PROCEEDINGS

BEEF IMPROVEMENT FEDERATION

RESEARCH SYMPOSIUM & ANNUAL MEETING

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PROCEEDINGS OF BEEF IMPROVEMENT FEDERATION

RESEARCH SYMPOSIUM AND ANNUAL MEETING

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The New World of Animal Agriculture

C. G. Scruggs, Editorial Director
Progressive Farmer Magazine
Dallas - Memphis - Birmingham - Raleigh

Historians will undoubtedly mark the early 1970's as a major turning point in American Agriculture and in Animal Agriculture.

Permit me to list some highly significant points which lead me to the above conclusion. Permit me, too, in the interest of time and space to list some of these major turning points without documenting them here. Let me add, however, that I have what I believe is good documentation of the soundness of all of them.

1. Man began competing directly with animals for the world's supply of food grains in the early 1970's. And significantly, man has shown that when supplies of food grains are short, man will pay for and get food grains at the expense of animals. Over the long span of the years ahead, only limited quantities of grains will be available for animals.

2. We have witnessed the first major setback in the American age of Food Abundance. For the first time in perhaps a century, Americans have found that they cannot take food abundance for granted.

3. Agricultural productivity is the strongest, the single most effective advantage the United States of America has in its dealings with the world community of nations. Thus, American farmers and ranchers have been boldly thrust into world geopolitics and economics.

4. American consumers have proved that they want -- and can go into the streets and demand and get -- food at a low price. Additionally, they have told beef producers again -- but more loudly and clearly than ever before -- that they want beef that is lean, tender and cheap!

5. The early 1970's will also mark the time that plant proteins proved they can be substituted for animal protein and thus may capture up to 40% of the American meat market in the next decade.

Now having delivered these premises, what specifically do they mean to animal agriculture and beef?

Among other things, farmers and ranchers aren't just cowmen or feeders anymore. They are now considered a part of the food business, but with less to say about the price and form of the product than anyone else in the chain. And as part of the food chain, beef producers are going to be "cussed and discussed" in most vigorous terms and without much real sympathy on the part of the other members of the food chain or consumers.

This means that we must all adopt some new positive attitudes and reactions that we aren't going to like at first.

Among them are these:

A. A cowman or feeder is only one part of a 20 or more part food chain to the consumer and one who handles less dollars and has less to say about the product than almost any of the rest of the chain.

B. We must become increasingly conscious of insects, diseases, and environment. In the past, the fact that there was brucellosis, anaplasmosis, etc., in a man's herd was only the cow owner's business. Now, the consumer will and likely shall say, "You're tolerating diseased animals; I don't like it; get rid of the disease -- or you don't sell your product."

In the past, a man could wade in manure up to his ankles and offend only his wife. Not so today. Properly, environmentalists have held our noses to the manure pile. We, nor they, like what we smell or see.

C. We've mistakenly assumed that there is only a single beef market -- choice grade steaks. The truth is there are many, many markets for beef. And to serve all highly varied and special markets, we have tried to produce one animal equally good for all these markets.

Think about the various beef markets:

- Pre-cooked ready to eat TV meals
- Hamburger chains
- Cafeterias
- Hospitals
- College dormitories
- Retail food stores
- Pizza parlor
- Snobbish expense account jet set restaurants
- The patio "impress your boss" steak demand
- The veal market of Europe

All these special and varied markets have specific demands for beef. For example, most producers I know erroneously believe that a big thick steak, served rare, is the beef market and try to evaluate all beef and their own animals on the basis of demand for this single specialty steak.

It surprises many to learn that 40% of U.S. beef is consumed through institutional markets -- vending machines, cafeterias, dormitory dining rooms, hotels, motels, hospitals, etc. Their demand is for uniformity -- of price, size, cut, etc., with quality of taste secondary. For example, how many so called choice premium steaks have you ever selected in a cafeteria?

A cafeteria, hospital, Holiday Inn or similar institution wants 100,000 pieces of beef to chicken fry that do not vary an ounce in weight or a millimeter in size. They want this number every week year round and preferably at the same price year round.

Now, do beef cattle come this way? Does it make any difference to the cafeteria manager whether the beef comes from a Hereford, Simmental or a Zebra? No -- just as long as it's uniform and cheap. Tender -- who cares? They're all pounded to a pulp. Suppose these "chicken fries" have 25% texturized soy protein in them? So what, it's covered with a batter or gravy and who can tell the difference?

Let me reemphasize again that up to 40% of all beef -- maybe it's 50% now -- is sold through institution outlets that demand uniformity of size, shape and color and cheapness well ahead of so called quality standards as we think of them.

So, in the future we may be selecting and producing cattle for a specific market whose cattle will be just for cafeterias and who will produce for the 21 Restaurant in New York. You take the expense account restaurants and I'll produce for the institutions and ready cooked TV dinners, and I'll have a market 1,000 times larger than yours.

It's imperative that beef breeders identify all the major markets and determine the kind and amounts of beef these markets want rather than trying to make every animal fit every possible need!

And be wary of what Mrs. Housewife tells you and what she really buys. She serves hamburger 10 times as often as she does sirloin. Yet, she and we, talk mostly about the price of sirloin. In reality, she's big on buying thin lean steak for panfrying two or three times a week and fancy steaks once every two months.

And the American consumer doesn't mind textured soy protein (TSP). In the past we have regarded TSP as only an extender to be added to beef. But, spurred by high beef prices of recent years and other factors, General Mills and other food giants are testing and selling completely simulated meats -- 100% plant protein. Think of the appeal -- "No fat, no bone, no waste, no dicing or boning." The new "Country Cuts" are the "first complete soy analog for meat to be marketed to the consumer."

All the major food groups are in this market -- including our friends at Swift, Cudahay, Armour, etc. They estimate they have a good chance to capture a 200 million dollar market from beef.

The real danger to beef producers is that these folks just might capture most of the institution beef markets. Remember that's up to half of our present beef market. Could we exist on the heavy steak market alone?

The stakes are high! These companies are moving into these markets because consumers are buying these products -- and at prices less than beef! And strangely, in some cases, higher than beef!

We ought to get the message: people have told us in the last 2 - 3 years they want beef -- but they are not going to pay $2.00 a pound for fat! They have told us through purchasing less beef, through forcing government to impose price controls and through strikes.

What is the message we should be getting? Well, part of the message is this:

- People will give up beef. Dropping consumption in 1973 and 1974 proves this.

- They will, however, pay a reasonable price for beef. But in the face of high prices or more convenience, they will buy substitutes.

- They want tender lean beef at prices less than $2.00 per pound.

How then are we in beef business going to survive -- much less increase our markets -- if food grain and plant proteins will largely go directly to the consumer and not through beef?

The answer -- it seems to me -- is fairly clear: We must produce reasonably priced lean tender beef protein largely from forage and more efficient special purpose cattle.

Some idea of the magnitude of the opportunity is illustrated by some data just released by the Auburn University. Steers finished largely on forage produced High Good Carcasses -- Yield Grade 2. Feed cost per pound of gain based on 1973 prices -- an amazing 13¢ per pound. And it's just the kind of lean beef consumers want. Drylot grain fed cattle produced in the same test put on a pound of gain -- feed cost -- for 39¢ a pound. And note this quote from the researcher in charge: "The drylot steers gained more and faster but the increased weight gain was mainly fat."

That word "fat" is the one element that hurts the beef industry most. And the tragedy is that only the U. S. Department of Agriculture's out-moded grading standards are forcing feeders to produce over fat cattle -- just to get into Choice grade.

Meat sellers, researchers -- almost everyone -- recognize that conformation -- which today also means wasteful, uneconomic fat -- has nothing to do with eating quality. Fat increases costs to feed animals, costs money to haul around, costs extra labor just to cut it off, costs money to get rid of it. But, we keep on blindly piling it on. Why? Why? Why do we tolerate a wasteful practice that adds at least 10¢ per pound to the cost of beef? The only answer apparent to me is the lack of guts on the part of the USDA to change for fear of hurting a few out of date breeders. The ANCA recently straddled the fence on the issue when they had an opportunity to really prove they were industry leaders. They may have doomed the entire practice of grading -- a principle which nearly all have supported and believe helpful. But, unrealistic grades are worse than no grades at all for they force uneconomic practices. And in the long run uneconomic practices -- or grades -- will be abandoned.

One other wasteful practice that hurts the beef industry is our one bull -- one cow thinking. We must develop a system of mass genetics that will allow us to substantially improve our production.

As a part of that system we must have some minimum guidelines so we can clearly see goals and understand what we must do to reach them. Only when we have clear goals, do we make progress. Only when we began to measure Weight Per Day of Age did we begin to find fast growth.

To that end, I've developed some guidelines that indicate what I'm talking about. (see attached). They are presented mainly as examples of the type of specifications we need rather than the exact elements we should have in industry guidelines. And we should develop different guidelines for cattle intended for different end products. You who are specialists are in a better position than I to develop the specifics. But, goals we must have.

In summary, I believe that the U. S. beef industry as we know it today has about five years -- or 1980 -- to gear up to produce lean, tender beef largely on forage and at prices lower than today. If we don't, the U. S. consumer will mainly be consuming food grains and plant proteins -- and not beef. If we do produce lean tender beef efficiently, we will not only keep large amounts of it on American tables, but will be selling gigantic amounts of it in world markets.

Efficient Beef Protein Producers

A. Efficient Female Producing Units

- Reach puberty at 330 days (11 months) of age.
- Be permanently identified by number.
- Breed at 450 days (15 months) of age; weighing 600 pounds.
- Conceive on first service.
- Produce live calf weighing 80 pounds or less at 730 days of age (24 months).
- Nurse calf 240 days.
- Wean calf equal to 60% of her weight.
- Calve again by 1095 days (36 months) of age and have a mature weight of 950 to 1,000 pounds.
- Calve every 12 months thereafter; producing 10 calves by 12 years of age or a minimum of 6,000 pounds of calf to that time.

Efficient Beef Protein Producers

	Weight
B. Efficient Male Beef Protein Producers	
- Weigh 80 pounds or less at birth.	80
- Gain 2.5 pounds per day to weaning at 240 days of age. (600 pounds)	680
- Gain 2.75 pounds per day to 365 days of age. (If fed grain produce 1 pound of gain per 6 pounds TDN) (345 pounds)	1,025
- Yield carcass with 70% retail product and 15% fat or less fat.	

An address by R. Page Jones, President, Phillips-Ramsey Inc. -- before the Beef Improvement Federation, Denver, Colorado -- April 16, 1974.

R. Page Jones is president of San Diego's largest advertising and public relations agency and one of the larger agencies headquartered in the state. The agency currently handles billings of approximately $9 million, and serves prominent clients across the country. Among them are Mr. Steak, Inc; Dairy Council of California; Royal Inns of America; Avco Community Developers; San Diego Zoo; Solar Division of International Harvester; Del Mar Thoroughbred Club; Hewlett-Packard; U.S. Elevator; Toro, Irrigation Division; Cubic Corporation and approximately twenty others. Mr. Jones is a successful novelist whose books have appeared in a half dozen languages and as major motion pictures. He is a member of the Board of Directors of Mr. Steak and a frequent speaker before a variety of national and regional groups.

The Cattleman's Challenge: Managing Change

During the past several months I've appeared before a national conference on environmental marketing; on the program of the California Bankers Association; at the annual convention of one of America's largest restaurant chains; before students, educators, professional associations, businessmen.

And -- at least on most of those occasions -- my background of experience has provided me with a funny story or two.

But not this morning.

I'm sure you won't be surprised to discover that my knowledge of genetic potential in cattle is limited. Limited to no knowledge at all. And that I am similarly educated in the areas of sire evaluation, animal agriculture and milk production.

I'm what was referred to in those early Westerns as a tenderfoot.

And yet I think that we may have a great deal in common...you and I. Because, in the final analysis, we're all businessmen (or businesswomen). And, as such, we share common goals...of an improved product, of greater efficiency, of better profits.

More importantly...we share a growing problem.

That problem is change.

I think that without doubt the pace of social and technological change is the most notable, the most fascinating, and, in many ways, the most awesome and frightening aspect of our lives.

And I know of no industry where the prospects of change are more significant, more far-reaching, more potentially disruptive than the cattle industry.

And so I intend to discuss some of the ways that I see your industry affected by change...some of the changes that seem especially significant... and finally to suggest some ways that cattlemen can manage -- can take advantage of -- change.

The problem is vital. The choice that faces the beef industry today -- that faces you this morning -- is not between maintaining today's status quo, on the one hand, and accepting change, on the other. Instead -- in spite of the technological advances of the last several years -- the choice that faces you this morning is between being driven and inundated by change... or finding ways to control and manage it.

I am particularly concerned with the subject of change because, as head of a moderately large advertising and public relations agency serving several dozen substantial clients, we must increasingly keep abreast of change -- even ahead of change -- in markets, in buying habits, in life styles, in attitudes, in all sorts of social, economic, technological, and political trends. In order to represent our clients effectively -- in government and political relations, in marketing, in financial and public relations -- we find that today's agency must serve as a listening post, a sort of early warning system, for the organizations we serve.

Two of those organizations -- ones with which you might find it most easy to relate -- are Mr. Steak, headquartered here in Denver, who use more than 600,000 head of cattle annually, and the Dairy Council of California, one of the most active groups of its kind in the country.

We find this "listening post" role so important that our agency employs three people whose primary function is to be informed on social change before it affects our clients.

I think there are some ironies in talking to cattlemen -- and to dairymen, if I may throw them in -- about change.

In the public mind cattlemen are highly cautious, often behind the times, slow to accept new things.

And yet, just a glance at the agenda for this exciting three-day meeting tends to belie that point of view.

I think it would not be flattery to suggest that in a comparative handful of years, cattlemen have entered into a period of genuine technological revolution. Certainly today's attitudes and techniques in the areas of performance testing, evaluation analysis and production efficiency don't fit the still-popular image of cattlemen as tight-lipped, tobacco-chewin', guitar-strummin' cowpokes swapping tall tales around a prairie campfire.

The fact that the cattle industry has undergone dramatic change in a relatively short period of time, however, makes it all the more important for cattlemen to recognize -- and to think more -- about managing change.

It is vitally important to think about the implications and side effects of further change...to anticipate its consequences...to analyze its effects... and, most of all, to try to control change by encouraging desirable actions and slowing or stopping dangerous trends.

I think that the difficulty of anticipating what change can do is highlighted by a simple example.

About 65 or 70 years ago, when the automobile was just getting started and cowboys were hollering "get a horse" to passing motorists, I think it

is a pretty safe bet that those cowboys, more amused than anything over that new contraption, could not possibly have foreseen such consequences as these:

--60,000 highway deaths a year;
--vast changes in sexual customs resulting from use of the auto;
--profound effects on American foreign policy in relation to the oil-producing nations;
--a serious pollution problem affecting health and the economy;
--major changes in the layout of cities and in property values;
--creation of whole new industries, such as motels, and the decline of other activities, such as home delivery of milk and bread;
--and, closer to the subject of this meeting, changes in beef itself because of changes in how it is brought to market.

Think about it.

At how we laughed at the auto. In the beginning, it simply represented a change in our mode of transportation. And yet, from that simple change, there resulted enormous and far-reaching changes in our culture, our economy, our lifestyle.

The side effects of today's changes may be equally as startling in the years ahead.

During the next two days you'll be discussing new trends. New techniques. New ideas. In short, you'll be talking about change. Who knows how the changes that come from this meeting, how the sweeping changes that are occurring in your industry now, will evolve by 1985 or by the year 2000?

One thing is certain. Change is coming. Change that will effect each and every one of you. And it is coming fast.

And yet most of us hate to think about change. We get comfortably set in our ways of living, in our methods of doing business, in our attitudes... and then all of a sudden somebody wants to change things. That's usually disturbing. Because almost all of us tend to see the good old days in a romantic glow.

In fact, it is ironic, I think, that the rapid pace of change today has created a whole new industry...the industry of nostalgia. All over America today...as a sort of protest to change...we're spending enormous sums for old gum ball machines, for rusted Coca-Cola signs, for scratchy Harry James records.

But no amount of nostalgia will slow the pace of change.

