conditions. Tick paralysis is not uncommon in young animals; this condition causes flaccid paralysis. Adult animals, however, can have heavy infestations without developing symptoms. The disease is caused by a toxin that acts on the central nervous system.

Insecticides will not poison when used as directed. However, when used incorrectly (generally as a result of human error), toxicity can occur. Symptoms include salivation and tremors of the muscles of the eyelids, face, neck, body, and legs. Eventually the animal is unable to stand and exhibits violent paddling and kicking. Atropine is the drug of choice for treatment of toxicity caused by organic phosphorus insecticides.

There are numerous infectious diseases of cattle that can cause great havoc in an infected herd. Among the most serious of these diseases is anaplasmosis. This disease of mature animals causes a profound anemia, high fever, paleness of mucous membranes, great loss of condition, difficult breathing, and heavy mortality. The disease can be diagnosed by finding organisms in red blood cells observed by the microscope. Or, blood tests (complement-fixation and capillary tube agglutination) from recovered animals, or those that have been sick several days, can be conducted. Animals that recover from the disease are carriers and blood of these cattle can spread the disease

to noninfected animals. Mosquitoes, horseflies, and ticks are the principal vectors of the disease. However, the use of instruments such as vaccinating needles, dehorning tools, and castrating knives which contain infected blood can cause the disease when used with healthy stock.

Recently it was found that broad spectrum antibiotics (aureomycin and terramycin) have an inhibitory action on the causative organism. These products have value for treatment of the disease because they inhibit the multiplication of the organism in the red blood; however, these antibiotics do not halt the development of anemia associated with the disease. Thus, better treatment methods must be developed. Regardless of the treatment employed sick animals should not be exerted or they will drop dead.

It is possible to "premunize" or purposely immunize young cattle that are 6 months of age or less by injecting them with one ml. of carrier blood, because young animals develop such mild cases of anaplasmosis that they do not show signs of illness. They are, nevertheless, resistant to the disease thereafter, and they are also carriers. Thus, premunization really means the purposeful subcutaneous injection of young calves with blood from known carrier animals. This same technique is accomplished in nature by ticks. Sometimes the carrier blood used is derived from an animal that recovered

from an infection of Anaplasma centrale (an organism causing a mild strain of the disease). This strain also serves well in some countries for protection against the more dangerous strain, Anaplasma marginale. Since many cattle in Latin America are carriers of both anaplasmosis and babesiosis, calves would probably be premunized for both diseases with one injection of blood. One of the problems involved in importing anaplasmosis-free mature animals into heavily infected areas such as Latin America is that the imported animal is almost certain to come down with the disease shortly after arriving at its destination. The problem is most serious because these animals are highly susceptible to the disease and are likely to die from it unless corrective measures are instigated. There are two possible preventative measures for this situation. One is to deliberately infect the animal shortly after its arrival, and to treat it with a tetracycline antibiotic when 4-5% of the red blood cells have become parasitized. The other preventative measure involves vaccination. A commercial vaccine, Anaplaz, when given in 2 doses, at 6 weeks apart, is said to provide protection for one year. A minimum of 2 months is required for induction of maximum protection from the vaccine. A new vaccine is presently being evaluated that contains live organisms. It would appear that the carrier animal of anaplasmosis is a most valuable animal in countries where the disease is ever present. The

reason for this statement is that such cattle are completely resistant to the disease, even though they can still transmit the condition.

Tick fever is like anaplasmosis in many respects. It is caused by a parasite that invades the red blood cell; however, the tick is the only known vector of the disease. Thus, the disease can be theoretically eliminated by keeping cattle free of ticks. This, in fact, is the way that the disease was eliminated from the United States. Since this method is not possible in certain countries, treatment of sick animals must be attempted. One of the newest chemicals that has been employed in cattle in Europe is Berenil. Used subcutaneously at a dose of 3.5 mg/kg, there is rapid elimination of the parasite.

Bacillary hemoglobinuria, sometimes called red water disease, is caused by Clostridium hemolyticum. The animal has a high temperature, membranes which are orange-yellow in color, hemorrhages throughout the body, and hemoglobinuria (red wine). This disease could be confused with tick fever, but pie-shaped areas of dead tissue are found in the liver of an animal that died of red water disease and the bacterial agent of the disease can be cultured from this organ.

One of the most important findings to be reported within the past year concerning animal disease control concerns the

early detection of Johne's disease. Infected cattle that were not detected by serologic and intradermal testings were found to be positive by a special cultural examination of fecal specimens. By this method it is possible to detect infected cattle that have yet developed clinical signs of disease. The limitation of the test now commonly employed, the intradermal Johnin test, is that only about 22% of cattle slaughtered because of Johne's disease have a positive test and about 6% of animals with a positive test do not have the disease at slaughter.

No beef cattle enterprise can be successful if extensive sterility problems exist in the herd after nutritional deficiencies have been eliminated. Disease organisms must be considered when abortion storms or breeding problems develop on a ranch. There are 3 or 4 common diseases that can cause such reproductive problems.

Vibriosis is a venereal disease; it is an infection of the reproductive organs of cattle. It causes a period of infertility and occasional abortion (usually from 4 to 7 months). The causative organism is a bacterium, and is transmitted by the bull at the time of artificial or natural breeding. Most infected bulls remain carriers for an indefinite period of time, but the semen quality and health is normal. One infected cow in a herd is enough to perpetuate the disease and infect clean bulls. Often a prolonged calving season and low calf

rate is the first suspicion of occurrence of the disease. Vibriosis is self-limiting in that the recovered cow is resistant to the disease for several years and will even reproduce normally even though bred to an infected bull, but the cow is a carrier for long periods of time. Two agglutination tests are available for detecting antibodies for the disease in animals. The vaginal mucus agglutination test gives better results than the blood agglutination test and indicates animals to be cultured. Recently, the fluorescent antibody technique has been employed to detect Vibrio fetus in the cervical mucus or stomach of an aborted fetus. The results of these tests can be used to divide the herd into infected and clean groups. New additions to the ranch are not added to the clean herd until proven free of infection. Recently, bacterins have been introduced for the control of vibriosis in herds or areas where the disease is known to exist. Vaccination of cattle 30 to 60 days prior to the initiation of the breeding season, using 2 doses of the killed product has been reported to prevent most abortions in infected herds. Semen used in artificial insemination should be treated with penicillin and streptomycin.

Abortion is a common result of infection of cattle with leptospirosis. Such abortions can occur at any stage, but usually occur in the last one-third of pregnancy. Full-term calves may be dead or weak at birth. The causative organism

enters the susceptible animal by way of breaks in the skin, or through the mucosa of the eye, nose, or mouth. In cattle, the organism localizes in the kidneys for long periods of time, and as a result, is released in the urine. Leptospires are readily destroyed by heat, drying, and most chemicals, but can survive for long periods of time in stream and pond waters. Moving streams, thus, provide a ready means of dissemination of the disease organism. Diagnosis of leptospirosis can be definitely made only by laboratory means. Generally this involves the use of blood tests, and, in particular, the agglutination-lysis test for the detection of antibodies. Medication with antibiotics is useful in the treatment of the disease, but the use of bacterins is more valuable for stopping losses from the disease in the event of an outbreak. Another manifestation of leptospirosis is high mortality among calves along with the production of bloody urine prior to death. Man can develop leptospirosis from cattle, by handling contaminated animals or materials, or swimming in infected waters.

Trichomoniasis is another venereal disease that causes sterility and abortion problems in beef cattle. Trichomoniasis is spread through natural breeding or artificial insemination. The organism of the disease is found in the sheath of bulls, and usually this animal retains the infection for the remainder of his life without showing clinical signs of disease. The

organism is also present in the vagina or uterus of the infected cow. Even though this venereal infection has no observable effect on bulls, the animal spreads the disease by breeding. In the cow, it causes infection of the uterus, failure to settle in spite of repeated services, abortion at 30 to 120 days, often with an accumulation of pus in the uterus. Animals usually become infected by the introduction of mature infected male or female into the herd. The infection is permanent in bulls, but considerable immunity develops in cows as a result of exposure to the disease. An absolute diagnosis of the condition can be established only by recovery of the organism from infected animals. The disease is generally self-limiting in the female if a 90 to 100 days complete breeding rest is allowed. Attempted treatment of the bull is laborious, and sometimes successful.

All of the three above mentioned reproductive diseases, vibriosis, leptospirosis, and trichomoniasis, can be most successfully diagnosed by taking the tied-off stomach of aborted fetuses to the laboratory. At such a facility, the best opportunity exists for isolation of the causative organism involved in the disease outbreak.

Brucellosis (or Bang's disease) and tuberculosis are two common diseases of cattle for which testing programs exist for the detection of infected animals. For this reason there is

no excuse for resistance to elimination of these diseases in a cattle enterprise. If the cattleman does not take it upon himself to eradicate these diseases from his herd, it is only a matter of time before the public health authorities will force him to do so. In the near future, these two diseases will be of low incidence in all parts of the world. Medicinal treatments are worthless for these ailments, but vaccines are available for the prevention of brucellosis and tuberculosis (B.C.G.). Without question, newly purchases animals should be tested and found free from both diseases before they are added to the herd.

There are two diseases of calves in the tropics that frequently cause high mortality: They are blackleg and malignant edema. Cattle 6 to 18 months of age are most susceptible to these diseases. Animals under 4 months and over 2 years are rarely affected. The causative agents of these conditions are gas-producing, spore-forming organisms. Such spores are extremely resistent to heat, cold, drying, and disinfectants. Gaseous swelling under the skin, especially on the hind quarters, shoulder, chest, or flank are characteristic. The swellings cause stiffness and lameness. Most animals die 12 to 36 hours after the occurrence of symptoms, developing rapid bloating and black colored musculature so that the legs stand straight out from the body. A diagnosis can be readily

made from post-mortem lesions and symptoms, since the spleen is not enlarged and the blood clots normally, thus differentiating these diseases from anthrax. Vaccination is very effective and economical, but bacterins containing killed organisms for both malignant edema and blackleg should be employed. Vaccination, once started, should be continued on an annual basis. Medicinal treatments are of little avail in these conditions.

It is general knowledge that the stresses associated with the movement of cattle predispose to serious respiratory conditions or even death. This so-called shipping fever complex is probably caused by a multitude of etiological agents, such as stress, bacterial, and viral infections. A plan to reduce such losses from respiratory infections has been called preconditioning. This procedure involves the administration of appropriate vaccines and care prior to shipment. In particular, animals should be given shipping fever bacterins and a PI-3 (parainfluenza) vaccine. Treatment for internal and external parasites should be administered, as indicated. Following arrival at destination, the animals should be rested for 24 to 48 hours, and they should be provided with adequate amounts of clean, fresh water. Close confinement should not be tolerated, but cattle should be closely observed for 30 days following arrival and prior to being introduced into the remainder of the herd.

Newly described experiments indicate that bovine virus diarrhea can cause abortions, still births, and weak calves. Cerebellar hypoplasia (a brain defect) is the cause of the last-named condition and results from infection of the dam during the 4th or 5th month of pregnancy.

Disease prevention is much more economical than treatment Prevention involves use of vaccinations for all diseases known to be in the area, for which there are vaccines. Prevention also means periodic use of insecticides and anthelmintics, and feeding of an adequate diet which includes mineral supplementation. "Sick" or quarantine pastures must be maintained on ranches where unhealthy animals can be isolated from the rest of the herd. Newly purchased animals should be proven free of infection prior to introduction into the herd. The existence of poisonous plants must be recognized and cattle be prevented from eating them. For example, in Argentina, and perhaps in other South American countries, the consumption of a plant (Solanum malacoxylon), causes a condition known as Enteque Seco. In this disease, animals become lame, develop diarrhea, lose weight, and develop extensive calcification of the heart, blood vessels, and even the lungs and leg tendons. Competent employees must be available to detect the early stages of disease. Animals that die of disease must be adequately disposed of so as to prevent spread of an infection on the ranch. Burning of carcasses, or burying deeply and

covering with lime is ideal for disposing of carcasses. The premises where disease has occurred should be disinfected with a product such as lye at the rate of 1 lb./5.5 gal. of water. Such good management practices can do much to prevent the occurrence of disease and parasites on a ranch.

Sawdust liver, a slaughterhouse term for a liver which looks like it has been dropped in wood sawdust, occurs frequently in well-fattened beef cattle. It does not cause clinical symptoms, but such livers are condemned by meat inspectors. It is believed that liver necrosis in this condition is an expression of vitamin E-selenium deficiency.

An early diagnosis of a disease problem is essential if extensive livestock losses are to be prevented. Usually an accurate diagnosis can not be had by observations made with the naked eye, but involve the use of numerous laboratory techniques, such as bacteriology and histopathology. Thus, it would be highly desirable that Latin American countries make all possible haste to establish highly qualified diagnostic laboratories in their most populated cattle areas. If such laboratories were staffed by competent personnel, reliable diagnosis of important diseases could be established in a short period of time. In this way, proper treatment or preventative measures could be instigated in the early stages of the disease outbreak. Most certainly the cost of operating such diagnostic laboratories

more than pay for themselves. Diagnosis of animal ailments, like human sickness, demands a skillful mind and trained hands.

In general, there are 4 means by which losses of animals from disease can be kept at a minimum. First, aggressive research must be concentrated on local diseases about which little information is available. Second, governmental agencies must establish regulations to prevent the spread of disease, and these rules must be enforced. Some of these regulations might involve stringent restrictions such as quarantine of ranches, when circumstances dictate such strong action. Thirdly, eradication programs should exist to eliminate diseases for which control measures are known. Lastly, an early diagnosis of diseases must be obtainable from qualified diagnostic laboratories.