We're stuck with it. You and I. And we're going to have to learn to cope with it -- to manage it -- if we're going to survive.

What are the areas of change that are going to effect you most? I think they can be classified under three broad groupings. First are the changes in government that lie ahead. Second are the changes in business itself. And third, are the changes in people -- in the way they live, think, act, respond.

All of these areas of change will affect you. They will affect your industry...in the kind of employees you attract, in their performance, in their attitudes. Change will affect your various markets...your customers. It will affect your profitability...the long run future of you and your families.

Let's look at the three areas I mentioned.

First...what's happening in government? Now, I'm not talking about federal legislation, price controls, the Department of Agriculture. You're more familiar with what is going on there than I.

Instead, I want to touch on something I find significant...and fascinating. The fact that experts predict that the American city will be completely obsolete in the next thirty years. The mayor of St. Paul, Minnesota, recently predicted that his job would be gone by the year 2000. Counties, school districts, and many other local governmental units face an equally uncertain future.

At the same time, plans to regionalize the federal government for greater managability are being considered. New structures in national, state and local government will certainly affect your operations.

Pressure on government to hold back or manage growth is another trend that isn't likely to go away. Passage of propositions limiting growth, and of other laws and ordinances that restrict development, indicate the strength of the general sentiment that development -- new subdivisions, new factories, new processing plants, new shipping centers -- has gotten out of hand. The consequences of a slower growth rate on the development, processing and sale of beef cattle are, I believe, obvious.

Still another aspect of government of particular concern to cattlemen is that of government finance at all levels. Here, we face some perplexing issues -- what to do about property, taxes, how to finance schools, how much the sales tax can be boosted without revolt -- problems that are likely to be aggravated as the federal government tightens its spending.

And as a final note about government...the growth of laws and regulations protecting the consumer is causing many industries to completely review their operations and practices. Local governments are passing tougher new food ordinances. There is an increasingly tight hand on packaging disclosures. District attorneys are adding more and more strength to consumer fraud investigations. The federal government, through the federal trade commission and a variety of other agencies, is taking a tough look at advertising claims, at warranties, and other matters. In essence, organized consumer lobbies are demonstrating their new strength daily...and your industry is feeling the effects.

Now, these four brief points about government -- the likelihood of drastic restructuring in the not too distant future, the trend to tighter control of growth, the dilemma of government finance, and the growing strength of consumerism -- are obviously not the only issues that face us as businessmen.

But the major point is made...that fundamental institutions are changing, and changing fast, in ways that affect you...and that you must be aware of these shifts if your industry is to thrive.

The situation in the business world is one of even more rapid change.

Marketing experts warn that the whole concept of ownership may be outdated. People today are leasing more items than every before. But that's only the beginning of change. Some authorities think that eventually we may buy the service the product provides, rather than the product itself... a radical change. For example, instead of owning a television, a stereo, perhaps a home movie projector, we may buy a certain amount of home entertainment each month...with the seller providing the equipment we need. This same pattern can apply to clothing, to housing, to appliances, and, yes, to food. When you consider the shift away from ownership...and at the same time think about the greater mobility of today's population...we confront a situation that can have profound effects on you and your industry.

Nationally, about 20 percent of the population moves every year, and in my state, California, the percentage has been even greater. In Los Angeles for example, 85 percent of all the people who rent their dwellings move each year.

It is probably no coincidence that in that same area there are currently 8 divorces for every 10 marriages. And there are several other trends that experts say vary along with the increase in mobility...the rise in urban crime and vandalism, the growth in personal bankruptcies, the greater degree of mental and physical illness among transient populations, and the drop in the percentage of eligible voters who actually go to the polls.

Still another trend that affects business -- and I suspect yours in particular -- is the dramatic change in the economic makeup of the working force. The decline in manufacturing and the sharp climb in government and service employment in astounding. Right now about 60 percent of the total work force -- not including government -- is in the service area, and by 1990 only one out of 10 will be in the area of production.

If productivity falls off, the economic consequences for a population that earns and spends in a carefree way, counting on perpetually growing affluence, can be very serious.

Another interesting trend that affects the entire food industry is a shift in the way people like to buy. Over the past several years the fastest trend in retailing has been direct marketing to the home. There are of course the many companies like Avon that operate wholly by home selling. Now more and more companies are finding that catalog buying is an increasingly large segment of their business. Direct mail selling and telephone selling are important parts of this trend. It seems ironic that at a time when huge, luxurious new shopping centers cover the nation, more and more people prefer to buy at home.

Why is this happening? One reason is that people today want to use their time for things other than shopping...they want to avoid the long supermarket lines, the crowds, the parking problems, the delays. Another reason, sadly, is that more and more people are actually afraid to venture away from home anymore than necessary...they have been frightened by increasing reports of street crime, vandalism, car thefts, purse snatchings and similar hazards. And still another reason is the growing conviction among consumers that service in many retail establishments -- including supermarkets and restaurants -- is not very good.

This trend to direct marketing is almost certain to grow substantially in the years ahead, as new developments in communications media come on the scene. Sooner or later cable television will reach practically every home. It will carry a great many channels, including some on which businesses can display their goods in depth. It will also eventually be interractive... homes will be equipped with devices that will allow them to respond directly to the advertisers, to place orders, to arrange for credit.

Years away? Not really. A system like the one I have just described has been installed in connection with a new shopping center near San Diego. And this is only one aspect -- a minor one, relatively speaking -- of a communications revolution that will shake all our economic, political and social institutions to their roots.

How long before meetings like this one will be conducted via closed circuit television? Before national cattle auctions are held the same way? Before -- instead of coming to Denver to be with you -- I will remain in San Diego and be with you, and you with me, wherever you are?

I predict that it will be soon.

Practically all of these business changes -- the trends away from ownership, the growing mobility, the decrease in the manufacturing or production segment of the economy, consumer dissatisfaction with business, direct marketing to homes, and the communications revolution -- are linked in an important way to a significant demographic fact.

The immense size of the total market in the United States -- well over 200 million -- is resulting in a change from a mass market to a whole series of smaller markets. We are into an era of local marketing...local markets that are further divided by age, by sex, by socio-economic grouping, by area, by race or national derivation, by taste. We are facing a marketing situation where it is no longer possible to think of prospects for your product, for example, as a single homogenous group.

Instead, we must think of many market segments, each with different motivations, needs and drives.

You can see this today -- not just in the proliferation of restaurants appealing to highly specialized clienteles -- but in the growth of boutiques selling to very selective audiences; the emergence in a relatively short number of decades of the gigantic frozen food industry; the new health food and vitamin craze and others.

Again...I certainly haven't exhausted the list of business changes that will inevitably effect you profoundly. As I said about government, these changes are primarily indicators of the furious pace of innovation, and they are warnings...warnings that all businesses must be more alert than ever before.

Finally, I'd like to mention some of the changes that are taking place in people. These changes, of course, are behind the shifts in business and government I mentioned earlier. I find them the most fascinating changes of all.

Regardless of where you stand on the subject...feminism is here to stay. It is a powerful movement, more powerful than any in my lifetime. With it will come enormous consequences.

Did you know, for example, that 44% of the women in the United States today now hold paid jobs. And that is just a beginning. Women will increasingly seek employment outside the home...some because they must support themselves, some because they find family income inadequate without their contribution, some simply because they're getting tired of the traditional role of woman as a shopper, housekeeper and cook.

In contrast to the feminine exodus from the home, there are now 22 million American homes headed by single males...a substantial new market in its own right.

These demographic changes and many others are creating unusual business problems...and unusual opportunities. The combination of working women and male homemakers is resulting, for example, in the fact that 44% of all grocery purchases are now made by men.

Think about that.

Couple the male appetite for red meat with the fact that nearly half of the grocery purchases in this country are now being made by men...and you'll have some vision of the opportunities, as well as the problems, that emerge from change.

Changes in types of work and in the makeup of the work force are accompanied by increasing evidence that the old motivations to work are losing their steam. A recent study showed that more than eight out of ten unskilled auto workers would do something else if they felt they had a choice. The same is true of three-quarters of all blue collar workers and more than half of the white collar workers. And executives aren't immune to the trend. The American Management Association says that more than half of supervisory managers find their work unsatisfying. One-third of all executives complain that their jobs are affecting their health adversely.

Now, add together the decline in employment in the production sector -- where profitable output is becoming harder to achieve -- and the paralleled growth in dissatisfaction with work...and it is not difficult to predict that you are going to have increasing trouble with productivity.

By the same token...this is the kind of change that can be foreseen and that, perhaps, can be made less harmful by spending more time with such questions as: What do people really want out of life? What can my industry do to motivate employees more effectively.

Without doubt...the work ethic is vanishing fast. I'm certain that you can see this in your own industry. The importance of a job, the pure joy and satisfaction from working, the drive to succeed for the sake of success, all these fundamentals are weakening. The mobility I mentioned earlier is bringing with it a rootlessness, a lack of community feeling, an era of apathy and frustration. The extended family groupings that many of us knew in our youth are now becoming rare.

With these changes have come a more highly educated population. From 50 to 75 percent of high school graduates now go on to college. At the same time, goals of the educated class are shifting. Fewer graduates want business careers. More look forward to teaching (although that profession is overcrowded), to government jobs, to social service activities, to law, and in general to occupations that young people feel -- rightly or wrongly -- offer more fulfilling lives. And, because of the affluence of our society, young people are less concerned with making a living than any previous generation.

I hope that this brief catalog of change has not frightened you. Change, when it comes, is seldom as bad as we anticipate. But those industries -- especially today -- that do not look ahead in an effort to prepare for change can end up in trouble.

So I would like to conclude by listing five specific areas where I believe cattlemen can take specific steps now to live successfully with change.

One suggestion is to develop a sensitivity to change, a continuing awareness of what's happening. Most of us tend to read the same publications, listen to the same commentators, talk to the same people, and visit the same places. We mistake our little circle for the whole world.

It is a pretty safe bet that those of you in this room are not at all typical of the American public. Eighty-four percent of the people in the United States have not traveled by air in the last 12 months. We know that 79% do not own any stock. That 75% have never been outside the United States. That 60% have never spent a night in a motel or hotel. That more than half have not been 200 miles away from home in the last year. That half do not use any credit cards.

So you need an insight into what all these other people are thinking and doing if you don't want to be caught by surprise. Every now and then read something that you ordinarily wouldn't pick up -- Rolling Stone, for example, or the New Republic, or Playboy. Try to meet people that aren't part of the usual Rotary Club - Chamber of Commerce. Keep in touch with elected officials, union leaders, members of minority organizations, young people, old people. Try to use some small scale opinion research.

Surveys of 200 or 300 interviews, conducted by telephone, can be very helpful in keeping you aware of attitudes, beliefs, misconceptions -- and studies of that type can be very inexpensive. And, of course, if you can justify the costs, a regular program of opinion polls designed to develop trend lines over time can provide valuable background.

A second suggestion is to remain flexible, and avoid freezing your policies and philosophies any more than you have to. As occupational patterns change, as life styles change, as leisure habits change, new opportunities for innovation await those who are willing to take them. The first rule of successful marketing is to stop concentrating on what you have to sell, and why people should buy it, and instead think about what people need and want, and what you can do to supply it. In a rapidly changing environment, flexibility is the key to success.

A third point is to work to regain the credibility of business. To an important degree the way to fend off some kinds of harmful change is to gain the confidence of important groups -- your customers, your employees, government leaders, others whose opinions and actions are crucial. Psychological studies have shown that confidence or credibility has two main elements -- perceived trustworthiness and expertise. In the last decade there has been a dramatic decrease in the public's trust in business. A recent Gallup poll of confidence in major American institutions -- religion, public schools, Supreme Court, Congress, newspapers, television, labor unions, and business, found that business had the lowest rating. Similarly, a California poll showed that only 22% said they had a lot of confidence in business compared with 33% expressing a lot of confidence in public utilities, 37% in consumer protection groups, and 58% in scientists.

How can you build up low credibility ratings? First, by genuinely trying to understand public aspirations and supporting those desires that are reasonable. Second, by doing a better job of explaining why certain demands are not reasonable, and not simply saying no. And third, by taking action whenever possible. Deeds always carry more weight than words.

A fourth suggestion: try to provide more community leadership. Students of society have noted that every section of the United States suffers from a decreasing sense of community. Every community that I know of is suffering from a shortage of able, dedicated leaders. The leadership that does exist is tremendously overburdened -- every person with ability and community standing is asked to take on enough projects for a half-dozen people. The answer, of course, is to bring more leaders into action. You can help this process by encouraging and prodding the people in your organization who are on the way up to assume greater community roles. A great many men and women would like to make a contribution to local affairs and to gain recognition for it, but they are not asked, and often hesitate to offer their services. You can be a catalyst to bring your junior people together with the groups that need active leaders. A large part of the pointless, random and harmful change that occurs happens because leadership is not skillful enough. Anything you can do to increase the degree of involvement and participation in community life will help manage change better.

A final point: do a better job of communicating your ideas. In modern society we are suffering from a vast overdose of words and images -- an overdose so drastic that everyone might be said to be afflicted with media indigestion. In such a setting it is imperative that any communicating you do -- through advertising, publicity, or other means -- be skillfully planned. It must take into account all the barriers that communications come up against -- the human ability to avoid seeing or hearing what isn't interesting and to quickly forget any messages that get through but aren't significant to the receiver. It must, even more importantly, be designed to fit the values, beliefs and preconceptions of the audience. And that brings us full circle to my first suggestion, to keep in touch and be aware of what people are thinking and feeling.

These five ideas -- awareness, flexibility, credibility, leadership, and effective communication -- can help you manage and control the change that is not going to slow down. They are not offered as a sure-fire way to retain the status quo -- that is impossible.

But there is no reason why businessmen in general, and cattlemen in particular, must always react to the initiatives and actions of others. If we do our best to manage change, it will not manage us.

Psychology of Advertising

PRESENTATION BY
M. LAMAR MUSE
PRESIDENT, SOUTHWEST AIRLINES CO.
TO
BEEF IMPROVEMENT FEDERATION
DENVER, COLORADO
APRIL 16, 1974

Mr. Chairman, I sincerely appreciate that very generous introduction. Ladies and gentlemen of the Beef Improvement Federation, as you've always heard, they do things big in the State of Texas. My purpose here today is to convince you that even small companies such as Southwest Airlines can do big things when it's done in Texas.

To set the scene, we have to go back to 1967 when Southwest Airlines was organized for the purpose of filing an Application with the Texas Aeronautics Commission to obtain a Certificate of Public Convenience and Necessity authorizing Southwest to provide non-stop service with jet aircraft between Texas' three principal cities, those being Dallas, Houston, and San Antonio. After an extended hearing before the Texas Aeronautics Commission in late 1967 at which our principal competitors, Braniff Airways and Texas International, were opposing our certification, the Texas Aeronautics Commission issued on February 20, 1968 a Certificate to Southwest Airlines authorizing the operations between Dallas, Houston, and San Antonio previously mentioned. The very next day, February 21, 1968, Braniff, Texas International, and Continental Airlines went to State District Court in Austin filing suit against the Texas Aeronautics Commission in an effort to prohibit them from actually issuing to us the Certificate which they had awarded. This case was heard in State District Court, in the Civil Court of Appeals for the State of Texas, before the Texas Supreme Court, and finally the U. S. Supreme Court. The Texas Aeronautics Commission's right to issue the Certificate to Southwest Airlines was finally adjudicated on December 7, 1970 when the U. S. Supreme Court refused to review the earlier unanimous decision of the Texas Supreme Court.

I won't bore you with the details of the fast pace we traveled between December, 1970 and June 18, 1971 when our scheduled intrastate service actually began. Suffice it to say that during the intervening 190-day period we first raised immediate interim financing of $1,250,000; permanent financing of some $6,650,000; selected and purchased $15,000,000 worth of flight and support equipment; chose the Bloom Agency to build our advertising and promotion campaign; selected, hired, and trained 210 people to run the best damn little airline in the world; and finally after one final court skirmish with our worthy competitors before the Texas Supreme Court which we won on June 16, we celebrated our inaugural flight party on the evening of June 17 and began regular scheduled service on June 18, 1971.

Our competitors really brought out the big guns. I distinctly remember in one of the many court proceedings that we had, they even had Harding Lawrence there who is Chairman of the Board and Chief Executive Officer of Braniff Airways. Mr. Lawrence was trying to convince the Court that Braniff had for many years very adequately serviced the markets which we were attempting to enter. You see, Braniff has always felt that everything South of Dallas was their private backyard and that they were not going to permit nor did they think it was fair for any other carrier or company to share in the traffic on their private preserve. He explained that for 35 years Braniff

Airways had been servicing the public in these markets and that they still had an awful lot of empty seats with which they could service additional passengers without any help from Southwest Airlines. When it was my turn to speak to the Court, I told them I had been born and reared in Texas, a City boy in Houston, and that I had an uncle up in East Texas who had a fine quarter horse ranch where he raised and sold registered quarter horses. On my 13th birthday, June 4, 1933, I was spending a few weeks with my uncle and after lunch that day, he said to me, "Lamar, I think you are old enough now to learn some of the facts of life. We've got the finest quarter horse stud in the world coming in this afternoon on a trailer to service a couple of our mares and I'd like for you to see that and I think it will explain a lot of things to you." So he took me down to the barn and I witnessed the servicing of two mares by Cutter Bill, the most famous quarter horse that ever lived; and you know, it's funny that my mind flashed back to that long ago incident when Mr. Lawrence stated to the Court that they had been servicing the public for low these 35 years!

1 - Graph - Passengers Carried

This graph shows the growth of our passenger traffic from beginning of operations through the first quarter of 1974. As you can see from this graph, our total traffic each quarter had a very nice growth trend through the fourth quarter of 1972. In the first quarter of 1973 abnormal growth is shown as a result of two things: (1) on January 22, 1973 we cut the fare in our Dallas-San Antonio market from $26 to $13, and (2) during the months of February and March, 1973 we participated in a price war in the Love Field-Hobby Airport market instigated by our principal competitor, Braniff. This had the effect of diverting most of the commuter business from Intercontinental in Houston to Hobby Airport, with Southwest carrying approximately 60% of diverted traffic and Braniff carrying the remaining 40%.

In the subsequent quarters of 1973, we were able to hold the traffic gains which we had realized during the first quarter's price war at the regular fares and thus for the first time enjoyed profitable operations for a full calendar year. The passengers carried during the first quarter of 1974 show an additional sharp gain similar to the gain experienced during the first quarter of 1973 primarily as a result of (1) the energy crisis which, believe it or not, has taken a lot of people off the interstate highways, and (2) our predominant position in the market after January 13 when the Regional Airport became operations.

2 - Graph - Revenues

This graph of total operating revenues by quarter from the third quarter of 1971 through the first quarter of 1974 reflects not only our increases in passengers but also additionally reflects our pricing actions over the history of the company. Our price philosophy, including some of the mistakes we have made in this regard, will be discussed in more detail at a later point in this presentation.

3 - Graph - Expenses

This graph presents pictorially our total costs of operation, again by quarter. As the graph indicates, we have done a fairly creditable job of holding costs constant throughout our operating history in spite of substantial inflationary tendencies and very substantial salary and wage

adjustments at the beginning of our second and third year of operations. The very substantial increase shown for the first quarter of 1974 reflects the effect of the Middle East embargo on petroleum and the 25% fuel cost increase which that caused under our contract with Exxon.

4 - Graph - Net Income - Loss

This graph of net income or loss pictures the result of all our efforts and shows the very substantial initial losses incurred which have reduced each quarter until we finally broke into the profit column in the second quarter of 1973 and expect to enjoy profits in the first quarter of 1974 of some $600,000. The trend line is just about as straight as one could imagine and presents a textbook example of planned progress.

5 - Black

To this point I have given you a brief summary of how we financed and got the airline into the air within six months and in summary form the traffic and financial results of our 2 1/2 years of actual operations. No other airline ever reached profitability in such a short period, and many major carriers had much slower starts. American Airlines, for instance, carried its one-millionth passenger in its eleventh year of operation. We did it in less than one-quarter of that time. How did we move into these markets, expand them over 100% in two short years after they had sat dormant with no growth for the five previous years and thus carve out a place for ourselves against entrenched competition, debilitating lawsuits, and predatory scheduling tactics by our competitors? It was done by 215 competent, dedicated, and enthusiastic employees; by a pricing program that, after a few wrong turns, clicked; and finally a marketing concept with some zing.

First, I have always felt that the basic philosophy of the CAB certificated interstate carriers is to provide the minimum service that they can get by with for the maximum fare that they can get away with. Southwest Airlines' basic policy has always been just the reverse of that...provide the maximum service that you can for the minimum fare that you can live on.

6 - $20 - Lovely Price

Following this philosophy, we had started out in June, 1971 with a basic $20 fare which was $8 below the coach fare then charged by our competitors. We had selected the $20 fare because at that fare we could produce operating profits with an average of 40 passengers per flight operated, which at that time seemed to be a reasonable short-term goal for our 112-seat aircraft. As it developed, this price just provided the frequent business traveler who was going, irrespective of price, with a very substantial savings for a caliber of service far above any service he had ever experienced in these markets. But the $20 price was not low enough to reach the mass market which we had hoped it would accomplish. Thus, 89% of our passengers were business travelers.

7 - Black

We thus decided that what the businessman market was interested in was frequent commuter schedules with a high schedule reliability and a pleasant smile, and to heck with the price. Therefore, this particular market was inelastic as concerns price changes. We still believed, however,

that if the price were right, there was an entirely different market which would probably be even larger than the business traveler market. This was the housewife, the truck driver, the student, the secretary, and all other people in that same category who were interested in transportation between our cities but who had not used it in the past because the $20 price was somewhat above bus fares and the out-of-pocket costs of operating their private automobiles. We, therefore, decided in mid-1972 that we would do two things. First, we would raise our basic $20 fare for flights operating between 7:00 a.m. and 7:00 p.m. each weekday to $26 and at the same time we would reduce the $20 fare to $13 on all weekday flights operated at 7:00 p.m. and after and on all flights operated on Saturdays and Sundays in the hope that for the first time we would really begin to penetrate the mass market which we were confident was there for the taking, if the price were right.

8 - Bar Graph - System Traffic

The bar graph you see on the screen is a picture of what happened. Each bar represents a month's traffic from July, 1971 through January, 1974. The bottom portion of each bar which is black reflects the number of passengers flying our full-fare flights. The top part of the graph which is red shows the amount of traffic flying on the Southwest system at the $13 fare. As you can see from each month's bar graph, we have in fact substantially increased the amount of traffic over our system. It is extremely important to point out, however, that the substantial traffic which Southwest Airlines is carrying and the substantial increases that we have enjoyed have not been at the expense of our competitive carriers, Braniff and Texas International.

9 - Dallas - Houston Market

This graph shows the total amount of traffic in the Dallas-Houston market in each direction each day from 1967 through the first half of 1973. The bottom part of the graph which is red is Braniff's traffic in this market for 1967; 1968; 1969; 1970; 1971, divided into the two half-years before and after our operations began; 1972; and the first half of 1973. The yellow portion of the graph is that traffic carried by Texas International, and finally in the last three bars the orange top part of the graph is that traffic carried by Southwest Airlines. So, as you can see from this graph, at least in the Dallas-Houston market, we have not hurt the carriers that were there prior to our entry. What we have done is to expand the market. From 1967 through the first half of 1971, the average daily passengers in each direction in the Dallas-Houston market averaged between 500 and 550 passengers per day with no growth whatsoever indicated. With Southwest's competitive spur and superior service, in 1973 the average number of passengers in this market was well in excess of 1,000 passengers per day in each direction. And in March, 1974, Southwest alone carried an average of 650 passengers per day in each direction in the Dallas-Houston market. At current traffic levels, we are carrying all by ourselves more than the total market prior to our entry.

10 - Dallas - San Antonio Market

In the Dallas-San Antonio market the graph on your screen shows that from 1967 through fiscal 1972, the carriers serving that market, Braniff, Texas International, and American Airlines, averaged slightly in excess of 200 passengers per day in each direction with no growth whatsoever.

These are the black bars on this graph. The orange bar represents the average daily passengers carried by Southwest Airlines during the period January through August 1973, which by itself is more traffic than had historically been carried in this market by three other carriers combined. Last month, March, our average daily traffic in this market was up to the 340 passenger level, or 50% more than the total market before our entry. We don't know what the other carriers are carrying currently, since the reports have not yet been issued by the Civil Aeronautics Board, but we do know that Braniff is operating even more daily schedules today than they were during this base period from 1967 through fiscal 1972, so they must be doing O.K. Again, we have expanded the market and have not hurt our competitive carriers.

Enough talk about pricing. Pricing is critical. Everyone will agree to that, but it doesn't mean a thing if you don't tell the people about it. That's where the advertising and promotion come into the picture. You can give something away, and if nobody knows it, they're not going to take it.

Therefore, Southwest Airlines has, even from before we began operations, considered advertising and promotion to be an extremely crucial tool in our ultimate success. The remainder of this presentation, therefore, will be devoted to showing you on the screen and by sound the way Southwest Airlines has projected its product and its image to the people of Texas through the wonderful cooperation of our advertising agency, The Bloom Agency, in Dallas, Texas.

11 - Teaser Ads

Approximately two weeks before scheduled service began, these teaser ads were sprinkled throughout the leading morning and evening newspapers of the three cities we serve encouraging people to call a number and this is what they heard when they called that number.

A - Telephone Tape

12 - At Last,...

13 - Doubletruck

All Sunday newspapers on the Sunday immediately preceding our inauguration of service included this four-color doubletruck ad announcing the beginning of scheduled service by the fabulous new carrier in the Dallas-Houston and Dallas-San Antonio markets.

14 - 19 - Followup Full Page Ads

Each day following the Sunday doubletruck ads these full-page ads appeared in the paper up through the inauguration of service and all potential passengers entering each of our three airports could not have helped but see these large billboards.

20 - Billboard at Airport Entrances

All TV viewers saw one or more of these three 30-second commercials.

21 - Black

B - Three 30-second TV Spots

Our explosion on the scene with massive advertising and terrific service gained national publicity as indicated on the screen.

22 - National Publicity

And Frank McGee's 6:00 o'clock NBC News reported it in the following manner:

23 - Black

C-NBC News Segment

24 - Hourly Flights

We announced our every-hour service to Houston in this manner.

25 - The Love Seat

We guaranteed a seat to every passenger who arrived at our gate within five minutes of scheduled departure with this LOVE-ly ad.

26 - Fourteen Miles Closer

We shortened commuter times between Dallas and Houston by beginning service to Houston's close-in Hobby Airport and announced it with this ad.

27 - Who's No. 1 at Hobby?

When Braniff could no longer stand the pressure and joined us at Hobby, we ran this ad comparing our schedules and service.

28 - Executive Class

When we raised the $20 fare to $26, we did it in a positive vain and never had a single complaint.

29 - Black

During this entire period, we were running this series of 10-second TV spots.

D - Six 10-second TV Spots

30 - Remember What It Was Like...

During 1973, our principal campaign was built around "Remember What It Was Like Before Southwest Airlines?" and these posters were prominently displayed throughout our three cities. In Texas it was not hard to remember Braniff's poor service before the competitive spur of Southwest. At the same time this series of six TV ads was being shown on all local TV stations.

31 - Black

E - Six Remember What It Was Like TV Spots

32 - 60-day Half Price Sale

We had conquered the Dallas-Houston market but had never really made a dent in the Dallas-San Antonio market. We did it with this full page ad announcing a 60-day half-price sale on all flights in that market and backed it up with two funky radio commercials directed at the man on the street similar in vain to these two radio commercials which were run on country and western and top 40 stations at the time we went to the $13 fare on weekday evening and all weekend flights.

F - Two 60-second Frivolity Commercials

34 - Braniff's Get Acquainted Sale

In short order, Braniff retaliated by cutting the price in half on their flights between Dallas and Houston's Hobby Airport.

35 - Lousy $13

Four days later Southwest came out with this doublepage ad in the Dallas and Houston newspapers saying that nobody was going to take our passengers away from us for a Lousy $13 and meeting their price. Our traffic growth during this 60-day $13 War was stupendous, and if any one single thing made Southwest, it was Braniff's crucial mistake of entering into a price war with Southwest Airlines!

36 - Expose Yourself

After winning a Federal Court case in 1973 permitting us to stay at Love Field after it closed, the historic day finally arrived on January 13, 1974, when this full-page ad appeared in the morning and evening papers of all three of our cities.

37 - Poster - Love Is Still Our Field

Simultaneously, our 1974 program theme was introduced, which is Love Is Still Our Field. These posters actually blanket the three cities we serve, and heavy TV coverage of the following ads is currently taking place.

38 - Black

G - Four 30-second TV Spots

39 - "Thanks-A-Million"

In celebration of our carrying our millionth passenger in late January together with our desire to continue the fabulous traffic loads we have been carrying since January 13, each passenger who bought a round-trip ticket on Southwest during the month of February received a Passport to Paradise, Paradise being the Fairmont Hotel in Dallas, Texas, at which their Passport will have a value of $5 for any of the many services available at that fabulous hotel.

That, ladies and gentlemen, brings you right up-to-date on our marketing program and now I would like to show you a few of the beautiful girls who have played such an important part in making Southwest Airlines famous.

Catalog Sales

Earl L. Lasley
Farmers Hybrid Companies, Inc.

Catalog sales suggests a "male" order business. It implies volume and a single source supplying all the needs as well as sales based on customer confidence. For the beef cattle business that would be the wide variety of seedstocks needed to sustain a rotational crossbreeding program.

Today's beef cattle breeding stock merchandising program may be missing the point of performance testing. Performance is not as much a system for sale of breeding stock as it is for the means of improving the foundation herds from which seedstock is sold. A useful herd improvement program needs a herd structure that permits herd continuity or requires few introductions since the key to successful business is the establishment of a unique identity. A unique identity is needed to attract customers.

Performance is more than weight-for-age, in fact, performance testing as we commonly think of it is only about one-third of the needed input. Efficiency, maternal ability and reproduction capabilities must also be considered.

My firm's swine marketing concept is an example of a business approach for the future. It is based on proprietary breeds used in a crossbreeding rotation which we determine and which has the advantage of a high incidence of repeat sales. It provides breeding stock at a fixed and uniform price, provides delivery service, a respectable health program, breeding performance guarantee and is based on a formidable intra herd testing and intense selection program for traits of major economic concern to the swine industry.

Our beef breeding effort is patterned after this successful swine business approach. It is called the MIXER$_{tm}$ Beef Breeding System - not just a bull -- a breeding system -- the first systematic breeding system in the cattle industry.

Efficiency of Production and Cow Size

T. C. Cartwright
Animal Breeding and Genetics Section
Animal Science Department, Texas A&M University

Beef cattle breeders no doubt understand a great deal about cow size and its relationship to efficiency of various segments of production. Yet there is still difference of opinion and controversy about the "best cow size." This seeming enigma results, I believe, from two sources. One is the inability to allow for all the positive and negative effects of various sizes in the very complex accounting required to properly evaluate efficiency. I will return to this point later. The second is the failure to properly define our terms; that is, we talk to one another about different things and think we are talking about the same things.

Consider the key terms in the title assigned to me: efficiency, production and cow size. The term efficiency in the context of my talk may be defined differently from your concept. Commercial beef production may be divided into segments with respect to ownership or managementship; for example, one owner may maintain a cow herd and sell calves at weaning, a second owner may grow the calves for a period and a third owner finish them for slaughter. The interests of the several owners are not necessarily identical especially if the market rather imperfectly reflects the true relative value of different cattle. The market is not likely to be discriminating if the only creditable information transmitted to the buyer is the weight and appearance of the cattle. For example, the calf producer is interested in minimizing maintenance costs for his cow herd and may choose to select a type with small mature size if the market tends to recognize numbers of calves rather than gain potential of calves. Even though the market conditions may have an overriding control in determining the most efficient size for an individual producer, efficiency is considered here as if the production operation was integrated (one owner) from calf production, through finishing, to slaughter. All of the inputs and outputs of the system which may affect efficiency should be considered; these include production of replacements, maintenance of purebreds for use in crossbreeding and salvage value of cull cows.