DEVELOPMENT AND MANAGEMENT OF BULLS IN THE TROPICS

By

M. Koger
University of Florida
Gainesville, Florida

The title of the subject assigned for this discussion immediately raises the question whether or not the development of bulls in the tropics presents problems or considerations different from those in other parts of the world. The answer is that it does if maximum performance in the tropics is to be achieved.

During recent years, evidence continues to accumulate that beef cattle need genetic adaptability to the environment in which commercial cattle are grown. Since sire selection largely controls the genetic potential of cattle and the development program vitally influences which bulls may be selected, the implications are clear. The tropics have a bio-environment (climatic, nutritional and disease) that is different from that of the temperate zones. It follows logically that the program for development and selection of bulls should be designed to enhance selection for genetic adaptability to the environment where the bulls are to be used. Economics and other practical matters must be considered also.

To visualize how the development program for young bulls can best be made to contribute to the general objectives of the breeding program, it is helpful to review the characteristics needed in beef cattle. These include:

1. Adaptability to the bio-environment.
2. High rate of reproduction.
3. Good growth rate, both pre- and post- weaning.
4. Meatiness.

Sire selection almost exclusively governs the last two items of growth rate and meatiness. It also strongly influences adaptability and productive efficiency (Items 1 and 2) but for these items selection and culling practices in the female herd are vitally important also.

OBJECTIVES OF BULL DEVELOPMENT PROGRAM

The objectives of a development program for young bulls generally may be classified as follows:

I. Evaluation of the individual bulls for:

   a. Growth rate
   b. Meatiness
   c. Soundness
   d. Semen quality
   e. Breeding soundness, including aggressiveness and temperament.

These items are used as aids in selection.

II. To assure adequate growth rate and good general appearance of bulls. Unfortunately, there can be a conflict between sound procedures for genetic improvement and the temptation to develop eye appeal through getting bulls excessively fat. This is true especially where bulls are being offered for sale.

III. To develop procedures for achieving objectives 1 and 2 that are practical and economical.

METHODS AND PROCEDURES

Since most any practical program for the growth and development of young bulls will remove much of the environmental stress from the young bulls themselves, precautions must be exercised for bull selection to make any significant contribution to climatic adaptability or female fertility. In fact, unless precaution is exercised, there may be negative selection for regularity of production in females. Irregularity of production in females frequently leads to an accumulation of body reserves which is later milked off, giving a false impression of productivity. Bull calves from such cows may be picked at weaning as potential bulls. Thus, starting with the right bull calves, as well as the development program itself, is important.

Considering both the characteristics needed in beef cattle for the tropics and the general objectives of bull-growing programs, the following general procedures are recommended on the basis of experience in Florida.

1. Maintain the cow herd under practical conditions, comparable in so far as possible with conditions where the bulls will be used.
2. At weaning time select as prospects only the bull calves from cows with the best production records. Record weaning age, weight and score as the initial observations for a post-weaning test.
3. Grow the bulls on good pasture or roughage with the minimum amount of supplemental feed required to achieve a moderate growth rate. The gain will vary from one situation to another but should average one pound per day or more. Grow to an average weight of approximately 1000 pounds or more. Record an end-of-test age, weight and score. Compute weight at a standard age (or weight at approximately this age). Check for semen quality and breeding soundness.
4. On the basis of growth rate, meatiness, semen quality and breeding soundness, sort the bulls into three categories including:

a. Stud herd-sire prospects

b. Commercial bulls

c. Discards

The percentage of bulls falling into these categories will vary widely depending on circumstances. It should be remembered, however, that there is little to be gained from evaluating young bulls unless those with the poorest performance records are discarded. Otherwise the program resolves itself into one of picking prospects at weaning and then perpetuating the mistakes.

MANAGEMENT OF BULLS IN THE BREEDING PASTURES

Without good bulls there can be no improvement of cattle. Good bulls are scarce and expensive. Thus, every effort should be made to protect the investment in bulls with reasonable management.

The number of calves which a bull will sire during his lifetime is a function of aggressiveness, potency, fertility and longevity in the herd. All of these are controlled largely by management, assuring that only satisfactory bulls are released initially.

The two items most frequently contributing to poor mating performance in bulls is under-nourishment and leaving bulls in the breeding herd for extended periods of time such as

year-round breeding or during long breeding seasons of more than four months. The most effective solutions, both from the standpoint of relief for the bulls and productivity of the cow herd, is to practice seasonal breeding for not more than five months per year. This gives the bulls a rest period and provides an opportunity for building up body reserves. A bull managed in this way will on the average in the tropics sire more calves per year and remain in the herd for a greater number of years, than bulls which are left with the cow herd for longer periods of time.

With seasonal breeding, especially combined with preferential treatment such as good pasture or supplemental feeding just prior to the breeding season, bulls of most breeds will serve by natural service in much of the tropics. Without seasonal breeding, few such bulls will work satisfactorily by natural service except in the more favorable areas.

RESULTS OF CATTLE AND MANAGEMENT PROGRAMS ON RANCHES IN NICARAGUA

by

Guillermo Moore, Chief
Mission to Nicaragua
Latino-Consult Argentina
Managua, Nicaragua

1. GENERAL CONSIDERATIONS

Before beginning to discuss the results obtained in our work on behalf of cattle development in Nicaragua and the means which made our results possible, I wish to briefly explain the philosophy which guided our actions.

Nowadays we are hearing, each time more insistantly, voices that point out the ever increasing differences which removes the applied technology of the developed countries from that of the developing countries.

The difference has given rise to the term "technological gap" and your excellence represents one of the challenges of our time.

It is an established fact, at this time, that there is a definite need to effect a transfer of technology, with pertinent adaptations to the particular locale. At the same time, it is realized that there is the necessity of creating an intermediate procedure to bridge the two worlds which are running the very real risk of remaining incommunicado.

Some may think I over dramatize the circumstance. However, our experience, which originates in the South of Argentina and extends to

the tropical zones of the North, indicates to us that the field of agriculture is precisely where the "technological gap" is most serious.

Having expressed the foregoing, our concept of technical assistance can be defined: Importation, analyzing and conditioning of techniques, their adaptation to the environment and the creation of a new technological focus in harmony with reality.

Ending this brief discussion it is well to note that technical progress, to be real and permanently progressive, must be established upon a cultural level capable of assemilation, easily integrating it with the average conditions.

2. OBJECTIVES AND METHOD

The goal of the work in Nicaragua at the ranch level, could include the accomplishment of the transformation of that which is a routine activity into one of promotion, with a growing rhythm of development, elevating the productivity and lowering the cost.

This idea presupposes to create a managerial mentality where the producer must be the participant, not simply a spectator of the technical advance, acting fundamentally on the most outstanding aspects of cattle raising such as: Installations and improvements, cattle management, sanitation, nutrition and administration.

The means used to such an end constitute direct assistance, given by managerial technicians who teach practically how things are done, and who share in the responsibility for the results obtained.

The action is recorded within the livestock development plans undertaken by the government of Nicaragua through the National Bank, which loans the necessary credit assistance.

3. OUTSTANDING ASPECTS OF THE DEVELOPED TECHNICAL ASSISTANCE

ZONIFICATION

By distinctive features, Nicaragua can be divided into two climatic regions: The Humid Zone of the Atlantic where the rainy season is practically permanent, and the Dry Zone with well defined dry and rainy periods. The practical observation of the results obtained by the cattlemen lead to practical zoning of the country, encouraging breeding herds in the Humid Zone and fattening operations in the Dry Zones.

Analyzing the previously mentioned two large regions, the following is observed:

1) Humid Zone

The major difficulty is shortening the time necessary to fatten cattle, as steers are presently marketed at more than 4 years of age. Logically, with good management and upbreeding the excess age could be reduced, but presently you can assume that for every steer marketed there are another three steers of various ages and stages of development which reduces the capacity of the pastures for breeding cattle.

For this reason the small fattening capacity of the humid tropical zones is not well known. We believe there are several concurrent factors. The major problem of fattening animals with regard to climate is the nutritive capacity of the pastures which is affected by the prevalent leaching of the soils and the consequent deteriation of fertility, etc.

The profitability on these humid zone ranches which have complete operations (breeding, growing and fattening their own produce) is very low or even a deficit in many operations.

However, the contrary is true for those humid zone ranches dedicated solely to a cow-calf operation, selling calves at weaning, the profit is more than 7% annually.

With proper management of the breeding herd, planning the breeding season so that the calves will be born in the time of less rain, higher birth percentage can be obtained without having the expenses of the extra maintenance of the cows.

Nevertheless, it has been observed that supplements of agricultural byproducts high in digestible energy, such as rice or cotton seed hulls, can substantially increase the pregnancy percentage.

2) Dry Zone

From the observations made, the semi arid zone of Nicaragua has a great capacity for fattening cattle. The calves originating in the humid zone and moved to the dry fattening regions can be finished for slaughter under pasture conditions by the age of 2 years.

This occurance happens in other regions and countries having distinctive conditions. I might use Argentina as an example where cattle are traditionally fattened in a semi arid zone.

All of the high fattening yields obtained in Nicaragua, in some cases more than 1,000 kg/ha., originated in the Pacific Region.

The dry zone dedicated to breeding herds have the following option: Conform to lower calf birth rate or maintain high birth rate at an elevated cost for supplemental feed during the dry season.

Technically this can be done, but economically the rancher will profit more by investing in feed for animals which are gaining weight to be sold.

We believe that some factors which determine the type of cattle operation adapted to certain regions can be modified economically; others no, but these factors should always be conditioned to the operation.

This aspect of zone adaptation of cattle operations will require more investigation and we are pleased that the University of Florida will be helping develop this information.

CATTLE MANAGEMENT

The breeding season is the fundamental base about which total cattle management turns.

Save for a few honorable exceptions, this is not practiced in Nicaragua. Our first concern was determining the best season for breeding each of the two large climatic regions previously defined.

For this consideration the frequency of estrus by season and the convenience of the calving season, in view of sanitation and climate, were analyzed.

This having been determined, a program of work was planned for each ranch being assisted to affect rigorous selection for fertility with the intent of increasing the existing low birth percentage. The first step of this program was the general sanitation of the herd, elimination of all cows of old age, poor development, disorders of reproduction organs etc., which negatively affected their production capacity.

Another reason for concern was the constant effort to encourage specialization of cattle operations - milk or beef - abandoning a bad system called "dual purpose".

In the following graph 3.1 is a resume of a typical management calendar, with the breeding season of the humid zone of Nicaragua.

PASTURE MANAGEMENT

Although the major progress in cattle production has developed in the temperate zones of the hemisphere, the last decades have demonstrated the whirling progress occuring in tropical cattle production.

Two of these factors we judge to have had major possibilities: The defusion of Zebu breeds and their derivatives; and the progress made in adaptation and management of pastures. This last point is the one to which I especially refer.

Humidity and temperature condition nearly continual growth of pastures. In the dry tropical zone, especially referring to Nicaragua, irrigation for a cattle operation appears to be a very profitable practice.

The next problem, after obtaining the forage species most adapted to ecology of the area, is the forage management. In many cases the difficulty is not one of accelerated forage growth, but one of improving the quality and volume at the opportune time.

Especially evident in the tropical zone is the reduction of palatibility and nutritional value of pastures as they develop toward maturity.

Therefore, the application of a practical system which permits regular grazing of pastures, taking advantage of the opportune stage of growth, is of major importance.

Hence, a pasture rotation system is utilized, subdividing the pastures with electric fences to avoid exaggerated production cost.

This pasture rotation with electric fences, with installation cost revolving around the pasture size (10 cordobas* per M_z** to 80 cordobas per M_z), makes possible, in some cases, yields higher than 1,000 kg. of beef/ha/year as previously mentioned. Naturally these yields on pasture conditions were only possible on those ranches which combined good cattle, excellent pasture (Pangola type), fertilization and irrigation.

The net profit on these ranches dedicated to fattening, surpassed 1,100 Cordobas per ha/year. The production cost and return data is at your disposal for analysis. The size of ranches under pasture rotation range from very small dairies milking 10 cows to large fattening operations of 3,000 steers.

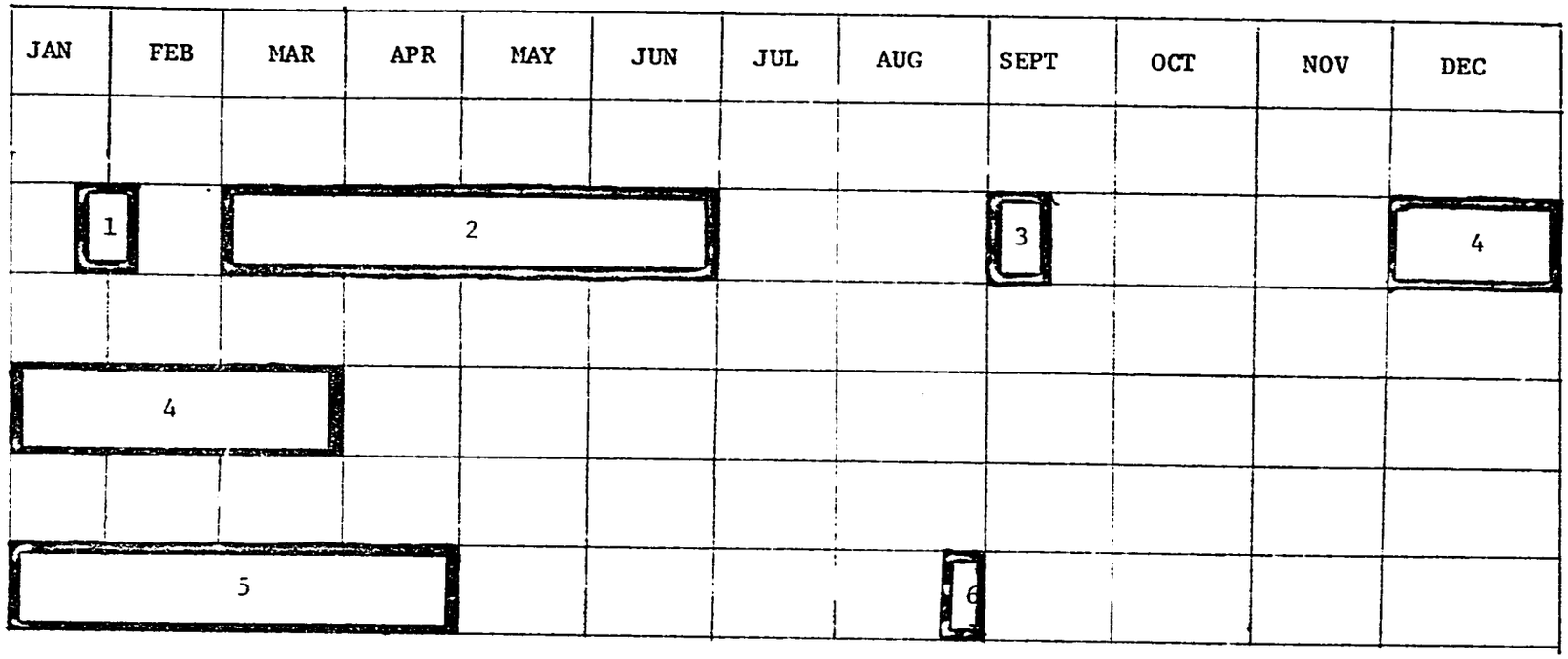
Through the concentration of a large number of cattle per ha, (the basic number is 60 large animals per Mz/day) and returning to the first pasture at the end of 25 to 30 days depending on the rapidity of recuperation, intensive utilization can be obtained from these pastures dedicated to:

* Mz = 7,000 M^2
** 14 cordobas = 1 U.S. Dollar

GRAPH 3.1

SEASON OF BREEDING, CALVING AND CORRESPONDING WORK

IN THE HUMID ZONE OF NICARAGUA



1. Fertility testing of bulls,palpation and selection of heifers for first service.
2. Breeding
3. Palpation of all cows which were exposed. Cull open and old cows
4. Calving
5. Castration, branding and dehorning
6. Weaning, marking and culling of old cows

- Reducing trampling loss
- Utilizing pasture at the optimium moment
- Giving sufficient rest to pastures, increasing the recuperation capacity
- Increasing the organic matter and therefore the soil fertility
- Effecting an economic use of water

As the last point of the topic, I wish to note that several grasses, which were previously considered as green chop, have been put into pasture rotation (among these is Merker).

The fundamental reasons were the economic and administration problems. Economically, the costs were reduced by taking the cattle to the pasture, without seeing a reduction in production capacity. Administratively, the country has a shortage of skilled labor, high value of agricultural machinery, and the lack of parts and repair facilities for the machinery, the sum of which presents large practical difficulties.

ADMINISTRATION

Of the characteristics of managerial technical assistance, administration is another of the outstanding aspects. The old slogan, (techniques propose - the economy disposes), must always be present to realize the labor of the technique.

Establishment of production cost, yield analysis, plans of movement of cattle and materials, simple accounting etc. were put into practice. Also, manuals such as "La Cartilla del Ganadero" were edited for the ranchers, in which a series of practical information is presented. Included in same is a final chapter dedicated to ranch management.

4. RESULTS OBTAINED FROM BREEDING RANCHES BEING ASSISTED

At the end of 1969, ninety cattle ranches, totaling 42,000 cows were under the controlled breeding system, carrying out programs of selection for fertility with the assistance of the Mission. I will reiterate in summary, by title of each example, some of the results obtained from two Nicaraguan operations from the point of view of productivity as well as the economic results of their breeding and fattening operations.

Ranch: "San Carlos"

Location: District of Rivas - Southwestern Nicaragua

Area: 1,510 Mz. Almost totally established in Jaragua grass.

Type Cattle Operation: Cow-calf operation and fattening of their own produce.

At the beginning of the program this ranch had a 60% birth rate with 2% mortality and a profit of 2%.

YEAR - 1967

First breeding season between July 15 and October 15.

Total cows examined	562	
" " pregnant	460	81.8%
" " open	93	16.6%
" " eliminated	9	1.6%

Within this total approximately 100 heifers had 90% pregnancy. Of approximately 176 dry cows, 96.5% (170) were pregnant. Of approximately 286 cows with calves, 67% (191) were pregnant.

YEAR - 1968

Total cows bred	624	
" " pregnant	510	81.7%

Total cows open	100	16.0%
" " eliminated	14	2.2%

Within this total approximately 134 heifers had 91.04% (122) pregnancy. Of approximately 95 dry cows, 97.9% (93) were pregnant. Of approximately 395 cows with calves, 74.68% (295) were pregnant.

YEAR - 1969

This year 653 cows went into breeding the herd. The bulls were retired at the end of November. In February, at the time this work was being prepared the herd was being palpated.

As was indicated previously, one of the objectives which confronts the Nicaraguan cattlemen is the reduction of the marketing age. Practically no steers were slaughtered under 3 years of age (4 teeth) until only a short time ago.

On the San Carlos Ranch with good Brahman bulls on common cows they wean calves direct from dam weighing 180-200 kg.

These same calves, born in May-June and weaned in December-January, are supplemented during the months of March through June with a ration composed of jaragua hay, cottonseed meal and molasses, then are put directly onto jaragua pasture in June from which they are delivered for slaughter in January at an age less than 20 months and averaging 403 kg. After a 12 hour shrink, they yielded 54.8% warm carcass, and the carcass yielded 76% boneless cuts. The economic results to date indicate that the return on a total capital investment of C$2,500,000 (cordobas) increased from 2.5% initially to 6%. That is to say the profit increased from $65,000 at the beginning to C$150,000 in 1969.

Ranch: "El Mono"

Location: in Camoapa - Humid Eastern Region of Nicaragua

Type cattle operation: Cow-calf operation with sale of calves at weaning.

At the beginning of the program, the birth rate was 50% with a profit of 2.65%.

YEAR 1967

First breeding season between March 2 and June 30

Calving season: Between December and March 20

Weaning: September - November

Total cows examined	906	
" " pregnant	648	71.5%
" " open	201	22.18%
" " eliminated	47	6.29%

YEAR 1968

Second breeding season

Total cows examined	741	
" " pregnant	532	71.79%
" " open	122	16.46%
" " eliminated	87	11.74%

In this year the major part of the cows which were open the year before were discarded.

YEAR 1969

Third breeding season

Total cows examined	725	
" " pregnant	519	71.58%
" " open	108	
" " eliminated	98	

The production cost of a year old calf the first year was as shown in the following results:

ACCOUNTABLE COST	Cordobas/1 yr old calf
Production cost and amortisation	C$ 230
Technical & Economic Cost (Accountable Cost plus Interest)	C$ 561
Sale value of each calf	C$ 400

The difference between the sale price and the accountable cost is $170 per calf, but it is not enough to compensate for the total capital and corresponding interest.

Upon reaching 71% birth rate the following results were obtained:

ACCOUNTABLE COST	Cordobas/1 yr old calf
	C$ 133

The difference between the sale price and accountable cost per calf is C$ 267. In the first case the profit on the capital investment was 2.65%. In the second case it increased to 7.5%. These results were reached almost without additional investments, but basically with better management. It is fitting to note that this management has developed with 4 ranches located in the Camoapa zone. Though isolated from each other, they function as one operation sharing the extra cost; and, it is estimated that if the total area (1936 mz.) were in one block the profit would be over 8%.

Terminating this brief presentation, which has reviewed the philosophy and some of the goals obtained through the technical assistance

developed in Nicaragua, I wish to thank the University of Florida for the interest they have shown in developing the Latin America Cattle Industry. We hope that from the exchange of experience new and better practices will be developed which will adequate to be used at our level of productivity.

RECOMMENDATIONS ON ESTABLISHING AND MANAGING IMPROVED PASTURES IN LATIN AMERICA

By

Dr. D. E. McCloud, Chairman
Department of Agronomy
University of Florida
Gainesville, Florida

The humid tropics have great potential for forage and livestock production. In this region around the world there are vast areas which are now virtually undeveloped. Most of these are native rangelands which produce very little livestock feed, and that produced is generally of low quality. Many of these areas, however, can be developed with improved high quality pastures with potential for high levels of livestock production.

The humid tropics is a varied area. The climate ranges from wet to dry with problems of flooding during the wet season to severe drouths during the dry season. The soils vary from highly fertile to very poor. The native plants of tropical savannahs are as a rule poor in quality and low in forage production. The animals usually are not high producing, generally being limited by scarcity of forage and its low quality. The potential of the animals for increased production is most times higher than is realized on native rangelands,

and rapid improvements can be made by improving the pastures.

In developing recommendations for establishing and managing improved pastures it should be recognized that any livestock operation involves a complex group of factors. The climate, soils, plants, animals, and degree of management must all be integrated into a livestock production system. The development of the best system is not easy. It is more difficult than developing a system for crop production -- for growing coffee, corn, or wheat.

Climate is the first basic component to be considered. It is composed of two aspects: temperature and precipitation. Generally in the tropics temperature is not limiting except at the higher latitudes, 30° north and 30° south, and at the higher altitudes, above 1500 meters, in equatorial regions. Here the tropical plants are restricted in production by night temperatures of 10° C. Temperate plants do not suffer from this limitation. Forage plants for tropical and temperate climates fall into two different groups. Pangola, bahia, guinea, and jaragua are tropical grasses, while bromegrass, ryegrass, orchardgrass and timothy are temperate grasses.

The second climatic component is precipitation. In the tropics this factor is highly variable. Three broad precipitation climatic types are found: 1) the humid tropics with high rainfall year around, the natural vegetation in this

type is the tropical rainforest, moisture is never limiting and often is in excess; 2) the semiarid-subhumid region with very pronounced wet and dry seasons, this is the tropical savannah region; 3) the arid climatic region where moisture is always limiting and the vegetation is of the desert type. These three climatic types are easily recognized by their native vegetation. While some overlapping occurs, grasses best suited for the humid tropics include paragrass, carib-grass, napiergrass, those best suited for the tropical savannah include pangola, bermuda, guinea, and jaragua. Grasses for the desert are generally native and vary widely from region to region.

The second basic component is the soil. Soils, while a function of parent material and topography, are markedly influenced by the climate and natural vegetation. In general, the humid tropical soils are heavily leached, low in pH, low in nutrients especially phosphorus and nitrogen and often times potassium, calcium, and magnesium. Also deficiencies of one or more of the microelements, especially iron, copper, manganese, and zinc, often occur. Unlike the climatic factors where, except for irrigation, little can be done to correct deficiencies, fertilizers can be used to correct plant nutrient deficiences. Soil tests should be relied on to determine fertilizer and lime needs. Legumes can also be used in tropical

forage systems to supply nitrogen, however, the management of legume-grass mixtures is more difficult since another component is added to the already complex system. In countries where inexpensive nitrogen fertilizer is available, straight grass pasture systems may be less complicated.

Nitrogen fertilizer on pastures markedly affects product per acre, but has little affect on forage quality. Another aspect of nitrogen fertilization is the carry over of nitrogen in pasture systems. Recent research indicates that little nitrogen is lost and that annual application rates may be lower than previously thought.

The third basic component is the forage plant. These as we have seen are chosen on the basis of climatic and soil adaptation. Pasture plants also can be selected on the basis of forage quality. Contrary to popular belief, forage quality is little affected by nitrogen fertilization. On the other hand, forage yields are markedly affected by nitrogen fertilizer. Forage quality is, however, greatly affected by plant species and by stage of maturity. Rhodesgrass, guineagrass and buffelgrass are examples of grasses of highest quality. Stargrass is on the opposite end of the scale and is of low quality. All forage grasses exhibit a wide range of quality and are highest in young tender growth and lowest in mature fiberous growth stages. Season of the year affects forage

quality. Tropical pasture grasses are higher in quality during the wet season and lower in quality during the dry season.

The animals, while beyond the scope of this discussion, must also be considered. Particular attention must be given to the level of animal performance desired, for example, maintenance, milk production, growth or fattening. Thus, the development of a pasture-livestock operation involves very complex interaction of many factors. The systems approach must be used, and it is not easy to put together all of the factors at their optima. There is no substitute for careful planning and step by step development of the system to be followed. Usually considerable trial and error is involve before the best system evolves. The system must be designed to fit your particular climate, soils, plants, animals, and the level of management you wish to apply.

The Development and Management of Replacement Heifers in the Latin American Tropics

John C. Glenn
Animal Science Department
University of Florida
Gainesville, Florida

The raising of replacement females has but one goal which is the development of heifers in an economical way which will permit them to conceive at the earliest age possible with enough size to calve with minimum difficulty and without interfering with their annual calving throughout the productive life.

The technical information for achieving such development and having the production of her first calf at approximately two years of age is already available. The failure to put this information to use is related primarily to economics and secondarily to the problem of having the female to produce her second calf at three years of age. Regular annual calving after the third year is not too difficult to achieve.

I would like to be very clear in stating that I am not recommending as a general practice that you, as ranchers from Latin America, should be having a part of your cows to calve as two year olds under present conditions. Some of you have the management, nutrition and type of animals to achieve this immediately but we lack information on the economics of such a practice.

It is difficult to describe an average ranch situation in Latin America due to variations which exist in all of the factors of production such as altitude, rainfall, soil quality, pastures, management and type of cattle. However, I will try to fabricate such an average ranch quickly, describing the present female replacement management.

The animals available are Criollo or grade Zebu which are raised

at or near sea level on relatively poor soils. The cattle are managed extensively and except during the first months after calving are seen very infrequently. Many of the cows are milked once a day with calf at side and those which are not milked have a rather low production of milk. Pasture conditions are such that good grass is available in the early part of the rainy season but because of improper grazing management becomes less nutritional as the rainy season progresses. At the beginning of the dry season the pastures are either burned to obtain some regrowth of young plants in which case quantity is limited or the dry overmature pasture is left standing in which case quality is low.