The inputs and outputs may be converted to dollars and cents terms and include cash flow and interest on capital in order to compute economic as well as biological efficiency. Both economic and biological efficiency may be of interest for use in evaluating cow size. The measures of production efficiency proposed are:

Profit - the net monetary return of a complete beef production operation; that is, all returns less all expenses including interests on capital.

Return to investment - profit divided by capital investment. If capital is borrowed from an extraneous source it must be included as indicated under profit. If capital is all from one source, the investor, then it may not be appropriate to include interest as an expense; whether it is or is not included must be specified.

Presented at the BIF Symposium on Cow Efficiency and Sire Evaluation, April 17, 1974, Denver, Colorado.

Liveweight produced per unit of physical input - pounds of liveweight sold per acre or per pound of TDN are examples. If quality of nutrients and of liveweight produced are to be included in the efficiency measure, economic efficiency may be more suitable as quality of a unit of input or output can be weighted by costs or selling price.

The term "production" probably first suggests to a breeder the type of climate, management, nutrition, breeding system and market product most familiar to him even though he does recognize that there are vast differences in these factors across the U.S. and that they do affect the efficiency of beef production. However, we may not fully consider that these factors may in turn affect the efficiency of production of different size cattle differently. For an example that may be current, consider a market which pays a premium for steers finished to the equivalent of the U.S.D.A. choice quality grade. The most efficient size for rate of gain may be quite different if the steers are fed in feedlots when grain is economically available around the year than if the steers are finished largely by grazing on forage which is highly seasonal in quality and quantity and grain is relatively expensive. In the first case, a genotype for a large, growthy type may be most efficient for the finishing phase. In the latter case a genotype for a smaller, quicker finishing steer may be a distinct advantage if the steer can be finished during two summer seasons of abundant forage and carried through only one winter season of poor forage production. (This example was inspired by possible changes in beef production practices which may result either directly or indirectly from a continued shortage of petroleum fuels.)

My point will be made, I believe, if it is recognized that evaluation of efficiency of beef production from different sizes of cows should not be applied to different sets of conditions without determining if it is justified.

The third term, which should be defined, is cow size. A great deal has been learned about size and growth curves during the past few years. The aspect of size, or differences in size, that I refer to is the genetic component. The genetics effect on size is illustrated by the differences between two breeds for average weight. Of course, the difference must be between cattle given relatively equal nutrition and of the same stage of maturity such as mature cows, heifers at puberty, etc. Cow size is the term cattle breeders use to refer to these differences in weight across the entire array of ages and sexes.

Absolute and relative measures of weight are perhaps regarded as the most important characters to consider in setting selection and breeding criteria for beef cattle. Selection for increased rate of gain at any age up to maturity tends to increase mature size to the extent of the genetic correlation between the gain character selected and mature size. This correlation has not been widely estimated, but is usually considered to be high; that is, there is a strong tendency for cattle to follow a pattern of growth. Also, it has been suggested that rate of maturing and

rate of growing are negatively correlated. However, some have observed variation in the relationship among these rates and mature size and suggest that selection could be effectively employed to increase growth rate while at the same time deterring proportionate increase in mature size. Selecting for increased growth rate without placing constraints on mature size and perhaps other correlated characters, may not have a favorable effect on efficiency. However, direct selection for large mature weight is widely recognized, intuitively, as an effective means of increasing growth rate. Heritability of average daily gain (ADG) at one year of age and mature weight may be reasonably assumed to be 0.40 and 0.70, respectively, within breeds under environmental conditions that prevail over a limited, uniform geographical area and system of management. Also, it is realistic to assume a genetic correlation of 0.70 between ADG and mature weight under these conditions.

Estimated increase in ADG resulting from a reasonable, specified level of selection (truncation selection with a standardized selection differential of 1.0) is 0.25 to 0.30 lb. based either directly on ADG or indirectly on mature size (assuming that the standard deviation of ADG is 0.68 lb.). Mature size would be expected to increase approximately 62 to 117 lb. respectively (assuming the standard deviation of mature weight is 165 lb.). The correlated response to selection for either ADG or mature size for more involved characters such as herd profit are not predictable from established genetic theory. Nonetheless, decisions concerning selection must be made.

Several years ago we began to apply some techniques of operations research utilizing data from our studies of rates of growing; rates of maturing (growth curves) and heterosis in beef cattle. We simulated the production and efficiencies of cattle taking into account the input and output variables of the entire system of the production of beef up to slaughter. One of these studied the effect of size on overall efficiency of production in an integrated operation. We assumed no differences in fertility or milk production but that growth and maturing rates were determined by genotype for mature size under a fixed environment. The same fixed amount of resources were allocated for nutrients for each herd so that comparisons could be made on the basis of liveweight produced from a given amount of resources for nutrients. A number of other assumptions were made and programmed into the deterministic model which included a linear program for maximizing profit. The production efficiencies for straightbreds of small (S), medium (M) and large (L) size, typified by mature cows weighing 950, 1100 and 1325 lb., respectively, were simulated for two sets of environmental (management-nutrition) conditions for the cow herd: (1) fed all harvested feed in confinement which is referred to as feedlot and (2) pasture as available plus harvested supplements which is referred to aspasture. All males and surplus females were fed for slaughter in a feedlot after weaning.

These results illustrate several points. One is that there are no very large differences in the overall efficiency of the different sizes. The advantages in efficiency of one size for one segment of production (e.g., lower per head maintenance requirements for the cows of small genotype) tend to be offset by lower efficiency for another segment of the production unit (e.g., lower rates of gain in the feedlot for the progeny from the herd of small genotypes). However, there were some differences which were not readily predictable. For the fixed input of resources for nutrients for sustaining the cow herd and finishing the slaughter cattle,

larger numbers of smaller cattle were possible and the smaller cattle consistently returned more total liveweight for their fixed nutrient input. Increasing size tended to increase economic efficiency in the feedlot while it tended to decrease profit and increase return to investment in pasture. Effects of size were less pronounced in the pasture regime.

The term cow size probably became established to designate size characteristics of cattle of both sexes and all ages because size is probably most important in the cow. It is most important in the cow because (1) she is more numerous and is kept longer than either bulls or slaughter cattle, and (2) the amount of feed (or acres of pasture or range) required to grow and maintain her is a function of her size. For example, 56% more small cows were supported than large cows in the simulated cow size study; i.e. where one large cow and finished calf could be supported over one and one-half small cows and finished calf were supported. Crossbreeding seemed to offer possible ways of using the advantages of both small size and large size.

Crossbreeding designates the mating of bulls of one or more breeds with cows of one or more breeds. Selection may be employed but, in fact, one real advantage of crossbreeding is that breed characteristics, which presumably are the result of long time selection criteria, may be exploited; that is, selection will be considered to have been employed within the purebreds, and except for utilizing the purebreds, selection will not enter into considerations of crossbreeding and cow size. The benefits which accrue from crossbreeding for a particular use may be classified into three categories: (1) additivity or a favorable blend of traits resulting from the averaging effect of each breed combined in a crossbred individual, (2) heterosis or a favorable interaction resulting from combining gametes from two or more different breeds in a crossbred individual, and (3) complementarity or a favorable interaction resulting from combining two or more different breeds in a crossbreeding production unit. The benefits of crossbreeding are almost always at least partly offset by complications of maintaining a crossing system or other undesirable effects such as increased dystocia.

The additive effects of crossbreeding are largely a matter of choosing a breed which is extreme for one or more characters of concern in order to improve a breed deficient in that character. Of course, if the second breed has traits which tend to overcome some efficiency in the first breed, then the combination becomes more attractive. An example of additivity is crossing Brahman with a British breed to gain a more favorable combination of adaptability to subtropical areas, growth rate and finishing qualities. Another example recently popular in combining the "meatiness" of Limousin with the marbling and finishing qualities of the Angus in an effort to gain an optimal combination of characters according to current vogue in steer shows. Heterosis levels have not been evaluated over a wide range of genotypes and environments but there is sufficient evidence in beef cattle to conclude that at least in some crosses there is substantial heterosis and that there is substantial variability in the general combining ability of different breeds.

Complementarity was recently described by Cartwright as the "advantage of one cross over another cross or a purebred resulting from the manner in which two or more characters combine or complement each other." Complementarity is made up of the cumulative effect of the interactions among the phenotypes of sire, dam and progeny on characters which are measures of the performance of the production unit such as net profit. An example of complementarity from a cross of Charolais bulls on Angus-Jersey F_1 cows, compared to straightbred Herefords, was conducted at the McGregor Station in Texas. Feed consumed by cows and calves during lactation and from weaning up to approximately one year of age were observed. The relatively low nutrient requirements for maintenance of the F_1 cows combined with a relatively high growth rate of the three-breed cross progeny so that the cross produced a pound of liveweight on 17% less feed up to weaning and on 6% less feed up to one year age of calf. However, this detailed study of the efficiency of cows and calves did not take into account the nutrient and other economic requirements necessary for producing herd replacements.

In order to experimentally evaluate the efficiency of total producing units for several different breeding systems using only a very small sample of the cattle breeds would require vast facilities and a long period of time; even if facilities, financing and personnel were available, problems of design and conduct would be discouraging. Using the simulation technique again with the small, medium and large cows in crossbreeding systems, the effects of cow size on heterosis and complementarity may be realistically examined.

Crosses between two small breeds (SxS), two medium breeds (MxM), and two large breeds (LxL) produced returns to investment of 15.9, 16.6 and 16.0% while S, M and L straightbreds produced 14.8, 14.9 and 14.9%. It is interesting to note that in these crosses, the M size tended to be optimal even though heterosis and input variables other than mature size and related rates of maturing and growing were set equal. The effects of complementarity can be demonstrated by observing the returns to investment of 15.0 vs 17.7% for SxL and LxS crosses respectively.

The results of crossing systems using three breeds and rotations were also examined. The three-breed crossing systems utilized F_1 cows and straightbred bulls. These systems provided the opportunity to minimize heterosis and complementarity in parts of the system but in the process of producing female herd replacments, unwanted small straightbred and F_1 males were produced. The rotation systems do not maximize heterosis and cannot take advantage of complementarity but production of replacements is uncomplicated and all cattle except the sires are hybrids.

Even though the various advantages and disadvantages of each of the crossbreeding systems in integrated, self-contained herds tended to counterbalance and equalize efficiency, there were important differences when considered as net effects. Both heterosis and complementarity consistently added to net efficiencies. Systems using smaller size cattle in crosses produced more liveweight. Compared to straightbreds of medium size (M) for mature cow weight, single crosses between two breeds were always more profitable except in one case of extreme negative complementarity where sires of small size (S) were mated to cows of larger size (L). However, liveweight

produced by single crosses was less than straightbred M in every case L cows were used. Two-breed rotation crisscrosses were generally comparable to the single crosses in all measures of efficiency; in fact, they were remarkably similar. However, the single crosses utilizing complementarity exceeded the most efficient rotation where complementarity cannot be utilized. Three-breed crosses using L sires on two-breed F_1 cows, added an additional increment of efficiency. These results indicate that breeds of smaller size can be more efficient under one typical Texas pasture production condition and are especially useful in adding efficiency to crossbreeding if sire breeds of large size are also available.

It appears that the net efficiency of commercial beef production can be increased by utilizing crossbreeding which produces heterosis and provides the opportunity for adding another increment through complementarity. In order to use heterosis and complementarity it is necessary to have purebreds; for example, in the three-breed systems of crossbreeding about 44% of the calves and about 20% of the cows are straightbred. In order to use crossbreeding effectively in a particular area, a number of different breeds with different traits, especially for size, and different genetic background are desired. These breeds, or at least some of them, should be highly adapted to the environment; a high level of uniformity within the breeds would also be desirable. Perhaps a real need which has been largely neglected is that of providing incentive to breeders of purebreds to select cattle for ability to combine well and complement other breeds when crossed. That is, selection for traits which tend to increase efficiency of the breed per se would be secondary to selection for traits which would improve efficiency in crossbreeding systems.

The efficiency with which purebreds reproduce themselves, because of the low fecundity of cattle, has an important effect on the efficiency of the crossbreeding system in which they are used. This effect is greater for breeds used as maternal lines in crosses than it is for breeds used as paternal lines; i.e. selection can be more intense for traits which contribute to combining ability and complementarity in paternal lines than in maternal lines. It appears that selection emphasis has tended to favor traits useful in paternal lines for all breeds rather than being limited to the few which already best fit the criteria. The results of these selection practices has been to create more variability, and consequently less predictability, within breeds and, therefore, to diminish the utility of breeds for as maternal lines in crossbreeding. This trend reflects a move toward more objectivity among breeders in selection but combined perhaps, with less understanding or concern for the total production system.

Cow size, along with its correlated effects, is probably the most important character in beef cattle. Fortunately we have wealth of genetic variability in size thanks largely to the exotics and AI. I believe that the possibilities for the American beef cattle producer to increase efficiency of production profit are enhanced if we retain this variability. It gives him greater opportunities and greater flexibility over a wider range of production conditions. However, this variability can be more sensibly and productively used if it is ordered into breeds. Every breed should set criteria--standards--for its most important characters. What is more important to know with assurance about a breed than its size?

EFFICIENCY OF PRODUCTION AND MILK PRODUCTION

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Milk and Weaning Weight

Due to a worsening cost-price squeeze for 25 years, cow-calf producers have been interested in increasing milk production of beef cows to increase weaning weights. Selection for weaning weight results in selection for higher milk production, but milk production potential can be increased most rapidly by infusing genes from animals of dairy breeding. Research has shown a strong correlation between level of milk production of beef cows and weaning weight of their calves.

Milk to Calf Efficiency

How efficient is the conversion of milk to calf? A conversion figure of approximately 5 lb. milk per pound of calf gain has been reported. More important is the conversion of additional milk to calf weight. Estimates indicate that among British breeds, 10 to 25 lb. additional milk above that produced by low producers is required for each additional pound of weaning weight. Even at the higher figure the conversion of milk dry matter is rather efficient (25 lb. milk x 12% dry matter = 3 lb.) compared to the 10 lb. dry matter per pound additional calf gain required from creep-feeding grain, especially considering that the cow can subsist on rather low quality forage most of the year.

However, high levels of milk production might be less efficient. Milk in excess of demands for calf growth might have a low economic value due to excessive fattening of the calf and accompanying lowered feedlot efficiency, reflected ultimately in a lowered price per pound at weaning. The ceiling for milk production may be governed by reproductive performance, with the optimum level of milk production in a particular environment not exceeding that level which could be sustained without a decrease in percent calf crop.

How Much Milk Should a Range Cow Produce?

How much milk will a cow with a very high potential for milk production actually produce under range conditions? Will the capacity of a cow's calf limit her milk production? Will additional increments of milk production at high levels of milk yield be efficiently converted to calf weight? Will a heavy milking cow rebreed under range

conditions? How much more supplement will a heavy milking cow need under range conditions? How will calves out of heavy milking cows perform in the feedlot? What kind of carcasses will they produce? And ultimately, how does level of milk production influence efficiency of use of total industry feed resources? All of these questions are important, many are related, and all are components of the original question, "how much milk should a range cow produce?"

Oklahoma Research

To provide some answers to questions regarding level of milk production, research is being conducted at the Oklahoma Agricultural Experiment Station.

Groups of Hereford, Hereford x Holstein and Holstein females have been continuously maintained under tallgrass native range conditions at the Fort Reno Livestock Research Station since they were one year old.

Different Supplement Levels

Within each breed, the females have been subjected to two levels of winter supplementation designated as Moderate and High. The Moderate level consisted of that amount of supplemental feed deemed necessary to allow good rebreeding performance in the Hereford females. Previous experience at the Fort Reno Livestock Research Station suggested a winter loss (including weight loss at calving) from fall to spring of 10 percent for yearling heifers bred to calve at 2 years of age and 15 percent for 2-year-old females, rebred to calve at 3 years of age. The same level was fed to a group of Hereford x Holstein females and to a group of Holstein females.