The majority of calves are born in the months just preceding the beginning of the rains which means that the calves are weaned near the beginning of the dry season. The heifer calves especially are thus required to accept the shock of losing their primary source of food at a time when pastures are of very poor quality and the limited capacity and ability for digestion of these small animals dictates a loss of a portion of the small amount of weight which they have. During the second rainy season, when the heifers are approximately 14-15 months old the ones which have survived grow well and probably achieve a weight of about 200 kilos. During the second dry season they are more capable of utilizing the forage available but still lose weight.

As the third rainy season begins the heifers grow rapidly and toward the middle to end of this period have achieved adequate physiological development for coming into heat and conceiving. At this time they weigh about 250-300 kilos and are 27-30 months of age and are thus at least three years old at first calving. Those same factors which delay age

at first calving also reduce the possibility of annual calving and the total productive years of the cow so that at ten years of age the female has finished her productive life and has only produced 3-4 calves.

With this description of average present management let us now look at an optimum management from a technical although not necessarily an economic standpoint. The heifer calves at weaning would be supplemented during the first dry season at a rate which would allow .5 kilo per day of gain. At 15 months they should weigh about 215 kilos or slightly more than non-supplemented heifers at 21 months. Although these animals will gain less per day in the second rainy season than non-supplemented they should achieve adequate development to come into heat and conceive toward the end of the rainy season or at 18-21 months of age with calving at 27-30 months, or about nine months earlier than at present.

The rate of gain during the dry season can be altered considerably by the level of supplementation but to achieve the level described here something similar to the following supplement should be used. First of all a source of medium quality roughage must be available, this may be in the form of dry pasture reserved from the rainy season, of hay or silage or some form of by-product feed such as cottonseed hulls containing some whole cottonseed, rice straw with a high percentage of leaves, coffee pulp etc. They must also have a source of energy and protein which can be provided by 2-3 kilos per day of molasses with 4% urea or 1% of body weight per day of sorghum, wheat bran or rice bran mixed in a 1:1 ratio with cottonseed meal, coconut cake or a similar protein supplement. There is a good possibility that yucca roots and leaves can also be used but there is not yet adequate data to suggest levels

or form of feeding.

During the second rainy season these heifers should have access to good quality pastures to continue their increase in size and weight and in the dry season after breeding low levels of supplementation should again be provided. As I have stated, we do not yet have sufficient data on the economics of this practice and perhaps some of you will be able to give some of your personal experiences during the discussion which follows.

We are, however, certain that such a practice will lower age at first calving, produce heavier, healthier calves and increase the possibility of frequent and regular calving of the mature cow.

As an example management of heifers, let me tell you about the system used at the Beef Research Unit here at the University. First of all the heifer calves at seven months have an average weight of approximately 190 kilos due to good milking ability of their dams on good pasture. After weaning the heifers are on dry pasture supplemented with a concentrate supplement plus corn silage (5# per day concentrate + 9# silage) for 5 months. At the beginning of the grass season supplementation is stopped and heifers are placed in breeding herds (approximately 15 months of age) and an average of 40% of these heifers have calved as 2 year olds. Practically all of the heifers not calving at two years calve at three.

I am almost positive that at this moment it is not practical for you to think of calving heifers at two years of age but that it is possible and practical to decrease the average age at first calving by at least six months.

While nutrition is a key factor in the development of replacement heifers there are also other conditions which must be recognized. First of all a crossbred female will normally out perform a straightbred when the breeds used for crossing are adapted to the environment. All heifers should be vaccinated against Brucellosis in infected areas along with vaccination for other important local diseases. In areas of high infestation of internal and/or external parasites the animals should be drenched and sprayed to reduce the stress of these parasites on the heifers. Mineral supplementation should be provided at all times.

Replacement heifers should be carefully selected according to their growth rate to weaning, to conception and to first calving. Consideration should also be given to the production of the dam in selecting heifers.

In summary, the advantages of placing more attention on the selection and care of replacement heifers will result in; earlier calving, larger and more regular lifetime production, heavier calves due to proper gestation, nutrition and increased milk production. The economics of supplementation should always be considered but you should not assume that the lowest possible cost of raising replacement heifers is the most economical since in Florida a low investment in the production of heifers has resulted in very high returns. As more data is available the same is sure to be true in Latin America but we must learn what the most economically productive level of investment is under various environmental conditions.

How To Decrease From A Year-Around Breeding Season To A 90-120 Day Breeding Season And The Problems Involved

A. C. Warnick, Physiologist
Department of Animal Science
University of Florida
Gainesville, Florida

First some of the principal advantages to a controlled length and time of the breeding season should be given and discussed. These follow:

(1) There is a time of maximum forage quality and quantity at certain seasons of the year and the breeding season should occur during this period. Usually this period lasts only 3 to 4 months depending on rainfall and other climatic conditions. With the maximum forage production the cow will be in a gaining condition and be more likely to come into estrus to obtain a high calving percentage. In an experiment in Australia the conception rate during the lush grass production was 48% compared to only 23% for those mated during the season of poor grass production. Also, by the calves being born ahead of the lush forage production the calf will be able to utilize the increased milk production which occurs when the lactating cow goes on good pasture.

(2) There is a great advantage in having calves of a uniform age in doing the best job in marketing at weaning time or whenever the cattle are sold. This uniformity simplifies marketing so it is done at one time rather than 2 or 3 times when calves are born throughout the year.

(3) The problems of cattle management are simplified so the routine operations of marking, branding, castration and vaccinations can be done

at one time. Also, when cattle are moved it is much easier to move cows with calves of similar ages.

(4) Unfavorable seasons when calves are born can be avoided by a controlled breeding season. In some areas there is a high calf mortality when calves are born during times of flooding or when the screw worm fly is active.

(5) The management of bulls is simplified since they are only with the cows a part of the year. Supplemental feeding of bulls can be done ahead of the regular breeding season so bulls are in better physical condition to insure maximum fertility. Also, if supplemental feeding of the cow herd is necessary it can be done to all cows at the same time for the maximum good of the cow.

(6) A more accurate evaluation of the productive ability of the cow is obtained since the environment in which calves are born and grown would be the same for all calves.

In most herds with a year-around breeding season the majority of the calves are born during a period of 4 to 5 months which is naturally the most favorable time. Thus, this time can be selected for the controlled breeding season.

After selecting the desired months for the breeding season, then one must decide how he is going to carry out this program. Obviously, there are multiple possibilities: (1) making the change in one year and (2) changing over a period of years by cutting off one or two months per year. This latter system requires too many years to obtain the advantages of the controlled breeding season.

One workable plan could be done over a two year period. These

months are given as examples but will need to be modified depending on local conditions. It is assumed that the desired months for the breeding season are March, April, May and June. The first year the bulls would be removed during the four months of September, October, November and December leaving two months ahead and two months at the end of the selected 120 day period. The second year the bulls would be removed during January and February; put out with the herd during March, April, May and June and then removed to eliminate the months of July and August. If a 3 month breeding season was desired then one month could be eliminated during the third year.

The main problem in reducing the length of the breeding season is that some cows calving out-of-season will not have an opportunity to get pregnant that particular year. Thus, you will need to carry these cows until the next year's breeding season before culling. This procedure will need to be repeated the second year before culling cows for reproduction failure.

There has been little experimental work done on a direct comparison of seasonal and year-around breeding. However, in some preliminary work in Australia the pregnancy rate was about 12% higher on a year-around breeding vs. breeding for only 2 months. It is quite possible the difference would have been small if the seasonal breeding could have been continued for 4 months. In a study with Brahman and Santa Gertrudis herds in Florida a comparison was made between a 3 month breeding season and year-around breeding. Those on the year-around program had 13% more calves born but the problems of management added many complications to the year-around breeding program.

All calves can be weaned at one time with seasonal breeding and culling of cows can be done more effectively. At weaning time the cows should be checked for pregnancy and the nonpregnant heifers and nonpregnant fat cows should be culled. Also, all cows weaning light weight calves should be culled.

In one commercial beef cattle operation in Bolivia the weaning percentage was 77% when operating with a 4 month breeding season on the native range. This operator was formerly on a year-around breeding program and his calf mortality was large. His reproduction rate has increased since going to a 4 month breeding season and putting on additional selection pressure for reproduction rate and calf weaning weight.

The advantages of a controlled breeding season lasting 4 months during the time of optimum forage production should simplify management and result in greater net returns to the ranch operation.

RECOMMENDATIONS ON THE VALUE AND USE OF MINERALS IN LATIN AMERICA

by

Tony J. Cunha, Chairman
Department of Animal Science
University of Florida

It is very important that beef cattle be supplied with the proper level of minerals which they need. A lack of minerals will cause cattle to perform poorly during growth, reproduction and lactation. Death will occur if the deficiency is severe enough. The money spent for needed minerals will be returned manyfold in increased returns to the producer. It is recommended that those wanting more details on minerals for beef cattle read University of Florida Bulletin 683 entitled "Minerals for Beef Cattle in Florida".

Interrelationships affect requirements

It will be difficult to determine mineral needs on a very exact basis until the many mineral interrelationships are understood. The requirement for one mineral element, for example, will, in many cases, be dependent on the level of other mineral elements in the diet. However, if one follows closely the level of minerals recommended in the United States, these should do a good job in Latin America. Later on, these levels can be changed if research studies in Latin America show slightly different levels are better. Where mineral requirements have been established in various countries there is very little difference in mineral requirements for livestock between various areas of the World. Therefore, mineral requirements for beef cattle in Latin America should be similar to the requirements in the United States.

Calcium and phosphorus

Calcium and phosphorus play a vital role in almost all tissues of the body. They are also needed for proper teeth and bone formation. The calcium and phosphorus level of forages will vary with soil fertility, level of fertilization, the kind of forage, moisture level, season of the year and other factors. Therefore, the need for calcium and phosphorus supplementation will vary considerably. The calcium to phosphorus ratio should be somewhere between 1.0 and 1.5 parts of calcium to 1 part of phosphorus. Vitamin D helps in the absorption and utilization of calcium and phosphorus in the animal. Vitamin D is of more help as the ratio of calcium and phosphorus gets more out of line. However, if the calcium to phosphorus ratio becomes too abnormal, then vitamin D alone will not be of much help in correcting the situation.

Table 1 gives the recommended levels of calcium and phosphorus to use in the total ration of beef cattle.

Table 1. Recommended calcium and phosphorus levels

Stage of life cycle	Calcium Percent in ration	Phosphorus Percent in ration
Growth	0.35	0.30
Fattening	0.30	0.25
Gestation	0.30	0.20
Lactation	0.30	0.25

The calcium and phosphorus can be supplied through bone meal, defluorinated phosphate, dicalcium phosphate and other sources.

Salt

Sodium and chlorine are supplied through salt. A lack of salt causes a loss of appetite, decreased growth rate, an unthrifty

appearance and decreased milk production. The salt requirement of cattle is usually met by using 0.5 per cent salt in the ration. Moreover, salt should also be self-fed in a mineral box. This allows the animals to consume additional salt, if they need it, from the mineral box. Salt acts not only as an essential nutrient but also as a preservative and as a condiment in the mineral mixture. For example, salt helps prevent mold growth when mixed with bone meal and also makes it more palatable.

Trace minerals

The use of trace mineralized salt is recommended for cattle in Latin America. Since all cattle consistently need salt, it serves as a dependable and safe carrier of the trace minerals. The following trace minerals should be added to the salt: iodine, iron, copper, cobalt, manganese and zinc.

The reason for recommending trace minerals in Latin America is to make sure cattle do not suffer from a lack of these mineral elements. Trace mineral deficiencies have been shown to exist in some parts of all the major livestock areas of the world. They also exist in many other areas even though research information is not available to substantiate their need. As a means of illustrating the decision on whether or not to use trace minerals, let us assume that an Experiment Station in one state or province of a country runs a trial to determine if trace minerals benefit cattle. If their results show no help from the trace minerals, it still does not mean that trace minerals are adequate in the other areas of the state or province or in the whole country. They have not tried trace mineral supplementation in all the areas nor with all the feeds produced and under different conditions.

To obtain all this information might take 10 to 25 years. In the meantime, why let the animals suffer from trace mineral deficiencies? The problem can be taken care of by feeding trace mineralized salt even though the experimental data are not available to indicate a definite need. The cost of adding the trace minerals is very small and so it is low cost insurance against a possible need. There is no danger or harmful effect in using trace minerals even though they may not be needed. Trace minerals need to be fed at least 30 to 40 times the required level before any toxic symptoms may occur. Therefore, there is no danger in using trace minerals at a few times their required level.

Table 2 shows the level of trace minerals recommended in the total ration of beef cattle.

Table 2. Suggested trace mineral levels in the total ration for beef cattle

Trace mineral element	Level in the total ration Milligrams per kilogram of feed*
Cobalt	0.1
Iodine	0.2
Copper	10.0
Manganese	10.0
Iron	40.0
Zinc	50.0

*This is the same as parts per million (ppm).

Supplying minerals to cattle

It is suggested that minerals be self-fed to cattle in mineral boxes. Mineral boxes which keep out the rain will help increase mineral consumption. The mineral boxes should be constructed so that the

calves can also consume mineral from them. The mineral boxes should be located near the water supply or where the cattle rest so that animals will not have to travel very long distances to get mineral. They should also be located where it will be relatively easy to refill the boxes frequently and before they get empty. It is very important to make sure the boxes contain minerals all the time. Cattle need minerals every day and many deficiencies occur because the mineral boxes are kept empty for long periods of time. Empty mineral boxes are still a big problem on many cattle ranches.

Accustom cattle to minerals gradually

If cattle have not had minerals for a long period of time it is recommended that the amount of a complete mineral mixture fed be restricted to about 1/3 of a pound per head per day. When the cattle start leaving some mineral behind and thus have satisfied their craving for minerals, then it will be okay to fill the mineral boxes and allow them to consume all they want. It is not a good idea to allow cattle which are starved for minerals to have free access to all the minerals they want right away. This can cause harmful effects.

Kinds of mineral mixtures

Various kinds of mineral mixtures can be used. Some prefer to feed a complete mixture with calcium and phosphorus plus salt and the trace minerals. These mineral mixtures should contain a minimum of 7 to 8 per cent phosphorus and 20 to 30% salt. They are self-fed in a ground form in a mineral box. Some prefer to use a two-compartment mineral box with trace mineralized salt in one compartment and the complete mineral mixture in the other. The advantage to this method is that the cattle can eat salt alone without having to consume the complete

mineral mixture. There are periods of the year on well fertilized pastures where the cattle will consume considerably more salt than a complete mineral mixture. Either method of feeding minerals is satisfactory, however.

On ranches where it is difficult to have mineral boxes and to refill them frequently, cattlemen will use mineral blocks. In some cases these are dropped on pastures, which are difficult to get to, from low flying planes. One problem with blocks is their hardness. If they are too hard, the cattle have to lick them too much and it can make their tongues sore. If the block is too soft, the rain will wash out much of the mineral. Therefore, the kind of mineral block to use will depend on the area, how much rainfall it has and how much mineral the cattle need to consume daily. Once cattle get used to mineral blocks one can help guide where they will graze by placing the blocks in those areas.

The writer prefers the use of ground minerals in mineral boxes except in areas where it is difficult to put in mineral boxes and to keep them filled with minerals.

Mineral consumption

The level of minerals consumed by cattle will vary considerably. With well fertilized pastures it might be as low as 10 to 20 pounds of a complete mineral mixture per cow per year. With native range, and with little or no fertilization, it could be 80 to 100 pounds per cow yearly. Therefore, there is no definite level of minerals which one can state cattle will consume. It depends on the conditions encountered on the individual ranch such as its soil fertility, forages used, level of fertilization and supplemental feeding, season of the year,

level of rainfall, the kind and productivity of the cattle and other factors. In Florida, it is estimated that the average mineral consumption in the state is 35 to 40 pounds per cow per year. In Latin America, where little fertilization and supplementation is practiced, the mineral consumption should be considerably greater. The final criterion on mineral adequacy is how well the animals perform. Rapid growth rate, high calf crop percentage and heavy weaning weights are a good indication that the mineral supplementation program is adequate. A high rate of production cannot be obtained unless a proper mineral feeding program is followed.

Other minerals

Other minerals may be needed under certain situations. These minerals will be discussed briefly.

Selenium

There is increasing evidence that selenium deficiencies are occurring with cattle in the United States and other areas of the world. Selenium has occasionally helped gain and feed efficiency with fattening cattle in the feedlot. It has also prevented white muscle disease with calves. The U.S. Food and Drug Administration is now considering whether it should approve the addition of selenium to cattle and other livestock rations. Preliminary indications are that a level of 0.1 ppm of selenium in beef cattle rations is about the requirement.

Magnesium

Grass tetany has become a problem in certain areas of the U.S. in the past few years. It has occurred with oats, rye and wheat pastures during the winter and spring. A few cases have occurred with millet and other temporary grazing crops during the summer and early fall.

These cattle show very low blood serum magnesium levels. A complete mineral mixture containing 14 per cent magnesium has been effective in preventing the condition. The cattle need to get about 15 grams of magnesium daily. Grass tetany may be more complicated than a simple magnesium deficiency and more needs to be learned about the problem.

Sulfur

Sulfur might help cattle rations when high levels of urea are fed. For example, the Iowa Station showed that adding sulfur (14 grams of sulfur per day as sodium sulfate) increased gains and feed efficiency with a steer fattening ration containing a high level of urea. The sulfur is needed for the rumen microorganisms to synthesize the sulfur containing amino acids methionine and cystine. A complete beef cattle ration should contain a ratio of 1 part sulfur to somewhere between 10 to 15 parts of nitrogen.

Potassium

As high concentrate and low roughage rations increase in use for fattening cattle, the need for potassium supplementation with certain rations will need re-evaluation. The grains are lower in potassium than roughages and a deficiency can thus occur. Some cattle feeders are already adding potassium to high concentrate rations. The level of potassium needed in the total ration for fattening steers is not definitely known but a figure of 0.7 per cent potassium has been suggested. The form in which the potassium is supplied, however, will need to be considered since it will influence the response obtained and the level required.

Molybdenum

Areas with excess molybdenum have been shown to occur in the U.S. and other countries. Excess molybdenum increases the need for copper.

Supplementation with copper will counteract excess molybdenum. With good fertilization practices the copper content of forages seldom exceeds 9 to 12 ppm. This level of copper will not prevent molybdenum toxicity when the forage contains above 4 to 6 ppm of molybdenum. It is recommended that 5 times as much copper be used in excess molybdenum areas. This means the total ration would contain 50 ppm of copper in an excess molybdenum area.

Blood and liver values

For those who are interested, table 3 presents blood and liver values for cattle. Three levels are given. The first column shows normal levels, the second the approximate level at which a deficiency begins and the third column has the level at which an extreme mineral deficiency occurs. These levels can be used as a guide. They might vary somewhat under various conditions in Latin America.

Table 3. Blood* and liver** values of minerals in cattle to use as a guide

Mineral Element	Approximate normal level	Approximate level below which a deficiency begins	Approximate level at which an extreme deficiency exists
Calcium			
Blood plasma	10-12 mg.	8 mg.	6 mg.
Phosphorus			
Blood plasma	5-8 mg.	5 mg.	2-3 mg.
Copper			
Blood, whole	0.75-1.00 ppm	--	0.25 ppm.
Liver	100-300	75	25
Cobalt			
Blood, whole	0.0004 ppm.	--	--
Liver	0.2	0.07	0.04
Iron			
Blood hemoglobi	10-13 gm.	10	6-8
Liver	200-300	--	--
Potassium			
Blood, whole	66 mg.	52	--
Sodium			
Blood, whole	256 mg.	244	--
Magnesium			
Blood, whole	2.04 mg.	0.1-0.4	0.1
Manganese			
Blood, whole	0.002 mg.	--	--
Zinc			
Blood, whole	0.88 mg.	--	--

*All blood values are per 100 ml. of blood.
**All liver values are in ppm on a dry matter basis.

ARTIFICIAL INSEMINATION IN SWINE

Fuller W. Bazer, Assistant Animal Physiologist
Department of Animal Science
University of Florida
Gainesville, Florida

1. Introduction

The use of artificial insemination (A.I.) in dairy cattle has greatly enhanced the development of that industry in the United States, in general, and in Florida. From a modest beginning to widespread use of A.I. in Florida, the percent of dairy cows bred by A.I. has increased from 5.2 percent in 1949 to over 80 percent in 1968. During that same period, average milk production per cow has increased from 4300 pounds to 8,600 pounds. The economic advantages of using outstanding sires is obvious; however, the advantages gained in improved herd health is also important.

Widespread use of A.I. for swine has not been achieved at present since techniques used for dairy and beef cattle are not directly applicable to swine. Swine producers have remained interested in A.I., however, since it offers distinct advantages to present management practices. For example, A.I. is suited to programs for producing specific pathogen free-pigs, increasing the influence of outstanding sires in carcass improvement programs and increasing efficiency in herd management.

2. Semen Characteristics

a. Volume and Sperm Concentration: The boar ejaculate is characterized by a large volume (approximately 250 cc) consisting of four fractions: presperm, sperm rich, post-sperm and plug. For A.I. the plug is strained out and about 160 cc of semen remains

which contains about 32 billion sperm. Each gilt or sow should be inseminated with 4 to 5 billion sperm; therefore, about eight sows can be inseminated from each ejaculate.

b. Frequency of Collection: Ideally, a boar should be used only three times per week; however, daily semen collections can be made for short periods of time when necessary. Excessive use of boars will result in their refusal to produce an ejaculate.

c. Age of the boar: The frequency of collection, semen volume, sperm concentration and semen quality all increase as the boar matures. Therefore, one must plan on using young boars less frequently and expect to inseminate fewer females per ejaculate.

3. Collection and Storage of Boar Semen

a. Training the boar: The boars must either be trained to mount a "dummy" sow or a sow in heat can be used. Depending on having a sow in heat results in an uncertain situation; therefore, a "dummy" sow is preferable. The "dummy" sow usually consists of a rack which can be easily mounted by the boar and should be positioned so that the boar has good footing. The rack should be covered with canvas or burlap bags for comfort to the boar. Also, the canvas or burlap can be soaked with urine from the females in heat or boar urine. This makes the "dummy" more interesting to the boar and stimulates sexual activity. In general, the "dummy" should smell like a pig.

The training of the boar is made easier if the boar is allowed to mate naturally, a few times, in the same area that the "dummy" sow will be placed. This allows the boar to associate a

place with sexual activity. Therefore, the boar will not be as hesitant about mounting the "dummy".

b. Collection of semen: Most workers use either the artificial vagina or the gloved hand technique for collecting semen. The latter method is more practical since one only needs a rubber glove, with a lubricant, and a receptacle in which to collect the semen. In this procedure, the spiral portion of the penis is grasped so that firm pressure can be applied with the little finger to the end of the penis. In this manner one tries to duplicate the pressure on the penis exerted by the cervix during natural mating.

c. Handling the semen: The semen should be collected in a clean receptacle which has been warmed to body temperature, by using warm water or heat from the hands. After collection the following steps should be taken:

1. Strain the semen through cheesecloth to remove the gelatinous portion of the semen.
2. Determine the number of sperm cells per cc if the maximum number of services is desired. This may not be practical on the farm, so if a boar of known fertility is being used, one may dilute the semen with an appropriate semen extender to increase the total volume of semen up to five times that collected. That is, up to one part of semen to four parts of semen extender.
3. The boar semen extenders which have given good results are as follows:

a. Purdue Boar Semen Extender
12 grams glucose
14 grams sodium citrate
0.29 gram potassium chloride
1.5 gram sodium bicarbonate
3 gram streptomycin
3 gram penicillin

Note: If a penicillin-streptomycin combiotic is on hand which contains 200,000 units penicillin and 250 mg streptomycin per cc, mix one cc combiotic with one cc of water and then add 0.5 cc to the other ingredients.

Add distilled water to bring the total volume to 1000 cc. Keep unused portions frozen, but discard after 4 to 6 weeks.

b. Whole Milk Boar Semen Extender
Some research workers have found pasteurized whole cows milk to be a satisfactory semen extender. Antibiotics, as described for the Purdue Semen Extender should be added to each 1000 cc of milk to prevent bacterial growth. This extender should not be stored since bacteria grow quite readily in the milk.

4. The extended boar semen may either be used immediately or stored for up to 48 hours. For storage, submerge the semen container in another container with water and store at 55-60° F. The outside water jacket prevents the semen from cooling too quickly.

d. Insemination of the gilt or sow: The females should be inseminated with 50 to 100 cc of the diluted semen containing 4-5 billion motile sperm. Stored semen must be warmed to body temperature prior to insemination. Regular cow insemination rods may be modified by slowly heating the rod with a match and bending the end 25 to 30 degrees upward about 3/4 inch from the tip. This tip will aid in penetrating the cervix. A 50 cc syringe is also needed. Then the following steps may be followed:

1. Draw about 50 cc extended semen into the syringe.
2. Place the tip of the inseminating rod (separated from the syringe) into the vagina with the tip up and move it slowly forward. Do not force it. After 6-8 inches it should stop. Turn it gently and with a forward motion. It should then move another 6-8 inches. Attach the syringe with semen and inject the semen slowly. The semen should flow freely, so if there is resistance move the inseminating

rod backwards for a short distance or until there is no resistance to semen flow.

e. Heat detection: The ability of the producer to accurately determine the time of onset of estrus is of utmost importance in swine A.I. Conception rates have been improved 35 percent by careful heat detection. Research data indicate that females should be bred at 12 and at 24 hours after they exhibit standing heat. Heat detection is most accurate when a male is in the presence of the females. One may turn the male in with the females and then cut out those sows which stand for the boar to mount or when pressure is applied to the back. It is necessary, of course, to prevent the boar from mating by making him dismount. This procedure has two main advantages: (1) a boar (the best heat detector) is used to find the sows in heat and (2) the sows can be penned until mated which makes A.I. easier. The presence of a boar outside a pen of sows during A.I. is also beneficial since the sows stand more readily and are somewhat quieter during the A.I. procedure.

4. Summary

Experimental work is adequate to indicate that A.I. in swine is practical and that satisfactory results are attainable. Of approximately 10,000 sows and gilts bred by A.I. in 1966, approximately 70 percent farrowed to the first service. The collection and processing of semen and insemination of the sow are simple techniques which can be accomplished by any producer who wants to make the system work. The rewards of A.I. will be realized

economically in greater genetic worth of the herd and improved herd health.

If we become so biased by conventional production practices that we believe that new techniques will not work, then those people who don't know that new practices won't work will take over the swine industry while demonstrating that they will work.

Comparison of Swine Carcass Values

R. L. Reddish*
Animal Science Department
University of Florida
Gainesville, Florida

I. Measuring and Comparing Hog Carcasses

A. Carcass Differences

1. Length

2. Average backfat thickness

3. Loin eye area

4. Quality, firmness, marbling, color of lean

5. Other

B. Differences in Lean Cuts

1. Fat and lean - amount and distribution

2. Marbling

3. Firmness of lean and fat

4. Color of lean

5. Presence and thickness of fat layers and pockets

II. The Tale of Two Carcasses

A. Differences in - See Chart

1. Length

2. Average backfat thickness

3. Loin eye area

4. Cut-out percentages - Four lean cuts

(a) Sum of weights - Boston butts, picnics, loins, and hams.