The High level was established by the Hereford x Holstein females and consisted of that amount of supplement estimated necessary to maintain a body condition and physiological activity comparable to that of the Moderate Herefords; this same level was fed to a group of Hereford females and to a group of Holstein females. Also, a Very High level was fed to a group of Holstein females. This level was established by the Holstein females and consisted of that amount of supplement estimated necessary to maintain a body condition similar to the Moderate Herefords and High Hereford x Holstein crossbreds; this level was fed only to Holsteins.

The base breed-treatment groups were the Moderate Hereford, High Hereford x Holstein and Very High Holstein females which were fed, as 2-year-olds, an average of 2.6, 5.5 and 7.7 lb./head/day post-calving of a 30 percent crude protein supplement, respectively. As 3-year-olds they were fed 3.0, 6.3 and 9.2 lb./head/day, and as 4-year-olds 2.7, 5.8 and 8.4 lb./head/day, respectively. Within each nutritional treatment, the quantity of supplement fed each female was adjusted for differences in body sizes. Supplement intake by treatment and breed is shown in table 1.

Note that the high level of supplement (estimated as the amount required by the Crossbreds) has been about double the Moderate level (estimated as adequate for Herefords), and the Very High level (estimated as the amount required by the Holsteins) has been approximately triple the Moderate level.

Results

The cows in this experiment have weaned three calf crops; some pertinent results are shown in table 1. Part of the cows have been maintained in drylot to provide information on roughage requirements shown in table 1.

Calves are placed on feed at weaning time, fed to an approximate grade of low choice, slaughtered and evaluated in the carcass. The first two calf crops have been slaughtered. Some results are shown in table 2; results are shown only by breed of dam since level of supplement of dam had little influence on feedlot performance or carcass merit.

First Calf Crop

As 2-year-olds, Crossbreds and Holsteins produced more milk (50 and 100 percent) and weaned heavier calves (53 and 117 lb.) than Herefords, but rebreeding performance of Holsteins on lower levels of supplement was somewhat lowered. Herefords fed the Moderate level were the most profitable because the larger, heavier milking females consumed more feed. In the feedlot, calves out of Hereford cows required the shortest feeding period, gained the fastest and were the most efficient, followed by calves out of Crossbreds. Calves out of Holstein cows were heaviest at slaughter and had an advantage in fatness (less), marbling, carcass grade and tenderness. Holsteins were most profitable in the feedlot, followed by Crossbreds, primarily because of their lower initial appraised value.

Second Calf Crop

As 3-year-olds, results were similar to those of the previous year, with Moderate Crossbreds failing to rebreed as well as Herefords. Moderate Herefords continued to be most profitable, either to weaning or through the feedlot phase, primarily because of acceptable rebreeding performance and minimum feed cost. In the feedlot, calves out of Hereford cows required the shortest feeding period, and gained most rapidly and most efficiently. Calves out of Holstein cows were heaviest at slaughter. Calves out of Hereford cows produced carcasses with more muscling, as indicated by more ribeye area per cwt. carcass, and a higher conformation grade, while calves out of Holsteins produced heavier carcasses with less external and internal fat and produced more carcass weight per day of age. Calves out of Crossbreds and Holsteins were similar in marbling and carcass grade, and slightly superior to Herefords in these traits.

Third Calf Crop

Winter weight losses within breed reflected differences in level of winter supplementation to a greater extent than in the two previous years, particularly among Herefords and Holsteins. Winter weight loss of Moderate Holsteins was especially high because many were open the previous year and consequently unusually heavy the preceding fall.

As has been true previously, level of winter supplement was not reflected in consistent advantages in milk yield or weaning weight within breed. However, breed differences in milk yield and weaning weight continued to be quite large; calves from Crossbreds and Holsteins weaned approximately 67 and 133 lb. heavier than those from Herefords.

In the third year, for the first time, Crossbreds rebred as well as Herefords. Perhaps as the females approach maturity and nutrient requirements for growth decrease, the Crossbreds will be more competitive with the Herefords. Those at the Moderate level certainly will be if they continue to rebreed well as they did this third year. Rebreeding of Holsteins at the two lowest levels of supplementation was very poor the third year. It appears that the Very High supplement level will be necessary to support the level of milk production typical of Holsteins.

Both Crossbreds and Very High Holsteins were comparable to Herefords the third year in returns above feed costs. Keep in mind, however, that these returns are on a "per cow" basis, and fewer of the heavier milking cows can be maintained on a given area of land.

Economic Interpretation

Economic analyses are subject to criticism because economic conditions change, and any given analysis may not apply to any specific operation. However, an economic evaluation can be valuable in adding perspective to results, and any individual operator can make the analysis pertinent to his own situation by appropriately changing the assumptions used in the analysis.

Per Cow

The return per cow above land and supplement costs as an average for the first three calf crops is shown in table 3. Herefords supplemented at the lowest level (Moderate) were the most profitable; heavier milking breeds required more land and either rebred at a lower level or incurred greater supplement costs.

Per Land Area

A more revealing analysis is the one based on 1000 acres of land. The heavier milking breeds were at a considerable disadvantage because fewer cows could be maintained. This important consideration is often overlooked.

Efficiency

The drylot phase of the experiment has yielded, information on the efficiency of utilization of feed resources. Holsteins have been most efficient in converting feed to milk, but Hereford progeny have been most efficient in converting feed (milk alone or milk plus creep) to weaned weight and in conversion of total feed consumed by cow and calf to carcass beef or carcass energy.

Hereford progeny responded most (in weight) to increases in milk production and required the least milk per pound of gain, followed by Crossbred progeny.

Conclusions

Weaning weights were increased considerably with heavy milking cows. However, these increases in weaning weight were not free and were in fact unprofitable.

Many cows produce too little milk and the weaning weights of their calves could be profitably increased by higher levels of milk production. But we should not worship weaning weight for the sake of weight alone. The name of the game is still profit. There obviously is a point beyond which additional increases in weight accomplished with higher levels of milk do not increase profit. We must recognize that there is such a point and consider economic implications before assuming that an increase in milk production is automatically desirable.

TABLE 1. PERFORMANCE OF HEREFORD, HEREFORD x HOLSTEIN AND HOLSTEIN FEMALES AS TWO-, THREE- AND FOUR-YEAR-OLDS

Item	Breed of dam	Hereford		Hereford x Holstein		Holstein		
	Level of supplement	Moderate	High	Moderate	High	Moderate	High	Very High
2-Year-Old (Calves sired by Angus bulls)								
Weight at calving, lb.		885	904	988	995	1151	1190	1116
Daily supplement, lb.		2.6	4.8	3.1	5.5	3.3	5.7	7.7
Daily milk yield, lb.		12.0	12.9	17.3	19.3	23.5	24.5	24.8
Weaning weight, 240, lb.		507	500	550	563	604	621	634
% cows rebred		100	100	85	100	69	87	94
Roughage intake, %		100	102	118	112	147	146	136
Return above feed cost, $		122	106	115	105	105	97	90
3-Year-Old (Calves sired by Charolais bulls)								
Weight at calving, lb.		1012	1022	995	1070	1187	1172	1210
Daily supplement, lb.		3.0	6.1	2.9	6.3	3.3	6.4	9.2
Daily milk yield, lb.		13.4	13.2	17.7	22.4	31.9	27.8	31.0
Weaning weight, 240, lb.		601	592	645	641	723	736	730
% cows rebred		100	94	79	90	94	94	100
Roughage intake, %		100	92	104	107	131	126	128
Return above feed cost, $		163	149	141	144	103	121	111
4-Year-Old (Calves sired by Charolais bulls)								
Weight at calving, lb.		990	1030	1096	1051	1272	1183	1212
Daily supplement, lb.		2.7	5.8	2.7	5.8	3.1	6.1	8.4
Daily milk yield, lb.		13.4	13.5	20.4	20.2	25.5	29.8	26.2
Weaning weight, 240, lb.		574	576	625	659	732	699	692
% cows rebred		86	92	92	86	50	64	100
Roughage intake, %		100	113	122	128	145	147	138
Return above feed cost, $		186	181	193	184	91	115	184

TABLE 2. FEEDLOT PERFORMANCE AND CARCASS MERIT (AVERAGE OF STEERS AND HEIFERS)

Item	Breed of dam		
	Hereford	Hereford x Holstein	Holstein
First calf crop (sired by Angus bulls)			
Slaughter weight, lb.	877	981	1081
Days fed	140	158	188
Daily gain, lb.	2.86	2.81	2.62
Feed/lb. gain, lb.	7.62	7.64	8.98
Carcass weight, lb.	530	599	675
Ribeye, sq. in.	10.8	11.4	12.0
Fat thickness, in.	.84	.94	.80
Cutability, %	48.1	47.2	47.5
Carcass grade[a]	9.6	9.9	10.4
Second calf crop (sired by Charolais bulls)			
Slaughter weight, lb.	990	1047	1177
Days fed	187	207	231
Daily gain, lb.	2.24	2.11	2.02
Feed/lb. gain, lb.	10.0	10.8	13.0
Carcass weight, lb.	618	651	748
Ribeye, sq. in.	12.4	12.8	13.7
Fat thickness, in.	.63	.67	.55
Cutability, %	49.3	49.2	49.9
Carcass grade[a]	9.9	10.2	10.2

[a]9 = high good, 10 = low choice.

TABLE 3. ECONOMIC ANALYSIS[a]

Item	Breed of dam	Hereford		Hereford x Hereford		Holstein		
	Level of supplement	Moderate	High	Moderate	High	Moderate	High	Very High
Return per cow[b], $		158	143	137	142	102	113	136
Per 1000 acres								
No. cows[c]		143	140	124	123	104	102	107
Profit per year[d], $		14,000	11,600	9,500	10,000	4,300	5,400	8,000

[a]Based on results of three calf crops.
[b]Return above land and supplement costs.
[c]Based on roughage intake in drylot.
[d]Return above all costs.

COMPARISON OF ANALYSIS PROCEDURES FOR NATIONAL SIRE EVALUATION USING SIMULATED DATA[a]

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Background

National sire evaluation programs are being conducted to provide the beef industry with Expected Progeny Difference (EPD) values. The EPD is used to rank sires on the basis of the predicted performance of their progeny. Sires are compared through the performance of existing progeny records in economically important traits.

Questions that arise in determining an appropriate model for estimating EPD include whether sires should be considered as fixed or random effects, whether dams should be considered in the model, whether an interaction between sire and herd should be included and whether there is a constant mean-variance relationship across herds.

Sufficient data is not available yet to indicate the existence or magnitude of a sire by herd interaction. The interaction, if present, could be due to a true genotype by environment interaction or to special treatment given to a sire progeny group or both. The constant mean-variance relationship or coefficient of variation [(variance)$^{1/2}$/mean] has been observed in beef data. Bull calves weigh more and have a proportionally larger standard deviation [(variance)$^{1/2}$] than heifers.

In this presentation, I wish to relate some of the results from research concerning analysis procedures from national sire evaluation programs. Six procedures were used to calculate EPD values on sires in all or some of sixteen simulated data sets. Only a brief description of the data sets and analysis procedures will be given.

Data

Sixteen data sets, the combinations of four data structures and four data models were generated on a computer. By using generated data, the true transmitting ability (what the EPD is intended to estimate) of each sire was known. Yearling weight was the trait considered. The effects of age and sex were not considered. That is, all animal records were assumed to have been adjusted to 365-days and to a steer basis. The same one hundred sires produced progeny in each of the data sets.

Descriptions of the four data structures are given in table 1. Structures A, B and C were intended to represent data from possible designed sire evaluation programs, whereas D hopefully would simulate data arising through performance records systems from which sires could be evaluated.

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[a]Based on Ph.D. thesis research at Iowa State University, Ames.

Descriptions of the four data models are given in table 2. Model I was a simple linear model. Models II and III had a 5% or 10% sire by herd interaction considered in their generation. A constant coefficient of variation was used in model IV. In all four models, the within herd heritability (h^2) was .40.

Analysis Procedures

Six procedures were employed to calculate EPD. Procedures LI, L2, MS and RI were used in all sixteen data sets, MSI was used in data sets generated by models II and III and W was used in data sets of structures A, B and C. Brief descriptions of these are given here.

LI: Least squares effects for sires (from an analysis considering herds and sires) were regressed by $\frac{nh^2}{4+(n-1)h^2}$ where n = number of progeny by the sire.

L2: Same as LI except regression factor was $\frac{\sigma_s^2}{\sigma_s^2 + \sigma_d^2}$ where σ_s^2 = sire component of variance and σ_d^2 = sampling variance of least squares sire effect.

MS: Least squares equations (considering herds and sires) with $\sigma_e^2/\sigma_s^2 = 4/h^2-1$ added to the diagonal of the sire equations were solved for the sire effects (σ_e^2 = within component of variance)(also called mixed model).

MSI: Least squares equations (considering herds, sires and sire by herd interactions) with σ_e^2/σ_s^2 added to diagonal of sire equations and σ_e^2/σ_{sh}^2 added to diagonal of sire by herd equations were solved for the sire effects (σ_{sh}^2 = interaction component of variance).

RI: Iteration using within herd sire progeny ratios adjusted for sire of contemporaries and weighted by number of progeny by the sire, number of contemporary progeny and number of progeny by reference sires. Ratios were changed to deviations after the iteration was completed.

W: EPD = S - R + R* where S = within group estimate for the sire, R = mean of within group estimates of reference sires, R* = overall mean of the estimates for the same reference sires; all estimates were calculated by the mixed model method.

Results

Simple correlations and rank correlations were calculated between the EPD values and the true values (transmitting ability). The simple correlation is a measure of the degree of closeness of linear relationship between EPD and true values. The rank correlation is a measure of the closeness between the ranks of the EPD values and of the true values. Evaluation of the procedures was based on the magnitude of these correlations for each procedure in the data sets where used.

There was really little difference between the analysis procedures. The difference between the highest and lowest correlations in each data set was never more than .06. Procedure MSI, although it did do the best job, was only slightly better in its ability to estimate EPD values than the other procedures in the interaction data sets. Whether sires were considered random (procedure MS) or considered fixed and then regressed for numbers (procedures LI and L2) made little difference. Procedure RI used ratios in the solution and the ratios were then converted to deviations for the EPD values. The ability of this procedure was not different from procedures using deviations throughout their calculations.

The MS and RI procedures had the highest correlations overall for the different data structures and models. Solutions for procedure RI were completed much faster than the solutions for MS. Solutions for MS were obtained via inversion of the coefficient matrix. Alternative routines to solve the equations in MS such as iteration with only one equation held internally in the machine at a time would reduce the storage requirements. Possibly the main criteria by which to select an analysis procedure are the theoretical properties of the procedure. Then MS would be the procedure of choice.

The mean simple correlations and rank correlations within each data set (model and structure combination) are given in tables 3 and 4. Comparisons between data models and between data structures can be made from these tables.

Estimation of sire EPD values should be optimum under model I compared to models II, III and IV. No large differences were found between the correlations in the data using models I and IV. The interaction model data had lower correlations. This was especially true in data structures B, C and D. The presence of a sire by herd interaction as small as 5% reduced the ability of the procedures to estimate EPD values in this study.

The large differences between data structures can be attributed to the number of progeny by sires. Structure A had 10 progeny by each non-reference sire and they were compared against 2 or 3 progeny from each reference sire used in the same herd. The number of reference sires in a herd ranged from 5 to 10. Structure B had 10 progeny by each nonreference sire and from 5 to 15 progeny by each reference sire in the same herd. Two of the four reference sires were represented in any one herd. The total number of reference sire progeny was the same for any particular herd size in both A and B. Correlations in structure B were higher than in A, except for model III. With the same total number of reference sire progeny, fewer reference sires (B versus A) with more progeny each appears to give a better structure. The optimum design would be to have only one reference sire. Structure C had twice the number of progeny for non-reference and reference sires as structure B. The larger numbers of progeny increased the accuracy with which the procedures could estimate the sire values. Most of the nonreference sires in D had 20 progeny (like C), except for a few sires having only 10 progeny. The big difference between C and D was the number of reference sire progeny. In C, number of progeny ranged from 10 to 30, but in D, number of progeny ranged from 10 to 75 per reference sire in a herd. Nondesigned data which may arise in breed programs may not have as many progeny per reference sire as D in this study. Nearly twice the total number of calves (7280 versus 3200) were necessary for data structure D as C, but the correlations were only slightly higher. This suggests a savings in total calves used in sire evaluation by using a designed structure. However, if the data are available anyway, this point is not at issue.