(b) Sum of lean cut weights divided by chilled carcass weight.

Lbs. chilled carcass $\frac{\text{\% - lean cuts}}{\text{Total wt. 4 lean cuts}}$

B. The most economical and desirable.

III. Dollars and Cents Value in Carcasses and Cuts. See Chart.

IV. Use of the Swine Testing Stations and Other Information Available.

A. Florida & other states - see Swine Evaluation Center report.

B. Information from packing plants - cutting tests.

C. Comparison of herds tested and those on the farm - from the same owner.

D. Observe and study changes made by various herds tested - how recent was carcass information.

V. Tests Tell the Tale - Favorable and Unfavorable.

A. Swine Evaluation Center or similar testing organizations.

B. Meat Packing Plants.

C. Comparison of records from testing centers and meat packing plants.

VI. Two Examples of Hogs Tested.

Average Backfat Thickness		Loin eye area (sq. ins.)		Carcass Length (ins.)		% lean cuts of chilled carcass wt.		Ham Loin %	
1.53	1.27	4.00	4.15	28.75	32.00	53.51	55.27	37.50	38.84
1.37	1.43	4.24	4.72	29.25	30.75	53.50	55.88	37.80	39.82
1.63	1.53	2.84	3.34	28.00	30.00	48.69	50.21	33.37	34.79
1.47	1.33	3.16	5.18	28.50	30.25	51.76	56.09	37.08	39.39
Averages									
1.50	1.39	3.56	4.34	28.62	30.75	51.86	54.36	36.43	38.21

VII. The Dual Role of The Swine Evaluation Center

A. Selects out and shows outstanding sires

1. Production characteristics

2. Carcass characteristics

B. Provides easy, accurate and efficient method for locating nearest local examples of outstanding:

1. Sires

2. Herds

3. Potential source of seed stock

C. Makes it possible for local producers to prove sires first and results should indicate -

1. Adequate or better sires for seed stock production

2. Need for an extent of culling inferior sires

SUWANNEE COUNTY SWINE IMPROVEMENT PROGRAM

Robert N. Whitty
Extension Agent - 4-H & Agriculture
University of Florida

To fully understand the Suwannee County Livestock Improvement Association and the objectives of the program, you must understand a little of the background of the program. For many years, Suwannee County was one of the major tobacco producing counties in this county. I might add, that Suwannee County is still the leading tobacco producing county in the state of Florida.

Let us look briefly at what has happened to tobacco in the United States in the past few years. In the 1930's and the 1940's tobacco was grown on small farms across the South with the farmer and his family doing almost all of the labor. Yields during this period were very small compared to today. In the 1930's, tobacco was one of the crops that the federal government placed under acreage allotments in order to control production and price.

After World War II, the price of tobacco increased, fertilizer became more available, and farmers took advantage of increased technology such as irrigation. This all led to such an increase in production in the 1950's, that the government was forced to institute one acreage cut after another, in order to hold the price and not glut the market.

However, the farmer's costs had increased and he found it very difficult to live on his reduced acreage of tobacco. The smaller farmers began moving to the larger towns in order to find jobs to support their families. Suwannee County was losing population steadily throughout this period.

The businessmen of Suwannee County, The Suwannee County Chamber of Commerce and The Agricultural Extension Service met to discuss the problem to decide what should be done to avoid the county from becoming an economic deprived area. This group felt that livestock would be the best replacement for the decreased tobacco. It was decided that a five year program would be developed to promote the increase in livestock production. Through the Suwannee County Chamber of Commerce, individual merchants pledged money to buy improved breeding stock to be awarded to farmers in order to upgrade the livestock herds of the county.

The livestock was purchased and in 1963, the first of five Suwannee County Livestock Promotion Banquets was held in The Suwannee County Agricultural Coliseum. These banquets became famous throughout the area because of the unique idea of merchants and farmers working together to build up the local economy without government assistance, and the fact that the animals were paraded in the banquet hall for the presentation. The program received national publicity in 1968 when CBS covered the banquet as a feature of its nightly news program. At the end of this program, $29,250 had been spent on cattle and swine.

After the success of the Suwannee County Livestock Promotion Project, the merchants, the Suwannee County Chamber of Commerce, and the Agricultural Extension Service and farmers agreed that there was a need for a continued and improved program. It was felt that on the small farms that exist in Suwannee County, that swine with their rapid reproduction, and ability to grow in a small area, would make the most progress. The swine used in the first program were bought from local breeders. Mr. Ken Durrance, Extension Swine Specialist, suggested that the new association consider buying the breeding swine from the very top breeders of the United States and that they try to get one of the top breeders of the country, Roy Keppy of Davenport, Iowa to select the animals for the project.

In the summer of 1968, Mr. Durrance, Dr. Gilbert Hollis of the Suwannee Valley Experiment Station, and Mr. Paul Crews, County Agent of Suwannee County paid a visit to Mr. Keppy at his home in Iowa. Mr. Keppy agreed to cooperate and was hired to select all animals to be awarded in the program. The final details of the program were worked out later in the fall. The first year of the program, there would be five groups of five bred crossbred gilts and one purebred boar would be awarded to the top five farmers. There would be 20 other purebred boars awarded to other farmers. This was later reduced to 16 boars and two boars were held by the association for artificial insemination. Each farmer receiving a boar would be required to return to the association three market hogs within the following year. Those receiving gilts were required to give the association the top two picks of the first litter and breed them to the boar they had received and return them to the association the following year in time to be awarded at the next banquet.

Who was going to receive the first awarded pigs, then became the big question. This was settled practically the same way that it had been settled in the first program. The members would submit completed questionnaires to the County Agent's office. About 30 of these were selected for personal visits by a judging team. The team was composed of out-of-county individuals, who were considered agricultural experts. They were such people as, Mr. Don Adams, who is the Agricultural representative for Florida Power and Light Co. and who was a former county agent. Another was Mr. S. L. Brothers, who is a retired extension specialist and former county agent. Mr. Ernie Lucas, a graduate student in animal science at the University of Florida was another. So was

Mr. John Folks who is the agricultural representative for Florida Power Corp. and a former professor of animal science at the University of Florida. Mr. Gifford Rhodes rounds out the individuals that have been used. Mr. Rhodes is a livestock marketing specialist for the Florida Dept. of Agriculture.

The judging team was composed of three of these individuals who rode to the farms in a group with the assistant county agent. They would observe the farmer's swine, his facilities, and question him to determine his desire and ability to raise swine. They would spend about thirty minutes with each farmer. Afterwards, each would make an independent evaluation of each visit. When all farms had been visited, the judges would get together and rank them in order. The swine would then be awarded in this order, the top five receive five bred gilts and what we considered the top five boars, the next 18 received a boar.

At the awards banquet, there was a good bar-b-que dinner, a stirring speech, and then the swine were awarded. boars first and then the groups of gilts and boars. As the names were read out, the farmer would pose for pictures with his new hogs and then go by a table set up for the Association's lawyer and sign a contract that he would return to the Association the two bred gilts, for each gilt received, and three market barrows for each boar he was receiving.

The first gilts began farrowing about a month after the banquet. It became necessary that the farmer begin making arrangements for this almost immediately. One had a farrowing house under construction at the time of the banquet. Others soon had, or built some pens under existing shelters or buildings. All soon appreciated the fact that more pigs could be saved with less labor and stress on the farmer.

After the banquet, a weekly series of informative meetings were held to teach all farmers new skills in the management of swine. These

were taught by research and extension workers from the University of Florida. The subjects ranged from feeding and breeding to disease and management. They lasted about six weeks and were considered by all concerned to be successful.

Another service offered the farmers, whether they were members or not, was the artificial insemination service. A Yorkshire and Hampshire boar were retained by the Association for A I service. Unfortunately, the Hampshire died of pneumonia before he was ever used for A I. The Yorkshire was used rather extensively, both in Suwannee County and in surrounding counties. The boar was kept at the Florida Swine Evaluation Center here in Live Oak. A farmer desiring to use the boar would call either Mr. Bob Dunn, who is Superintendent of the Florida Evaluation Center of Mr. Jerry Scarborough, who is an assistant county agent here in Suwannee County or Mr. Paul Crews, County Agent for Suwannee county or me. Mr. Dunn and Mr. Scarborough, so far, have collected all the semen. The semen was extended with a formula developed at Purdue University and checked with a microscope for sperm motility. Two 50 cc bottles were filled for each sow in heat. One of the Extension Agents or Mr. Dunn would then go to the farmer's farm and breed the farmer's sows. He would leave one of the 50 cc bottles of semen and an inseminating rod with the farmer. We believe that the farmer would be able to breed his own sows the second time after we demonstrated the first time for him. We recommend that a sow be bred ½ day after she is first noticed in heat, and again one full day after she is first noticed. In other words, if a sow comes in heat this afternoon, she should be bred in the morning and again tomorrow afternoon. This has given the best conception and the best litters. We have found that time of insem-

ination is very important.

Mr. Jerry Scarborough and I worked very closely with the winners, especially the five who won the gilts. We encouraged the construction of farrowing houses and other equipment. We suggested feeding and breeding and management changes to improve the farmer's operation. We worked closely with the farmer on disease and parasite problems. We encouraged each of them to take advantage of the Florida Swine Evaluation Center here in Live Oak. All of the winners of gilts so far have entered test pens. We feel that this is very helpful in a breeding program. I would like to point out that one of the farmer's pens was the second highest indexing pens ever recorded here. We feel that this shows that we are getting a high quality animal in the program.

We visited the farms in the fall and selected the gilts to come back into the program this year. They were bred with the boar that the farmer had won starting on November 15. The boars stayed with the gilts until December 15 when they were brought to what we call the Suwannee County Livestock Improvement Association Stud Farm here in Live Oak, out close to the Florida Swine Evaluation Center. We made arrangements with one of the farmers who had won a boar but no gilts to let us use his boar as a follow up from December 15 to the time of the banquet. This was just in case some of the gilts had failed to settle during the first 30 days when they were on the farmer's farm.

We have encountered several problems and are working to solve each of them. We have had a hard time convincing some of the farmers of the value of a farrowing house and how to use it. This has been especially true when the farmer is a low income farmer. Getting them to worm regularly has been a problem with some, but I believe that all are

convinced of the value of worming now. This can be said of controlling external parasites as well. These are management problems that are being solved without too much difficulty. We have found what we think is more than our share of foot and leg problems. We don't have the total answer to this right now but we are working on it.

This year we have added a youth division to the program. The Live Oak Rotary Club and the Suwannee County Farm Bureau agreed to buy two gilts each year to be given to 4-H Club members and FFA members. These members are required to return two gilts a year later just as the adults are.

When the program ends in 1973, there will have been 155 different farmers given a group of five gilts and a boar. There will have been also 104 different 4-H Club and FFA members receiving a gilt apiece. When all animals are returned a year later, they will be sold and the proceeds will be used to pay any outstanding bills and the remainder will be used to provide scholarships for Suwannee County youth who wish to attend college and need financial help.

We hope that with the influx of quality breeding stock into the county will raise the quality of the herds in the county not only by the animals in this program, but through their offspring as well, along with the animals we hope the farmers will buy on their own, when they see what a difference a set of good breeding animals can make.

We have made a film of the program here in the county called "A New Day A Comin'". We will look at it now and I believe that it will explain the program in greater detail than I could.

The film A NEW DAY A COMIN'

Most city children are still asleep when the farm boy gets up in the half-light of early morning.

The scene might soon become husking, harvesting, packing, picking, plowing or planting.

Seldom do we remind ourselves that farmers feed the world.

Down by the river there's a place where farmers and businessmen, merchants and citizens, realize the economic necessity of doing things better.

Farming is more vital today to the economy of Suwannee County, Florida, than when Stephen Foster penned the immortal words to "Old Folks At Home".

But the people here were confronted with a modern day problem of insuring a bright future in livestock.

The problem's significance is supported by the fact that all, or at least part, of the annual income of many county residents is derived from the production of livestock.

One thing was certain, the housewife----not just in Suwannee County---but all over the country, wanted beef and pork with less fat and more lean meat.

Thinking of a possible solution, the Suwannee County Chamber of Commerce, in 1962, inagurated a unique livestock promotion project.

The program, which was to span 5 years, proved a tremendous example, not only for the participants, but for their neighbors.

At annual banquets during the period, 108 swine and 27 cattle, all top breeding stock, were given to deserving farmers.

Said State Senator Jerry Thomas; "The most commendable point of the

program is the fact that you wanted to do something for yourselves, independent of the government".

Purebred animals awarded during that 5 year project so spurred the livestock industry that it drew nods of approval from a few beauracratic carcasses and attracted national television coverage.

CBS reporter Charles Kuralt said in a nationally broadcast news report; "Well we stayed around here long enough to find that 'Way Down Upon the Suwannee River' people do care about one another".

The success of the 5 year awards program shed light on a "new day a comin' in Suwannee County, Florida".

Immediately, another local organization, the Suwannee County Rural Areas Development Council, developed a new 5 year program.

This time an active Agriculture Committee planned and helped organize the Suwannee County Livestock Improvement Association. . . . a new group with a new concept.

Their goal. . . . (pause) . . . to upgrade swine operations with a self-improvement program.

A truck loaded with 25 cross bred gilts and 25 purebred boars purchased from top swine producers in the Mid-West crosses the Suwannee River.

The arrival of these animals mark the beginning of a second 5 year project to upgrade livestock, boost income on the farm and bolster the overall economy.

The president of the Chamber of Commerce during the first year of this second, bold livestock effort was veterinarian, Doctor Donald Burch. He described the businessman's attitude; "(quotation from Burch)".