Summary

Procedure MS appears to be the method of choice at this time. This is based on its performance in this study and on its theoretical properties. Studies need to be made to determine if a model other than model I describes the data better.

The accuracy of EPD from any sire evaluation program is much more dependent on the data going into it than on the method of analysis. Progeny by different sires must be produced and reared such that the only known difference between them is in the contributions from their sires. This requires equal average merit of the groups of cows mated to sires within any herd test. These progeny must then all be managed the same.

The importance of the number of progeny by nonreference sires and reference sires was shown in this study. For a fixed number of progeny by reference sires, it was better to have fewer reference sires with more progeny each (B versus A). One reference sire would be optimum, however the program may be less acceptable to breeders if only one reference sire is available. More progeny by both reference sires and nonreference sires (C versus B) also had a large effect. The relationship between the accuracy of the sire evaluation and the amount of resources (cows and progeny) allotted needs to be studied.

Table 1. Data structures[a]

Structure	Probability of herd being chosen	(Number of herds)	Number non-reference sires	Progeny by each non-reference sire	Number reference sires	Total progeny of reference sires[b]	Total progeny in herd
A							
	.20	(7)	1	10	5	10	20
(1510 total progeny, 32 herds)	.20	(8)	2	10	6	15	35
	.20	(5)	3	10	8	20	50
	.20	(8)	4	10	9	25	65
	.20	(4)	5	10	10	30	80
B							
	.20	(11)	1	10	2	10	20
(1610 total progeny, 34 herds)	.20	(0)	2	10	2	15	35
	.20	(12)	3	10	2	20	50
	.20	(6)	4	10	2	25	65
	.20	(5)	5	10	2	30	80
C							
	.20	(10)	1	20	2	20	40
(3200 total progeny, 32 herds)	.20	(2)	2	20	2	30	70
	.20	(6)	3	20	2	40	100
	.20	(6)	4	20	2	50	130
	.20	(8)	5	20	2	60	160
D							
	.20	(16)	1	10	1	10	20
(7280 total progeny, 61 herds)	.35	(21)	1	20	2	40	60
	.35	(18)	3	20	3	90	150
	.10	(6)	10	20	4	300	500

[a] Information inside parentheses describe data actually generated.
[b] To ascertain the number of progeny per reference sire, divide the number into the total.

Table 2. Data models[a]

Model I

Progeny phenotype = mean + herd + sire + dam + segregation + random deviation

mean = 1000 pounds, herd = $R_1\sigma_h$, sire = sire transmitting ability, dam = 1/2 $R_2\sigma_g$,

segregation = $(1/2)^{1/2}R_3\sigma_g$, random deviation = $R_4\sigma_\delta$, $\sigma_h^2 = 2000$, $\sigma_g^2 = 2500$ and $\sigma_\delta^2 = 3700$

Model II

Progeny phenotype = mean + herd + sire + dam + segregation + interaction + random deviation

mean = 1000 pounds, herd = $R_1\sigma_h$, sire = sire transmitting ability, dam = 1/2 $R_2\sigma_g$,

segregation = $(1/2)^{1/2}R_3\sigma_g$, interaction = $R_4\sigma_{sh}$, random deviation = $R_5\sigma_\delta$, $\sigma_h^2 = 2000$, $\sigma_g^2 = 2500$,

$\sigma_\delta^2 = 3700$ and $\sigma_{sh}^2 = 440$ (5% of total variance)

Model III

same as model II except $\sigma_{sh}^2 = 910$ (10% of total variance)

Model IV

Progeny phenotype = mean + herd + sire + dam + segregation + random deviation

mean = 1000 pounds, herd = $R_1\sigma_h$, sire = $(\sigma_{g_i}^2/\sigma_g^2)$ x (sire transmitting ability), dam = 1/2 $R_2\sigma_{g_i}$,

segregation = $(1/2)^{1/2}R_3\sigma_{g_i}$, random deviation = $R_4\sigma_{\delta_i}$, $\sigma_h^2 = 2000$, $\sigma_{g_i}^2 = c\bar{y}_i^2K_G$, $\sigma_{\delta_i}^2 = c\bar{y}_i^2K_\delta$,

$c = \sigma_T^2/(\text{mean})^2$, $K_G = \sigma_g^2/\sigma_T^2$, $K_\delta = \sigma_\delta^2/\sigma_T^2$, $\bar{y}_i$ = mean + herd for the i^{th} herd, $\sigma_g^2 = 2500$,

$\sigma_\delta^2 = 3700$ and $\sigma_T^2 = \sigma_h^2 + \sigma_g^2 + \sigma_\delta^2 = 8200$

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[a]Each R_i represents a random deviate from N(0,1) distribution.

Table 3. Mean correlations between true values and EPD values

	Model			
Structure	I	II	III	IV
A	.41	.38	.40	.41
B	.50	.45	.24	.49
C	.76	.63	.62	.77
D	.82	.64	.56	.82

Table 4. Mean rank correlations between true values and EPD values

	Model			
Structure	I	II	III	IV
A	.39	.37	.39	.39
B	.47	.40	.26	.46
C	.76	.62	.63	.76
D	.77	.58	.54	.77

MEASURING COW EFFICIENCY[1]

Charles F. Parker[2]

The subject of cow efficiency is of paramount importance for profitable beef production. Since the feed required by the cow herd comprises the major input investment in the production of beef, feed utilization must therefore be recognized as the important efficiency component. The pounds of edible beef or protein produced per unit of feed is the production efficiency function that should be of interest to the cattle producer. In the future, economical sources of dietary nutrients will receive increased attention with an added emphasis on higher fiber diets. This expected change is likely to cause some major changes in production systems and the selection objectives for some cattle breeds.

Any measure of feed utilization will involve the nutrients needed by the cow for maintenance and production during the interval of time required for calf development from one production cycle to the next. Therefore, a general method for measuring cow efficiency would be the ratio of calf weight produced to cow weight since the feed required by the cow is a function of her weight. The common expression of cow size for this ratio is metabolic body weight or cow weight to the 3/4 power. This ratio could be easily calculated as a measure of cow efficiency for use by the cow-calf producer. All attempts to estimate net efficiency should relate those proposed measures with the total efficiency for producing the ultimate product. Total feed (or total digestible nutrients)/slaughter weight, total feed/retail product, carcass energy/metabolizable energy fed, total feed/total protein are measures of end point efficiency of feed utilization.

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[1] Comments from presentation at the Beef Improvement Federation Meeting, Denver, Colorado, April 17, 1974.

[2] In charge of Beef Breeding Research, Department of Animal Science, Ohio Agricultural Research and Development Center, Wooster, O.

Recent studies at the Ohio Agricultural Research and Development Center with mature cows of various breed types and sizes indicated that calf weaning weight/cow weight and calf weaning weight/(cow weight)$^{3/4}$ ratios are highly related to efficient feed utilization by the cow and calf to weaning. However, these ratios were only moderately related to the total feed required by the cow and calf to produce a unit of edible beef.

Productive measures that appear to be important for total net feed efficiency are: rate of calf maturity to slaughter, increased slaughter weight relative to cow weight (from creating a genetic differential between sire and dam for growth potential of their progeny) and most importantly, factors affecting overall reproductive rate. Current beef cattle breeding research is evaluating these components and formulating alternative strategies for optimum production efficiency.

Intensification of beef production in the future will create an increased need for the development of cattle genetically patterned for optimum performance under rather specific sets of environments and involving particular resources. These expected changes suggest there will be a continued emphasis for improving cattle that are superior for various production traits for combining through crossbreeding to be used in particular environments for the production of beef to meet market demands.

1974 BIF Committees

Record Utilization	Farm & Ranch Post and Prewcaning Testing Pgms	Performance Pedigree	Merchandising Performance Testing	Carcass Evaluation	Central Test Stations	Reproduction	Sire Evaluation
R. Willham CHMN	R. Meyer CHMN	C. Burch CHMN	M. Patton CHMN	L. Chesnut CHMN	B. Rankin CHMN	D. Bennett CHMN	L. Cundiff CHMN
J. Gosey SECY	J. Minyard SECY	K. Zoellner SECY	R. deBaca SECY	C. Schoonover SECY	C. Christians SECY	A. Eller SECY	G. Butts
L. Anderson	C. Allen	C. Acord	F. Bassford	V. Arthaud	J. Carpenter	J. Brinks	F. Francis
J. Bennett	R. Arthaud	A. Bennett	C. Cooper	F. Baker	J. Delaney	G. Dickerson	B. Jones
R. BreDahl	T. Burch	R. Frahm	K. Cunningham	J. Bradford	J. Gillooly	C. Dinkle	C. Ludwig
W. Butts	G. Butts	F. Francis	B. Graham	R. Cross	J. Glenn	B. Durfey	P. Miller
M. Cook	H. Fitzhugh	C. Ludwig	M. Hammond	R. Epley	J. Hemmingsen	V. Felts	L. Tom
M. Crandall	W. Forbes	H. Matthiessen	C. Iverson	J. Forrest	B. Morgan	R. Koch	D. Vaniman
D. Dearborn	E. Harmon	D. Nichols	C. Koch	R. French	V. Northouse	K. Johnson	R. Willham
K. Ellis	M. Jorgensen	J. Patterson	B. Lamont	D. Frischknecht	G. Sierks	D. Laster	
P. Gibbs	M. Kirkeide	W. Severin	R. Lilley	H. Hendricks	L. Sumption	L. Riu	
H. Gregory	A. Linton	J. Todd	D. Noller	D. Jacobs	R. Wallace	W. Singleton	
R. Hatch	T. Marlowe	D. Vaniman	J. Ricklefs	R. Kimble	C. Yarbro	B. Teichert	
C. Haugse	J. Massey	B. Vantrease	J. Ross	B. Leverete		R. Woodward	
L. Maddox	W. McReynolds		R. Spader	J. Maddux			
M. Maples	K. Messersmith		J. Sullivan	M. Mohler			
J. Nolan	G. Mitteness		R. Vanderkolk	M. Sutton			
S. Northcutt	L. Nelson		H. Westmeyer	C. Swaffar			
J. Sagebieh	H. Paarlberg		J. Wolf	W. Wharton			
H. Webster	F. Rhodes						
	G. Ricketts						
	W. Stuart						

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Reproduction Committee Report & Recommendations

Doug Bennett, Chairman (absent)
A. L. Eller, Secretary

Secretary Eller served as Chairman and reviewed minutes from 1973 committee meeting concerning female traits for recording in performance records. Wayne Singleton served as recording secretary.

Female

The Cundiff, Laster and Koch report on female reproduction traits was discussed.

The committee recommends the following female traits be recorded.

I. A. Open or pregnant (0 or 1)
   B. Calving date
   C. Calf born (0 or 1)
   D. Calf weaned (0 or 1)
   E. Age at first calving

II. A. Birth weight - Ratio within like sex - age - management groups

III. A. Calving difficulty (calving ease)

Suggested Scoring System

1. No difficulty, no assistance
2. Minor difficulty, some assistance
3. Major difficulty, mechanical assistance with jack or puller
4. Caesarian section, very difficult or other surgery
5. Abnormal presentation

Note - Scores one through four can be averaged, but five should not be included.

A livability score (0 or 1) should be included in a separate column, where 0 = born dead and 1 = born live.

Male

Bill Durfey presented an excellent report "Evaluation of Reproductive Soundness and Performance Record Programs." It was recommended that this report be included in the BIF proceedings.

The committee recommended the following guidelines (as outlined by Dr. Carroll, CSU) for physical examination and semen evaluation for both Central Bull Testing and On the Farm Bull Testing programs.

Bull Exam - Screening Exam

Normal reproductive function

1. Physical Exam Should Include:

   Score or Measure

   0-1 - Palpation of scrotum and contents
   Cm - Measure scrotal circumference
   0-1 - Examine extended penis for injury or abnormalities
   0-1 - Palpate accessory glands

   cm = centimeters, 0 = unacceptable, 1 = acceptable

2. Semen Evaluation

   Volume
   Concentration
   % motility
   % primary abnormal cells

   Should emphasize % normal sperm. Head and midpiece abnormality are especially important, i.e. primary abnormality.

Bulls with abnormalities detected by physical examination should be considered for culling.

The scrotal measurement should be recorded as an actual measurement and the percent primary abnormalities be recorded as a ratio for the group of bulls tested together.

The scrotum, penis and rectal examinations should be recorded as acceptable or unacceptable - if unacceptable the report should tell why.

A sub-committee (Carroll) will be asked to develop these guidelines further and to devise an appropriate form for recording this information.

The examination should be performend by competent personnel.

Considerations for Research

1. Stimulate more research in the bull fertility area (i.e.) h. of cryptorchidism, patent frenulum, testicular measurements.

2. Support research for further study on finding better ways to predict sire differences in calving difficulty.

For the Record Only

It was suggested that the committee consider the merit of figuring NPPN on actual weaning weights as well as adjusted weaning weights.

Background Statement for Consideration of BIF Reproduction Committee

Larry V. Cundiff, Danny B. Laster, Robert M. Koch

Phenotypic variation in reproduction is large. For example, percentage calf crop can easily range from 75 to 95%, even among large herds. Heritability is low indicating that most of this is not due to average genetic differences between herds; but, rather differences in management, nutrition and other environmental factors. The fact that heritability is low does not mean that detailed records should not be kept. Records on reproduction are useful in identifying management problems which can be modified to improve reproductive performance in the herd. Even with low heritability, rigid culling to remove open cows can be useful in bringing about a more profitable reproduction pattern in a herd. Environmental effects influencing traits such as early calving date tends to have a permanent favorable influence on reproduction in subsequent years. Most of the improvement which results is not genetic, i.e., if the practice were discontinued in the next generation reproductive performance would be expected to decline. However, selection pressure can still be used effectively because the economic importance of reproduction is large. Also, the return from culling open and other problem cows and keeping pregnant cows increases the number of calves weaned relative to cost of production and does provide greater opportunity to select for other economically important traits because of a larger total number of offspring available.

No single trait or index can adequately evaluate reproductive efficiency. By the same token it is unrealistic to consider a large number of traits because many are closely related. After considering last year's committee report and other traits, the following is recommended.

I. Priority 1 Traits:

A.	Open or pregnant	(0 or 1)
B.	Calving date	
C.	Calf born	(0 or 1)
D.	Calf weaned	(0 or 1)

These traits require the record keeping process to begin with the time females are assigned to the breeding herd and that pregnancy be diagnosed on the basis of palpation or close observation. The latter could be left blank if it is not provided by the producer. However, pregnancy diagnosis may be useful to the producer when calf crop percentage is less than 90%.

Calving date and whether a calf is born and weaned require no more additional effort on the part of the producers than that already required in on the farm and ranch record of performance programs. Calving date is an important trait in any herd with regular calving seasons. The difference between calving dates provides calving interval which is determined by postpartum interval and gestation length. Calving date is recommended rather than calving interval; because, with seasonal calving which is most common,

calving intervals are unrealistic and misleading. Cows that calve early in the season are penalized relative to cows calving late in the season when reproduction is measured in terms of calving interval. Many cows calving early in the season are the most efficient reproducers in the herd. These are the cows with short postpartum intervals; yet this will not be reflected if they are not exposed to bulls during their first postpartum estrus. For this reason cows calving in the first 20 days of the calving season invariably have longer calving intervals than cows calving in the second 20 days. Calving interval can, in addition, reflect open versus pregnant condition of cows, but this is evaluated more accurately as a separate trait. Thus, calving date is recommended because cows that calve early in a calving season are more likely to rebreed and calve in subsequent breeding seasons.

Calf born is related to pregnancy diagnosis but it also aids in assessing fetal mortality. Calf crop weaned is related to the previous traits but, in addition, provides information on postnatal survival. Comparisons among herd averages from year to year for percent of cows pregnant, calves born alive and calves weaned will help to determine the magnitude and relative importance of fertility, calving management and subsequent health management on overall percentage calf crop in each herd.