The idea of self-improvement has been successful because farmers in

Suwannee County realize that increased incomes and a better livelihood will result from producing high quality animals.

People came to Live Oak from all around and ate delicious bar-b-que.

And farmers and the business community together, looked to the future.

They heard guest speaker Doctor Frank Goodwin say of the county's ambitious pilot self-improvement program, "You've got an idea. . .a plan"; "You've got it. You've got the enthusiasm. You've got the positive outlook. You've got the spirit of cooperation. . .the friendliness. Infect others with it. . . so that you will have a future limited only by the total population of Suwannee County."

During the first year, 48 high quality swine were awarded to 23 winners.

"Our first place winner is a man who never says no. . . . . ."

Over the five-year program, more than a thousand head of high quality animals will be distributed to nearly 200 farms in Suwannee County.

The quality of the animals is apparent in the apt discription of Judging Committee Chairman Don Adams; "These are hogs in whose presence I think you'll feel reverent. I've never seen such hogs. I didn't even know such hogs existed because I'm quite local in my operations, being confined pretty much to the state of Florida. But these hogs have dollar marks on them. I know that you're going to be able to see the dollar marks and I know that they're going to trigger a great reaction in the swine industry, not only in Suwannee County and Florida, but of the southeast."

The farmer's major contribution to the self-improvement program is that of returning animals to the association to help defrey expenses of the program.

Farmer's receiving boars return 3 market hogs while those winning females, return 2 bred females which are awarded the following year to other livestock winners.

By helping others, the farmer's help themselves.

The number of gilts awarded annually is doubled.

During the year following a banquet, winning farmers are visited by the suprevisors of the non-profit livestock improvement association.

Yearly winners are chosen by a team of out-of-county judges who score the farmers on the basis of approved management practices and attitude.

The potential of the individual swine operation is also considered which allows small and large farms to compete.

On-the-farm preparation is extensive before a winner proudly announces his first litter of high quality pigs.

From the outset of the new program, the animals stimulated a desire to improve production and management.

The association's goal. . .to upgrade swine operations with a self-improvement program. . .would be accomplished by producing more pigs, using less feed, and realizing greater profit.

Said Florida's Commissioner of Agriculture, Doyle Conner; "I think perhaps, our greatest potential in Florida agriculture is in the swine business."

Before the first year had passed, several interested groups asked to sponsor a youth awards program.

A rew wrinkle in this program would have two county groups footing the bill. . .Rotary for 4-Hers and Farm Bureau for FFA members.

Fifty-two bred gilts will be awarded by each organization to

participating youth during the remaining program.

Education conferences were held with leading livestock specialists informing swine producers about the latest management techniques aimed at improving production, and experts like Doctor T. J. Cunha, Chairman Department of Animal Science, University of Florida, talking frankly with hog men; "We notice you have 5 gilts here of real good breeding. In the past you've used some pigs with not quite as good breeding. Do you feel it's worthwhile getting some animals with good breeding to put on a farm like yours?"

"It's very worthwhile doctor. These pigs have grown off a lot better than the other hogs and in fact, I'm going all the way with this type of hog."

In practical discussions, experts explained to Suwannee farmers, the value of properly selecting and feeding their animals.

The response was tremendous.

They explained how to control disease and parasites and how to most effectively use modern equipment to increase profit.

Farrowing houses cited as being one of the most effective methods of improving production.

"You're farrowing house. . .I think you've done a nice job with it. I like the way it's set up and certainly the fact that you've raised a little over 8 pigs per litter speaks well for it."

About farrowing houses, another expert said; "I think that just like what you were telling me here, you can see that a farrowing house will pay."

The top five winners at the first awards banquet each received 5 gilts and one boar.

Each has built farrowing houses.

None have regretted it.

Closely related to improving production on the farm is the research accomplished by the Florida Swine Evaluation Center and the Swine Research Unit of the Suwannee Valley Experiment Station, in cooperation with the county agricultural extension staff.

Through these agencies, an artificial insemination program was started, using only the best boars in hopes of further upgrading the overall quality of Florida hogs.

The increased utilization of a top individual boar is the advantage of the artificial insemination program.

It is significant because the service is available to all swine producers in Florida.

One of the Livestock Improvement Association's goals is to cause the expansion of, or addition of, marketing and packing facilities.

Already, high quality, Suwannee County produced swine demand a considerably higher price at the auction market.

"This association has given awards of approximately 1,000 head of high quality animals to the Suwannee County farmers during the next 5 years. These are all purchased from top breeders in the corn belt. Mr. Bryan has the first offspring."

Carcasses of some of Suwannee County's top quality swine are pushed from the freezer of a packing house.

More meat on the individual animals means more money for the farmer.

Bob Dunn, Superintendent of the Florida Swine Evaluation Center at Live Oak measures the length of the carcass.

The animals are cut up and the loin eye is measured.

Progressive farmers like this project winner are utilizing local resources to better their production and increase their profit.

Measurement of the carcass length and the loin eye provides a reliable method of determining the quality of livestock.

The housewife is demanding a better product and her demands will provide a continuous market for better pork.

The farmer is faced with evaluating his livestock on a regular basis to maintain consistant quality.

The Swine Evaluation Center in Suwannee County provides the facilities for this.

Explained Extension Swine Specialist Ken Durrance of the University of Florida; "The purpose we have here at the Swine Evaluation Center is testing people's herd sires or breeding animals for them, lets say, by testing the progeny from a given sire. In turn, by so doing, we can identify breeding animals that have the genetic potential to sire the right kind, to convert the feed properly, to have the right kind of carcass and thus satisfy madam housewife and then in turn this makes us more money."

Doctor Gilbert Hollis is responsible for new management techniques being investigated at the Suwannee Valley Experiment Station's Swine Research Unit near Live Oak. "I notice that you're the only one of the 3 that are using automatic watering cups. . . . "

Thirty-thousand dollars was spent on the original 5-year livestock improvement effort.

During the useful lifetime of those animals ---awarded in the original program----economists tell us they'll add $440,000 in extra income to the economy of Suwannee County.

The second 5-year program outdoes the first one by millions of dollars.

Estimates indicate that an original expenditure of about $100,000 will, in 5 years, have added 1½ million dollars to the county's economy.

During the useful lifetime of all animals awarded in this program, the economists say, the economic benefit will total about 4½ million dollars.

A Florida agricultural economist, Doctor John Holtz, cited the significance of the improvement program; "To an individual I think that the primary thing is that it will make him more money. To an economist, we're interested not only in an individual producer improving his income, but the impact of adding income to individual farmers and the growth in an area."

The Suwannee County Livestock Improvement Association began as an idea. . . an idea for self-improvement.

It is supported in its entirety by annual membership dues of $5, by a proportionate return of animals to the non-profit association, and by contributions from Suwannee County businessmen, merchants and farmers.

The product of the farmer's handiwork will not stop at the end of this five-year project. This program undoubtedly, is only the beginning.

How I Would Finish Hogs for Greater Returns

H. D. Wallace, Professor
Department of Animal Science
University of Florida
Gainesville, Florida

We have numerous options when it comes to finishing hogs for market. There are many different ways that the job can be done well and profitably. I always tell my students in our swine production course that feeding the growing-finishing hog requires the least managerial ability or know-how of any of the various phases of swine production. I believe this to be true. But at the same time this phase represents a major portion of total expenditure -- particularly in regard to feed. Thus the growing-finishing phase is an extremely important part of the total operation. Small improvements in efficiency can be strikingly significant relative to net returns. A producer must do the basic things well and then work on the many little opportunities for greater efficiency if he is going to distinguish this phase of his operation.

First, I would like to list some things that I would not do in the hog finishing business -

1. I would not <u>hog off crops</u> such as peanuts, soybeans, chufas, corn, small grains and other crops. There is enough evidence available to indicate that this procedure is generally wasteful and inefficient where the finishing hog is concerned. He will perform much better if closely confined and fed a carefully formulated feed mixture. Another

point of considerable importance in this regard is the soft pork problem. Hogs fed peanuts, soybeans and chufas produce soft pork and this pork is undesirable and unwanted from both the meat packer and consumer point of view. Why produce a product that is undesirable and unwanted? As a general recommendation crops should be harvested mechanically and if hogs are to be involved it should be in the clean up or gleaning aspect of the operation. And these hogs should be bred sows and gilts and not growing-finishing hogs.

2. I would never feed growing-finishing hogs in the same lots or pens with sows or other animals. The reasons for this are so obvious that they need no further comment.

3. I would not purchase complete mixed feeds. Generally this is far too expensive and to be successful other alternatives must be used.

4. I would not feed hogs to excessive market weights. This is not an uncommon practice among swine producers. When hog prices are high it often seems of immediate advantage to feed them 2 or 3 weeks longer. And it may be. But in the long pull it is better to feed to a given desirable weight taking into consideration local market demands and not vary from this set objective. A consistent marketing procedure gives the producer more bargaining power on a year around and year to year basis.

Now, to look at some of the things I would do.

1. I would have heavily muscled meat-type hogs with strong feet and bone structure that gain rapidly and efficiently. There are great differences in hogs. Some are money makers and some are money losers. I certainly would not expend energy and money on poor quality hogs.

Every producer knows how difficult it is to attain and maintain top quality in a herd. But this is so basic to success in the business that the smart fellow will work hard on this continuously.

2. I would produce my own pigs for finishing purposes. I would not purchase animals from the outside to place in the finishing pens. A completely integrated system of production would provide a better opportunity for disease control and overall production efficiency. It would also provide the opportunity for genetic improvement which as mentioned should have high priority in the total scheme of things.

3. I would castrate male pigs at an early age and complete any other needed treatments prior to placing them in the growing-finishing pens.

4. I would feed in concrete confinement on concrete slats constructed over manure basins. The justification for this preference is of course related to the cleaning problem. Pen size would be such to accommodate 20-25 pigs. The long narrow pen design concept would be used.

5. Much emphasis would be given to the grouping of pigs. They would be grouped according to the following guidelines:

(a) Uniformity of size - an attempt would be made to avoid any more than a 4 or 5 pound variation within a group in initial starting weight, assuming an average initial weight of 40-50 pounds.

(b) Barrows would be separated from gilts. It is a fairly well established fact that gilts require a higher level of protein in the finishing diet for maximum performance and optimum lean

carcass development. Having the sexes separated would provide opportunity to exploit this fact by diet adjustment during the finishing period.

(c) Once a group is formed a policy of never adding new pigs to the group would be adhered to. Keep disturbing influences, particularly fighting, to a minimum.

(d) Special pens would be available for cull pigs -- injured, sick, unthrifty, undersized. These animals would be provided special diets and treatment as needed for recovery. But the important thing would be prompt discovery and removal from the main feeding groups where they could create problems in addition to being competitively disadvantaged themselves.

(e) It would be preferable to leave the groups of pigs in the same pen for the entire feeding period and not move them at all until they were loaded on the truck for marketing.

6. Each pen would be equipped with an automatic watering device at the appropriate end of the pen. Normally this would be at the end away from the feeding area. Great care would be taken to assure that the pigs had a continuous supply of fresh clean water available.

7. Self feeders would be used for feeding. A 1000 lb. capacity feeder (this would provide 1 weeks feed supply) with 8 feeding holes would be placed in each pen conveniently located for filling from a bulk truck auger unit or other convenient means.

8. Misting devices would be used to cool animals as necessary during hot periods and drafty situations would be avoided during periods of cold weather.

9. The feed mixture would be dependent upon feed availability and costs. More than likely, at least in this country, it would consist of a basic mixture of corn and soybean oilmeal fortified with vitamins, minerals and a growth stimulating additive. There is not adequate time to consider this aspect in much detail. Dietary protein level would be of primary concern and would be influenced by weight and sex of the pig. The following could be used as a guide in the formulating of diets to make optimum use of costly protein supplement.

Recommended Dietary Protein Level (%)

Sex	Pig Weight		
	40-100	100-160	160-220
Barrows	16	14	12
Gilts	16	15	14

As a growth stimulating feed additive I would recommend the use of high level copper, either copper sulfate or copper oxide, at a level to provide 200 p.p.m. copper to the diet. This would be fed up to 160 lb. and then withdrawn from the diet during the finishing period. Very complete and accurate mixing would be especially important with the use of copper as would ample provision for trace element fortifications, especially iron and zinc.

In conclusion I would reiterate that many varied approaches can be used successfully in the hog finishing business. Certainly those outlined above are not very new or unusual. Neither have all of the important details been adequately outlined and discussed. However, I

feel that I have outlined the important philosophy and procedures relative to the profitable finishing of hogs for market.

HOW I OPERATE MY SWINE PROGRAM

By

Howard L. Howes
Owner
Howes Swine Farm
Live Oak, Florida

The most important phase of a successful swine program is the operation and management of your farrowing facilities. It need not be as elaborate as mine, but practical to you and your operation. Many things I will mention below are not recommendations for you to follow but are listed as the best way I have found, through experience, to operate my farrowing house.

Sows are normally put into farrowing stalls one week before scheduled farrowing. They are immediately scrubbed, deloused, and wormed. I have found that worming sows just prior to farrowing, not only gives me more live pigs at birth, but eventually cleans my pastures of worm infestations. Pigs will have fewer and fewer worms at worming time.

Up to farrowing, sows are fed six pounds daily of a medicated farrowing chow containing NF 180. After farrowing these sows are fed one pound the first day and increased one pound per day until the tenth day when they are placed on full feed. Sows are kept on full feed with a 14% ration until pigs are weaned and sows rebred.

I try to make sows as comfortable as possible during their stay in the farrowing house. Rubber mats are provided them in the farrowing stall, helping to cut down on sore feet and knee bruises. Oat straw is put into stalls a day or two prior to scheduled farrowing. I have found that this will make a sow more contented and when she starts bedding gives me an indication that farrowing isn't too far away.