II. Priority 2:

A. Birth weight (actual weight)

Birth weight is recommended because research has shown it is the best single indicator of calving difficulty which in turn effects subsequent survival of calves and rebreeding performance of cows. Birth weight is recommended over calving difficulty score because it can be measured more accurately and objectively and because it can be measured on calves from cows of all ages in the herd. Calving difficulty is generally expressed only in first and second calf females. Birth weight expressed as ratios to sex-age of dam-management group means should be used in sire and dam summaries. Selection of sires that do not have excessively large birth weights should help alleviate the problem. Also, first calf heifers can be bred to those bulls with lowest expected birth weights of progeny.

III. Priority 3:

A. Reason for culling
B. Breeding code

These are items that may be useful in terms of reviewing past management practices in the herd. The following codes are also recommended for consideration:

Reason for culling:

1 = death
2 = bad udder
3 = eye problems - cancer eye, etc.
4 = poor condition
5 = old age
6 = sold for other reasons

Breeding code:

1 = AI
2 = Natural service
3 = AI or natural service (AI with cleanup)

There are a number of other traits that could be considered. However, they have not been recommended because they are difficult to measure or are closely related to the above items.

Background Statement for Reproduction Committee Evaluation of Reproductive Soundness for Performance Record Programs*

William M. Durfey, Executive Secretary
National Association of Animal Breeders
Columbia, Missouri

The primary objective of an evaluation of reproductive traits for bulls in a performance testing program is to determine which bulls should be independently culled for a lack of potential breeding soundness. A logical point in time to make such a determination is upon completion of the postweaning performance test and before placement in natural service entry into artificial insemination service. The second objective is to record appropriate information indicating breeding soundness for possible use in genetic evaluation in future generations.

SEMEN EVALUATION

Initial tests to be conducted on individual bulls for the evaluation of potential breeding soundness must have practical application under field conditions either on the farm or at a central bull test station. Under such conditions it is not practical to consider use of an artificial vagina for semen collection. In addition, complex and expensive equipment, and highly trained technicians for the use of such equipment are not normally available.

The most practical means of obtaining a semen sample under the above conditions is with the use of an electro-ejaculator. An electro-ejaculator is relatively inexpensive and a competent operator, which may be a general practicing veterinarian or other trained technician, is generally available to collect semen samples. Additionally, an electro-ejaculator is applicable with the bull restrained in a chute.

It must be recognized that there are many variables associated with the use of an electro-ejaculator that can significantly affect the results of a semen evaluation. Such variables are attributable to the bull, his age, rate of sexual development, and environment; competence of the operator and his procedure; the ejaculator itself; and available facilities.

Age and its interaction with rate of sexual development and nutrition is a very important consideration. A bull that is young, develops late sexually, or is deprived of an optimum environment for physical and sexual development, may not exhibit his true potential for breeding soundness at a given point in time. Collection and subsequent evaluation of semen may be adversely affected by long periods of sexual inactivity or frequent masturbation, both of which are of concern in the case of bulls in a postweaning performance test.

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*Review for information of Reproduction Committee of the Beef Improvement Federation April 15-17, 1974.

An experienced technician with good technique and with adequate facilities and equipment can usually consistently obtain a semen sample representative of the quality normally produced by the bull being evaluated. In contrast, an inexperienced operator, inadequate equipment and facilities, and improper technique can all negatively affect the results obtained with one or more bulls.

There are several basic semen traits that may be evaluated in an effort to determine potential breeding soundness. Certain of these are of greater significance than others and there is often an interaction among some that may affect the overall evaluation. Accuracy of evaluation is greatly enhanced by evaluation of an increased number of collections. Accuracy is also dependent on the fraction of the semen sample collected. A brief discussion of semen traits that may be evaluated follows:

1. Volume of semen production generally cannot be accurately measured by use of the electro-ejaculator. Thus, it should not be included as a trait for evaluation where this method of collection is employed. Greater accuracy is possible with the artificial vagina.

2. Concentration is an estimate of the number of sperm per cc. of semen. It may be based on subjective visual rating of the semen in the collection vial or a more accurate estimate can be made with an appropriately calibrated photolometer, where available. Concentration is highly dependent on the fraction of the sample collected and prior sexual activity. Its value as a criterion of semen evaluation is considered questionable.

3. Motility is based on the individual activity of sperm cells. Semen samples are graded on the basis of differences in the amount of swirls and wavelike motions created by movement of the sperm.

   Motility ratings are affected by semen concentration, percent live sperm, physiological condition of the bull and the temperature of the semen at time of evaluation. Evaluation of motility must be made under carefully controlled conditions if an acceptable degree of accuracy is expected.

4. Percentage Live Sperm is an estimate of the percent live sperm cells obtained by making a smear of semen on a slide and staining it with a special live-dead stain. An alternate procedure is to observe the percentage of progressively motile sperm in a diluted sample.

Conditions must be carefully controlled if a reasonable repeatability is expected. Estimates may vary significantly between different methods, technicians and evaluations by the same technician on the same semen sample.

5. Percent Abnormal Sperm appears to be relatively highly correlated with fertility. Morphological abnormalities can be observed with a ligh microscope and are generally classed as primary (head abnormalities) and secondary (protoplasmic droplets and tail abnormalities) abnormalities.

6. Percent Intact Acrosomes - In recent studies of acrosomal cap alterations, Saacke and White[1] have reported a correlation of .60 for percent intact acrosomes with 90 day non-return rates. This is a higher correlation with fertility than can be attained by any other trait for semen evaluation. It was reported that 65% of the variation in fertility among the bulls in this study could be accounted for by measuring intact acrosomes at 2 hours of incubation (37°C) or by obtaining the mean for a 10 hour incubation period on 5 to 13 ejaculates. It appears that the use of this technique in combination with routine evaluation of percent motility and abnormal cell content should be our best quality control program.

The studies reported above are encouraging, but it must be noted that they were conducted under well controlled laboratory conditions with semen from bulls in A.I. studs on routine semen collections. Factors such as previous sexual activity that affect the accuracy of semen motility also affect the accuracy of semen motility also affect the percent intact acrosomes after incubation. Thus, a single ejaculation following a postweaning feed test would not be sufficient for an accurate evaluation.

In view of our present knowledge of the techniques involved in estimating percent intact acrosomes this procedure cannot be readily employed in the field. Thus, it is not applicable to the preliminary screening of bulls on performance test at this point. However, percent intact acrosomes should be accurately evaluated and included as a part of the semen evaluation for all bulls entering artificial insemination service where the bull's semen must survive processing and freezing for storage and subsequent insemination.

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[1] Saacke, R. G., and White, J. M. 1972. Semen Quality Tests and Their Relationship to Fertility. Proceedings Fourth Technical Conference on Artificial Insemination and Reproduction, National Association of Animal Breeders.

SCROTAL AND TESTICULAR MEASURES

In view of the many variables that affect the usefulness of semen evaluation there is a continuing search for other indicators of potential fertility. The merits of such other techniques must be based on the conditions under which they are applicable as well as their value in predicting fertility and/or semen production potential. Two such techniques currently being studied are discussed as follows:

1. Tonometer Values - The tonometer is a mechanical device used to measure testis consistency. It is applied to the scrotum over the central areas of each testis. A spring loaded plunger applies a known force which compresses the testis according to its consistency. The extent of compression is read on a calibrated scale.

   Research by Foote, et al.[1,2] indicates that the tonometer is yielding more useful information than evaluation of a single ejaculate. Under controlled experimental conditions one tonometer reading was more highly correlated with an average of an intensive series of semen collections than was a single random ejaculate. However, there has not been sufficient research to confirm the usefulness of the tonometer as an indicator of semen quality under field conditions with beef bulls.

   If the tonometer proves to be a reasonably accurate indicator of fertility (at least equal to or superior to evaluation of a single ejaculate) in the field it appears to have several advantages. Some of the possible advantages are: (1) a technician can easily be trained in a few minutes (2) readings are highly repeatable provided the technician concentrates on proper use after training (3) low cost (4) frequent calibration not necessary unless damage occurs.

2. Scrotal Circumference - Based on research by Foote, et al.[1,2,3] it appears that scrotal circumference of bulls 12-18 months of age is a good indicator of future testis size, which is highly correlated with total semen production potential. Scrotal circumference is measured at the point of maximum diameter with a self-releasing tape.

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[1] Foote, R. H., et al. 1972. Can Fertility of Sires Used in Artificial Insemination be Improved? A.I. DIGEST, Vol. XX, No. 6

[2] Foote, R. H. 1974. Personal communication

[3] Hahn, J., et al., 1969. Testicular Growth and Related Sperm Output in Dairy Bulls. Journal of Animal Science, Vol. 29, No. 1

Because of rapid testis growth in bulls 12-18 months of age, Foote notes that comparisons must be made within age groups or age correction factors used. More than one measurement (i.e., at 12 months and again at 18 months) should add reliability to the prediction. Foote, et al. are currently developing standard curves and deviations from them for use in evaluating bulls of various ages and breeds on the basis of scrotal circumference. A model to investigate heritability of scrotal circumference is also under development.

Scrotal circumference measures have the advantages of: (1) ease of technician training (2) measures repeatable (3) measures relatively easy to obtain with bull restrained, and (4) tapes inexpensive.

PHYSICAL EXAMINATION

In addition to any of the above traits used in an effort to predict fertility it is recommended that each prospective breeding bull undergo a physical examination. An evaluation of breeding soundness is not complete without an examination of the general health of the bull, functional ability of internal and external genitalia, and testing for the presence of disease organisms that may be transmissible through the reproductive process. Such examinations should be conducted by a competent veterinarian.

BREEDING TRIALS

The only accurate way that fertility can be measured is through breeding trials. The parameters for evaluating semen and testicle measurements discussed above may be correlated with fertility. However, the magnitude of these correlations is subject to considerable change depending on many variable conditions as pointed out.

The basic records necessary to measure bull fertility are: (1) the total number of cows bred (2) exact breeding dates for each cow and (3) pregnancy diagnosis at a given time or calving date for each cow. These data would be summarized and expressed as conception rate.

There is presently considerable variation in the interpretation of the term conception rate. I would suggest that conception rate be uniformly computed and based on the percentage of cows that either are diagnosed pregnant or calve as a result of first service. This is consistent with the method of expressing non-return rates after a given period of time in dairy cattle breeding.

APPLICATION TO PERFORMANCE RECORD PROGRAMS

The basic value of evaluating semen and testicle measurements is in the preliminary screening of bulls on the basis of potential breeding soundness and to cull those bulls that obviously are not capable of causing conception. Records of evaluation scores or other measures for these parameters are of greatest value where actual fertility data is subsequently available. The records of the initial tests for potential breeding soundness can then be correlated with the fertility data to determine the accuracy of the various tests used for the initial screening.

There have been scoring systems established for semen tests in the field where the electro-ejaculator is used. In these systems, each of four traits (Concentration, motility, percent live sperm and percent abnormal sperm) are given a numeric rating. The sum of these individual ratings is the overall semen index or score. However, these scores do not generally give appropriate emphasis to the traits evaluated based on our present knowledge. It is recommended that each individual trait be evaluated separately.

There is need for additional research to determine the relative value of the various semen evaluation tests, and testicle measurement for predicting breeding soundness under different test conditions. Such research should include breeding trials to collect necessary fertility data.

Records of actual fertility data are valuable for use in screening low fertility bulls in artificial insemination service. However, the accuracy of such an evaluation is dependent on an adequate number of records from a fertile cow population. A breeding trial to evaluate breeding soundness of a bull in natural service is somewhat after the fact and is of little value.

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Virginia Polytechnic Institute

Carcass Evaluation Committee Report & Recommendations

Lou Chesnut, Chairman
C. O. Schoonover, Secretary

The Carcass Evaluation Committee recognizes that the beef industry is constantly changing. The product beef has wide appeal in consumer circles but is subject to fluctuating pressure of consumer demands. Voluntary grading plays an important role in the beef industry.

Grading was originally developed as an informational guide for consumers. Presently it is primarily used as a marketing tool within the beef trade. Grading should be flexible enough to respond to changes in production, processing and consumer desires as they occur. However, it is also recognized that changes in grading should be based on factual research. The committee strongly recommends that the USDA and cooperating research agencies initiate and continue strong and comprehensive objective research programs and methods in beef evaluation. Consumers should be periodically sampled to determine changes in buying and eating habits.

The beef industry is one of the main contributing income producing units in American Agriculture. However, it is not well represented in the distribution of research dollars. The committee strongly recommends that BIF request equal representation in distribution of research funds for beef carcass research. Economic and social conditions often dictate change. The ready availability of factual and meaningful research will expedite change.

Some other suggested areas of concern are:

1. Voluntary vs. mandatory grading.
2. Development of innovational grading techniques that might include mechanical or electronic devices.
3. Consumer education programs in the areas of:

    (a) Nutritional merits of beef.
    (b) Endorsement and promotion of the Meat Board (NLMB) sponsored retail cut labeling endeavor.
    (c) Programs related to the proper selection, care and cooking of various retail cuts from the various grades of beef.

4. Marbling - maturity relationship studies as related to palatability.

The committee recognizes that many consumer and taste studies have been conducted. However degrees of acceptable palatability at the consumer level have not been established. It is recommended that such studies should be conducted. These studies should reflect the influence of those factors that affect acceptance and palatability. They should reflect appeal at the retail counter and consumer eating acceptance.

The committee recognizes that little or no relationship exists between conformation and palatability as now used within the USDA Quality Grade. The committee recommends that conformation be dropped from the USDA Quality Grade standards.

Over the past two years several industry groups have proposed changes in the USDA Grading Standards. These suggested changes indicate that the mood of the industry has changed. Some segments of the industry have expressed concern over the present USDA Grade Standards.

The committee is not in agreement on the acceptance of a particular proposal. Both the ANCA and AMIF proposals were considered.

The Beef Carcass Evaluation Committee

I. The Beef Carcass Evaluation Committee commends the Ag Marketing Service and the cooperating meat packers for conducting the Beef Carcass Data Service program.

The Committee recommends that the President of BIF write a letter to all major packers thanking them for their cooperation and encouraging additional support for the Beef Carcass Data Service program.

The Committee recommends that BIF members, both those national in scope and those operating on a state basis, express appreciation to cooperating packers and request their additional assistance in making the Beef Carcass Data Service program really work.

II. The Beef Carcass Evaluation Committee recommends pages 25 and 26 of the GUIDELINES FOR UNIFORM BEEF IMPROVEMENT PROGRAMS be revised in accordance with the present Beef Carcass Data Service specifications.

III. The committee recommends a minimum carcass weight of 550 pounds for carcass contests. No maximum weight restrictions are suggested and are left to the discretion of the carcass contest management.

Merchandising Committee Report & Recommendations

Mack Patton, Chairman
Annette Bennett, Secretary

Effective merchandising depends upon integrity of the breeder coupled with the use of well defined terms relating to the product to be sold. This Committee recommends that BIF reaffirm the importance of the use in advertising and merchandising of the standardized terms developed by the various BIF committees.

For example:

205 day adj. wt.	365,452,550 adj. wt.
# of contemporaries	# of contemporaries
ratio	ratio

Similarly, we deplore the use of misleading statements which tend to be deceptive, make impossible claims or use only selected portions of the total record in the merchandising of performance tested cattle. Examples of such phrases are:

1. During a 60-day test this bull gained 5#/day.
2. Son-o-ray rib eye at 2165 lbs. was _____.
3. Weight of this bull at 23 mo. and 5 days was _____.
4. Calf weighed 363 lbs. at 4 mo. and 19 days.
5. The last 3 calves by this sire weighed 628 lbs.
6. This bull weighed 1,300 lbs. at 14 mo.
7. One calf sired by this bull weighed 1220 at 14 months.

In each one of the above cases, the corresponding BIF recommended standards should be used.

This committee also recommends that the member organizations of BIF continually exert every possible effort to inform and educate their members and cattlemen in their area with the significance of the recommended terms and their proper usage. To assist in this effort this committee will develop a leaflet on the subject of performance data in merchandising.