At first I was sitting at the rear end of each sow when she was farrowing, pulling pigs out, drying them off, cutting their naval cords, and dipping the cord into iodine. Time doesn't permit this now. I saved many pigs by being in attendance at farrowing time, and I would still recommend it in a small-size operation. Also, I have stopped clipping needle teeth and giving iron shots. I took into consideration a statement made by Mr. Roy Keppy in his address to the 1967 Swine Field Day in which he said that there has never been a needle tooth cut on his farm. I have tried it and it has proven to be practically 100% successful. Instead of iron shots, I start feeding pigs an edible iron compound when they are 2-3 days old. I find that by pigs starting to eat this iron compound they in turn will start eating baby pig chow earlier. The things I have stopped doing have cut down several handlings of baby pigs. I believe the less baby pigs

are handled the better off they will be. Now to find some way to do away with castration! I'm working on it! Believe me!

Pigs are usually kept in the farrowing house until they are 10-14 days of age. By then they are eating and have been castrated. At castration time all pigs designated to be sold as feeder pigs have their tails clipped. I had been doing this previously when giving iron shots. Any pig you see on my farm that has a tail has at one time been considered for breeding stock. Note: Docking tails is one sure way to cut down tail bitting. It is easy and simple. Articles in magazines now indicate that buyers up North are paying $2.00 per head more for feeder pigs that have had their tails docked.

There are several other things in the management of my farrowing facilities that I think may be important to mention. I try to breed my sows 20 at a time so they will farrow as close together as possible. By doing so I can adjust litter size both by number and size of pig. Yes, if several sows farrow close together, I take all small pigs and give to one good sow. I adjust litter size so there won't be one sow trying to nurse 14 pigs and next to her one with only 8. If pigs 2-3 days of age need to be placed with a sow that has younger pigs, or vice versa, I put all together for a couple of hours, spray with hair spray, and usually the sow will accept all. As the new pigs get hungry, they will soon latch on to a new dinner plate.

Heat lamps are a must in a farrowing house. I keep one burning on both sides of the sow until she has finished farrowing and the pigs are through their initial nursing. Usually I burn one lamp for 4-5 days. Heat lamps will keep the pigs away from the sow and 10¢ a day for electricity is cheap compared to losing a $5.00 pig mashed to death by the sow. One thing I have found out is not to have the lamp too close to the pigs. This is especially true of red pigs. If too close to red pigs, the heat lamps will cause them to lose all their hair and you end up with some hairless wonders until they are 4-5 months old. Before leaving farrowing house, all purebred litters are ear notched.

Most of my litters go to pasture from the farrowing house. Up to now special and most good purebred litters stayed on concrete and never touched the ground. But, I am about to be convinced that there is something in dirt that does pigs good. More of my pigs are coming into the finishing barn that are larger and healthier than the same age pigs that didn't go to pasture.

All pigs are weaned when the group of sows average six weeks, meaning some pigs may be five weeks old and some seven weeks old. I want to breed as many as possible in the shortest period of time. Usually, sows weaned at the end of 5-7

weeks will be ready for the boar within 3-4 days. To keep my continuous farrowing cycle of 20 sows every three weeks, I adhere to a strict weaning and breeding time.

After pigs are weaned, they are wormed, deloused, and vaccinated for erysipelas. Usually by the time they are 12 weeks old they are sold as feeder pigs. My feeder pig buyer has his truck weighed in town, picks up the pigs, goes back to scales and pays me according to the average weight of the pigs. He prefers 60-80 pound pigs. If they average 60-70 pounds, he will pay me six cents over the Chicago tops for that day. If they weigh 70-80 pounds the pay is four cents over Chicago tops. I have found this better than selling on feeder pig sales as 2-3 cents per pound goes to market and trucking expense.

Possibly a fourth of my pigs at present are kept for future breeding purposes. This includes those for my own herd and those to be sold. At weaning all pigs with tails are separated from those whose tails are docked. They are also separated according to size and sex. Any pig at that time may have his tail docked and be castrated if it isn't up to standard with the other pigs. Boars will be castrated up to any weight if for any reason he proves he should not be sold or kept for breeding purposes. Gilts are subject to be

culled and sold as market hogs up until they are actually bred and even then if one doesn't settle.

When sows and gilts are bred they immediately go into a strict feeding program. I divide my sow herd into two groups and bred gilts are kept in a separate group. Each day for approximately six hours one group is turned into a central feedlot. During this time they have access to a self-feeder filled with a 14% ration. For the next two days they are on pasture. Usually I try to keep them on green pastures, millet in summer and oats in winter. At times though they have to be kept on dry pasture. This has been my sow feeding program for nearly two years. Litter size has been excellent. I couldn't use more live pigs. For management it is ideal. I only have to close one gate and open another each day in order to feed up to 50 sows and gilts. My feed company keeps feed in the feeders. I never touch any of it. This allows me more time to spend looking at that group of sows and each group is inspected closely every third day. This is a must! Keep feed fresh. Have water and shade available in the feed-lot. Twice yearly I add hygromycin to the sow ration for worming purpose.

Cleaning, sanitation, and manure disposal are the biggest headaches on all swine operations. They are in mine, too.

Everyone of us just hates to clean and dispose of manure. My farrowing house and finishing barn are all concrete, built with a gradual slope out towards a gutter. All manure is hosed off at least once a day, normally twice. With plenty of water and good pressure this is no job. It's one job I prefer as when I'm in the pens hosing out the manure, I have the opportunity to closely observe the droppings and give the pigs a close look. This puts me into each pen of pigs nearly twice daily. All manure from farrowing house and finishing barn end up in a large lagoon. Back of the main lagoon I have built two smaller ones. By the time water, manure, etc. pass through the third lagoon I believe it will be safe to go into the ground and not contaminate the underground water supply.

My cleaning and sanitation is practically one operation. As a farrowing stall or finishing pen is emptied, it is immediately hosed down using a water gun that increases water pressure. Then a lye-base cleanser is applied to the concrete surfaces. After a thorough soaking it is then hosed off. Most times the concrete is as clean as if it had just been poured.

It has been a pleasure writing and presenting this paper to you. Please feel free to visit my swine operation anytime.

REPRODUCTIVE PROBLEMS IN HORSES

Fuller W. Bazer, Assistant Animal Physiologist
Department of Animal Science
University of Florida
Gainesville, Florida

Reproductive failure is such a widespread problem in the horse industry that only 50 to 60 percent of all mares bred produce living foals. This statistic coupled with the long gestation period for horses, means that any improvement in the reproductive rate for horses will result in increased economic returns for horse breeders. The fact that some horse farms obtain 80 to 100 percent foal crops is encouraging, since they indicate the potential reproductive rate. In order to obtain a high foaling percent one must be aware of nutritional, managerial and pathological factors which tend to reduce reproductive efficiency. Some of these factors will be covered in this discussion.

The estrous cycle of the mare is usually 21 days in length when she has a heat period of 5 days. Most mares have heat periods of 3 to 7 days with a range of from 1 to 37 days. When the heat period is longer than 5 days, the time from the beginning of one heat to the beginning of the next will be correspondingly longer. Often this is not taken into account and mares are considered "settled", because they did not show signs of heat at the 21st day; however, the time to next heat should be calculated as 16 days from the end of the previous heat.

Ovulation usually occurs from 24 to 48 hours prior to the end of heat regardless of the length of heat. Instances have been reported, however, where ovulation occurred as early as 24 days before the end of heat and as late as 5 days after the end of heat.

The preceding paragraphs should indicate that there is a "normal"

pattern to the reproductive cycle of mares during the breeding season. Mares are considered to be seasonally polyestrous, that is, they exhibit heat at regular periods during the spring and early summer. Some work, however, indicate that some mares of a group will show heat during any month of the year. Hutton and Meacham (1968) studied nine horse farms and found that the number of mares served increased from 7 in January to a peak of 444 in April and declined gradually to 7 again in September. Conception rate was poorest in January and February and was associated with irregular estrous cycles. Trum (1950) reported more long heat periods (over 10 days) in March and associated this with low fertility. Conception rates were highest in Hutton and Meacham's work from April through September.

In addition to irregular estrous cycles, anestrous, or the complete absence of heat, has been reported to reduce the reproductive rate by as much as 15 percent (Andrews and McKenzie, 1941); however, of 1,161 mare records in a recent study (Hutton and Meacham, 1968) only 0.6 percent of the mares were completely anestrous. The use of 1000 to 2000 I.U. Pregnant Mares Serum (PMS) has been used to overcome anestrous in some mares (Cameron, 1942; Day, 1940). Anestrous is a difficult condition to define since the term "silent" heat may be more appropriate. During "silent" heat there is development and rupture of the follicle during the "silent" heat period, as well as development of the uterus, vagina and vulva. However, there is no exhibition of a desire to mate. "Silent" heat does not prevent conception if the time of ovulation is determined by rectal palpation of the ovaries and the mare is mated or artificially inseminated at the appropriate time.

A condition known as "split" heat also occurs in mares. The condition is characterized by one or more days of heat, several days out of heat and then a return to heat for several more days. Ovulation does not usually occur until the second portion of the "split" heat. If this condition is not recognized certain mares may have disappointing breeding records.

Up to this point the discussion has included pheromena which reduce the chances of insuring union of a viable sperm and ovum which will result in a healthy offspring. In an attempt to insure a fertile mating it is generally recommended that mares be bred on the second day of heat and every other day thereafter until the end of estrus. More precise matings can be achieved if a qualified person is available to determine the expected ovulation time by palpation of the ovarian follicle through the wall of the rectum.

Mares are usually considered clean and ready to breed before the breeding season; however, a few conditions should be discussed which may or may not be detected, particularly in maiden mares, and cause reproductive problems. They are:

(1) Infantile reproductive tract - all or part of the reproductive tract is abnormally small. In some animals the vagina and cervix appear normal while the ovaries and uterus are quite small. There is no known treatment; however, fillies can be put back in training and checked again the following year.

(2) Imperforate hymen - the hymen is a thin membrane which closes the vagina of maiden mares. Normally this membrane is easily ruptured at the first mating; however, this membrane may become very thick and

tough in some females and cannot be easily penetrated. If this is the case, the hymen should be surgically removed before the next breeding is attempted.

(3) Anemia - may be a problem especially if the female is heavily parasitized. The mares should be warmed and returned to a thrifty condition before the breeding period.

(4) Excessive fatness - tends to reduce breeding efficiency. Thyroid treatments under supervision of a veterinarian are sometimes recommended to increase the mares metabolic rate.

(5) Teeth - insure that the teeth are sound and that there is no need for a special ration to keep a mare in breeding condition.

(6) Irregular heat periods - "teasing" mares is the practice of bringing a mare into a lane or chute next to a stallion to test the mare for receptivity and signs of heat. A solid fence should separate the animals. Mares not in heat will squeal, kick and resist the stallion. The practice of "teasing" is useful prior to the breeding period since each mare will tend to repeat a regular pattern for each estrous cycle. During the breeding season the heat period may be distinguished by an open and vascular cervix, the vagina and vulva become vascular and moist with secretion, frequent urination, raising the tail, frequent contraction and relaxation of the vulva and acceptance of the stallion. "Teasing" aids in breeding mares at the most effective time.

(7) Follicular cysts on the ovary and fibrocystic ovaries occassionally develop in mares. The follicular cysts do not result in nymphomania as is the case for cows. Instead, the females develop rather short and irregular estrous cycles. Hormonal therapy with HCG

and estrogen or ovarian puncture have proven effective in many cases under supervision of a Veterinarian.

(8) Small, hard ovaries may occur which results in cessation of estrous cycles. Ovarian massage and hormonal treatment with FSH have been used with some degree of success. However, if the ovary has completely atrophied, there is no effective treatment.

(9) Inflammation and infection of the reproductive tract - pyrometria, or pus in the uterus, and inflammation of the cervix are examples of infections which reduce reproductive efficiency. Streptococci are the most common cause of genital infections in mares. Antibiotics, particularly penicillin, have been quite useful in controlling these conditions.

(10) Abortion rates for lactating, barren and maiden mares was reported to be 4.8, 7.2 and 0.0 percent, respectively, by Hutton and Meacham (1968). Abortions have been associated with twin pregnancies (Lieux, 1963 and Hutton and Meacham, 1968). Other workers feel that abortions tend to occur in mares when there is a shift from ovarian to placental sources of progesterone.

Nishikawa and Hafez (1962) indicate that the average abortion rate is about 10 percent. The primary corpus luteum of pregnancy has a functional life of from 40 to 70 days and then accessory corpora lutea form as a result of follicular development in response to high levels of circulating FSH and LH. Ovarian progesterone level begins to diminish from day 40 until it completely ends about the 150th day of gestation. Many investigators feel that abortions are most likely around the 5th month of gestation when maintenance of pregnancy is completely dependent

upon adequate placental progesterone being produced when the ovarian source has completely ceased. Some workers recommend subcutaneous 300 mg. progesterone implants after 120 days gestation (Day, 1957).

The three main causes of low fertility in stallions appear to be:

(1) Poor health, feeding and management - Vitamins A (15 mg. carotene/day) and E (600 to 1000 I.U. α tocopherol succinate appear necessary for good condition, libido and sperm quality. Excessive use of stallions may also result in poor reproductive performance.

(2) Masturbation - A potential problem which can be prevented by keeping the stallion where he can see other horses and get adequate exercise. Stallions developing this bad habit are often difficult to manage, over-anxious at time of service and generally their semen quality is poor, i.e., thin and watery due to reduced sperm concentration. Also, there is a high percentage of immature and abnormal sperm.

(3) Hereditary factors - certain lines seem to be shy breeders; however, very exhaustive studies are necessary to separate environmental and genetic factors which may be involved.

The most reliable test of a stallions fertility is the production of a high percentage foal crop. However, laboratory tests can indicate conditions which are related to either low fertility or complete sterility.