National Sire Evaluation Report & Recommendations

Larry V. Cundiff, Chairman
Richard Willham, Secretary

The first session of the National Sire Evaluation Committee met from 7:30 p.m. to 10:00 p.m. Monday, April 15, 1974 at the BIF meeting. The purpose of the session was to hear reports from the several sub-committees appointed last year. What follows are these reports and the related discussion:

PUBLICATION OF LAY PAMPHLET ON SIRE EVALUATION PRINCIPLES AND PROCEDURES. A draft of this publication was distributed to the committee for their study.

RANDOMIZATION PROCEDURES. A report of this sub-committee was passed out which included procedures for chute randomization of cows bred AI.

ACCURACY OF PROGENY TEST INFORMATION AND MAGNITUDE OF RANDOM VARIATION. A report of this sub-committee was handed out. It related to various terms used and suggested the use of prediction error. Another paper was presented relating the use of probability statements. A straw vote on use of probability, prediction error or accuracy, or correlation to report "accuracy" was taken. The result was not conclusive.

ANALYSIS PROCEDURES. A report was made on research results which suggest that the particular statistical procedure used to estimate EPD values made little difference. A proposed procedure was passed out suggesting a mixed model approach with interaction using an iterative solution.

PUBLICATION PROCEDURES. A report was not made in anticipation of outcome from the other sub-committees.

Also discussion was made concerning establishing guidelines for dealing with deleterious recessives. The point was made that the beef industry needs a united effort in which the Vets are involved and guidelines are established for reporting and dealing with abnormal calves. Possibly an educational program would help.

The second session of the National Sire Evaluation Committee met from 2:00 p.m. to 4:00 p.m. Tuesday, April 16, 1974 at the BIF meeting. The purpose of the session was to act on the reports of the sub-committees discussed in the initial session.

PUBLICATION: Motion was made and seconded to present the draft copy to the BIF board of directors for BIF publication. Motion passed.

RANDOMIZATION: Motion was made and seconded to include chute randomization procedures into the revision of the BIF guidelines. Motion passed.

ACCURACY: Motion was made and seconded to call the measure of variation of the EPD the POSSIBLE CHANGE (ACCURACY) and that this be the prediction error from the analysis procedure used. Motion passed.

ANALYSIS PROCEDURE: Discussion followed. Motion was made and seconded that the mixed model approach using equal opportunity groups and sires in the model to estimate EPD values be the recommended procedure of analysis especially for new programs. The procedure and a lay interpretation should be developed for inclusion in the revised guidelines. Motion passed.

PUBLICATION POLICY: Motion was made and seconded that for each trait evaluated the EPD (in actual units of the trait), the actual number of progeny, and the POSSIBLE CHANGE (ACCURACY) be reported. The particular format should be developed by the individual organizations. Motion passed.

Motion was made and seconded that EPD values be reported in actual units of the trait. Ratio EPD values can be used to supplement the EPD values in actual units for weaning and yearling weight. Motion passed.

REVISION OF GUIDELINES: Motion was made and seconded to delete the portion of the Sire Evaluation Guidelines on BREEDER TESTS (section B). Motion passed.

Discussion followed on ways to revise the current guidelines. The chairman will assign parts to be revised to committee members and act as editor for the revision.

Discussion followed on non-designed programs and their description inclusion in the revised guidelines. This will be put in the guidelines.

GUIDELINES FOR DEALING WITH DELETERIOUS RECESSIVES: What is currently in the guidelines was reviewed. Need was established to develop guidelines for means once an abnormal calf was born to examine the evidence and make decisions concerning the evidence. Miller was appointed to chair a sub-committee to develop such guidelines. Nielsen and Francis were appointed to the sub-committee. Some way needs to be found to encourage development of a qualified lab to study abnormal calves.

A brochure needs to be developed in lay language on random sampling fluctuations of EPD values. Miller was appointed to make first draft.

Background Statement on General Considerations in Sire Selection

Sire selection is the key to any breeding program. All sire evaluation procedures are designed to predict breeding value. Performance of the individual himself, performance of ancestors and collateral relatives, and performance of progeny are all useful to estimate breeding value. The usefulness of these relative groups varies on whether a trait can be measured on the individual himself, on the heritability, and on prospective use of the sires.

The correlation between the "true" breeding value and the estimated breeding values is termed ACCURACY. Accuracy goes from 0 to 1 for perfect correlation. A knowledge of relative accuracies of estimation based on several types of information are useful. For three levels of heritability some figures are:

1. Accuracy for own performance only and progeny performance only:

Heritability	Accuracy for Own Performance Only	Accuracy for Progeny Performance Only			
		10*	20*	40*	80*
.20	.45	.58	.72	.82	.90
.40	.63	.73	.83	.91	.95
.60	.78	.80	.88	.94	.97

*Numbers of progeny

2. From combined information on own performance and progeny performance:

Heritability	Accuracy of Own and Progeny Performance Combined			
	10*	20*	40*	80*
.20	.66	.75	.84	.90
.40	.80	.86	.92	.95
.60	.88	.91	.95	.97

*Numbers of progeny.

The accuracy of an estimated breeding value applies only to the potential sires evaluated under situations in which they can be validly compared. Comparisons are of increasing value when greater numbers of bulls are compared. Within-herd comparisons are subject to less bias due to environmental differences than are between-herd comparisons. The usefulness of all sire evaluation programs is rooted in widespread within-herd testing.

For most growth measures, heritability is medium to high and the individual himself can be evaluated. Selection on the basis of own performance records should be intense. For highly heritable traits, increased accuracy in estimating breeding value from ancestor and collateral relative records is small. An exception to this is weaning weight. Bulls from dams with consistently good records are desired. For this trait a combination of own record and an estimate of meaternal ability of the dam is recommended.

Lacking knowledge of heritability of between-herd differences, within-herd differences is the criterion for selection on individual performance. Putting bulls in central tests for the post-weaning period to yearling age, to minimize effects of herd environment, is desirable. Central testing facilities, preferably provided or sponsored by breed associations, on a scale permitting testing of the top five percent of the bulls would be desirable. The five percent would be selected on within-herd performance to weaning.

Progeny testing is costly and can be justified only for bulls already selected on their own performance. Emphasis in progeny testing should be on traits not measurable in the bulls themselves -- carcass traits and maternal ability of offspring.

Generally speaking, the cost of progeny testing can be justified only for selecting bulls to be used extensively in artificial insemination.

The foregoing relates largely to selection of bulls within herds. A method of producing offspring of some bulls (termed reference sires) in many herds so that the progeny of all bulls tested in the system can be directly compared through the reference sires is outlined in the material on a "National Sire Evaluation Program" which follows. This is one method of developing sire comparisons with validity across herds. Some breed associations now have such programs. They offer a means by which any breeder, large or small, can identify germ plasm of potential usefulness in his herd. He can determine how his herd compares with others in the breed through progeny testing one or more sires raised in or being used in his own herd in comparison with reference sires. Another method of sire evaluation, used by breed associations with extensive AI, is to analyze the performance records necessary for registration into fair sire comparisons using bulls extensively used in AI as reference sires.

Background Statement on Randomization in Progeny Tests for Sire Evaluation Committee

Accurate estimation of differences among sires in breeding value for economic traits is essential to beef improvement. Differences in breeding value among sires can be estimated from a comparison of their own performance or the performance of their close relatives. Since breeding value is the ability to transmit economic value to progeny, the difference among the progeny averages of sires provides a way to estimate half the breeding value. Using progeny averages to estimate sire differences in breeding value can be made the most accurate of methods because large numbers of progeny are possible.

Performance records are influenced both by the genetic contributions of the sire and the dam and by environmental factors some of which are definable as to cause and others that are random in nature. Therefore, such records on progeny to be useful in estimating differences among breeding values of sires must meet certain criteria. To estimate differences among the breeding values of sires, the sires must be mated to comparable cows and the resulting progeny must be treated as alike as is physically possible. When such a progeny test is conducted and differences among the breeding values of sires are calculated using the progeny averages, the following assumptions are made:

1. The sum of the dam's genetic and maternal contribution to each progeny record averages to zero within the progeny of each sire.
2. The environmental factors that are definable are alike for the progeny of all sires.
3. The sum of the random environmental values for each progeny record average to zero within the progeny of each sire.

When these assumptions are met the differences among sire progeny averages will provide an unbiased estimate of the differences in breeding values among the sires. If the dams used are not comparable, or differential treatment is given to sire progeny groups, then the differences among sire progeny averages contain effects other than sire differences in

breeding value. If the number of progeny per sire is small, sire differences are unbiased but will not be accurate. That is, the differences would be expected to change with the addition of more progeny. The two important features to have a progeny test that estimates differences in sire breeding values are as follows:

1. All sires are mated to a smaple of comparable cows.
2. Resulting progeny are treated as nearly alike as is physically possible.

Actually to estimate differences in sire breeding values refers to only differences among sires so tested together in the same test. Because both known and intangible environmental factors contribute to differences among progeny tests conducted in different locations and times, comparison of differences among sires for breeding value cannot be made directly. Only if there exists a common sire to both tests can a fair comparison be made among sires having progeny only in different tests. Thus, the BIF sire evaluation guidelines suggest using specified sires of a breed as reference sires in each progeny test conducted.

Now, suppose reference sires are involved in the particular progeny test. Consider the two important features of a sound progeny test. All sires must be mated to a sample of comparable cows. Cattlemen know of several factors that make cows in the same herd perform differently. One is age of cow. Young cows produce lighter weight calves than do older cows. Thus, to circumvent giving one sire the young cows and another the older cows, all sires should be mated to a sample of each age of cow. If five sires are to be compared and 20 three- and 40 four-year-old cows are to be mated, then each sire should be mated to 4 three- and 8 four-year-old cows. Exact equality is not necessary. Other factors to consider in stratification are management groups, season of calving, breed or cross, etc.

Within the cows of a given group, each sire should have an equal probability of being mated to a particular cow. This can be done by randomization and this is the assurance on which the assumption that cow effects sum to zero within sire groups is made! Randomization is an admission of ignorance. If no way can be found to predict which cow is mated to which bull; then the assignment is random. Doing this in a practical way is not easy but there are some procedures that can be used. First, all cows in a particular group can be assigned a sire using a table of random numbers or by writing the cows down in any order and assigning sires in a random order over and over until all cows are assigned in that group. The problem with this individual assignment method is that just by chance some sires will get more cows that show estrus early or late in the season than others. One method to circumvent this is to randomize the matings at the time of breeding. As the cows are put into the breeding chute, they can be assigned to sires by using a pre-determined sire order of rotation that is repeated over and over. This will tend to have calves produced by each sire distributed in the breeding season. This procedure works best when nothing is known about the set of cows so that attention does not need to be paid to cow group. The validity of the progeny test depends on getting cows bred to sires at random within stratification group so cow differences do not bias the sire differences in breeding value.

The recommended procedure for randomizing cows to sires using complete AI is as follows:

1. Assign cows to groups depending on the known effects that influence calf performance. Put all cows having common effects such as age and breed in the same group. If nothing is known about the cows to be bred, then they represent one group.

2. Assign a sire order at random such that when a cycle is made of the order, each sire will have been bred to the number of cows proportionate to the numbers desired in the end. If three sires are being used and sire A is to have 10 cows, sire B is to have 10 and sire C is to have 20, then one random order would be B, C, A, C which when repeated would give the appropriate number of cows bred to each sire.

3. Then when the cows are in the breeding chute, determine the cow group and then assign the sire depending on where in the bull order the breeder is in that cow group. When cows are grouped this required keeping track of bull order for each group. Obviously the breeding must be recorded.

When part of the bulls are to be bred naturally, assignment of cows to bulls must be made before breeding begins. This chute randomization procedure is best especially when little is known about the performance of individual cows and the test is being done by a disinterested party. A breeder using his own cows should have the sires assigned by a disinterested party so that there is no question raised on the randomization.

Cows within group must be treated as nearly alike as is possible during gestation and both they and their calves must be given equal treatment through weaning. And the weaned calves of the same sex born within a cow group should be treated as alike as possible. If attention is paid to allocation of sire of calf, new post-weaning groups can be formed if management dictates. Sires and cow groups should be proportionately represented in each new group.

Even after all these rules to good progeny testing are followed, the performance records of progeny are influenced by intangible environmental differences that are random in nature. This random variation can be reduced by increasing progeny numbers per sire since the influence on the record is as likely to be positive as it is negative and averaging progeny tends to cancel out these random effects. But even a large number of progeny will not reduce a bias caused by unequal treatment or a non-random allocation of cows.

Background Statement on Analysis Procedure for Sire Evaluation Committee

For each of the BIF member organizations to offer EXPECTED PROGENY DIFFERENCES from their respective sire evaluation programs that can be interpreted the same way by the beef industry is one of the goals of the BIF Sire Evaluation Committee. Results of Nielsen 1974 suggest that,

on the four models examined and the four data structures simulated for each model, the seven analysis procedures gave comparable EPD values. The least squares and mixed model procedures were robust enough to analyze the model in which the coefficients of variation were equal for herds. The theoretical properties of the mixed model with interaction are best and overall data sets it gave EPD values that had high accuracy compared with the other procedures. As yet the magnitude of possible sire by herd interaction is not known, but this procedure is useful to account for the extra correlation among paternal half sibs in the same herd which is a form of sire by herd interaction. If only small interaction is found after analysis of beef data, this mixed model with interaction analysis procedure should be an adequate method of calculating EPD values. If important interaction does exist then most of the sire evaluation programs must be restructured to either obtain EPD values of sires when sires are used in many herds or obtain EPD values of sires for specific definable environments.

To obtain EPD values using the mixed model with interaction is a reasonably simple procedure. The data are assumed to have the following model:

$$y_{ijk} = \mu + h_i + s_j + hs_{ij} + e_{ijk},$$

where herds = h_i are considered fixed and sires = s_j and the sire by herd interaction = hs_{ij} and e_{ijk} are assumed random. Suppose we have the intra-class correlation among paternal half sibs within herds and the intraclass correlation among paternal half sibs over herds estimated along with σ_e^2. Then

$$r_w = \frac{\sigma_s^2 + \sigma_{sh}^2}{\sigma_T^2},$$

$$r_o = \frac{\sigma_s^2}{\sigma_T^2},$$

and

$$r_e = \frac{\sigma_e^2}{\sigma_T^2}$$

where $\sigma_T^2 = V(y_{ijk})$ and σ_s^2 is the sire component of variance and σ_{sh}^2 is the sire by herd component. To use the procedure we need two values,

$$\beta = \frac{\sigma_e^2}{\sigma_{sh}^2}$$

and $$\alpha = \frac{\sigma_e^2}{\sigma_s^2} \quad .$$

which can be obtained as $$\beta = \frac{r_e}{r_w - r_o}$$

and $$\alpha = \frac{r_e}{r_o} \quad .$$

Now code the sires from 1 to k and sort the data by herds and sires within herds. The input data needed are the number of progeny for each sire-herd group and the sum of the adjusted trait values for each sire-herd group. Call these n_{ij} and y_{ij} where i is the same for the herd and j represents the sire codes having progeny in the i^{th} herd.

For each sire reserve k + 4 storage locations either on tape or disk. Actually, the space reserved is 4 plus the number of other sires compared with a particular sire so the locations per sire can vary.

Now for each sire-herd group calculate the following values:

$$N_{ij} = \frac{n_{ij}\beta}{n_{ij} + \beta}$$

$$Y_{ij} = \frac{y_{ij}\beta}{n_{ij} + \beta}$$

After these are calculated for each sire-herd group in the herd, calculate the following values for each herd:

$$N_{i\cdot} = \sum_j N_{ij}$$

$$Y_{i\cdot} = \sum_j Y_{ij}$$

Then for each sire in the herd in turn add the following values to his storage locations as indicated:

Add to location $C_{\cdot j}$

$$C_{ij} = N_{ij}\left[1 - \frac{N_{ij}}{N_{i\cdot}}\right]$$

Add to location $R_{\cdot j}$

$$R_{ij} = Y_{ij} - \frac{N_{ij}\left[Y_{i\cdot}\right]}{N_{i\cdot}}$$

Add to each $S_{\cdot j'}$ location where j' represents the sires compared with the j^{th} sire

$$S_{ij} = \frac{N_{ij} \cdot N_{ij'}}{N_{i\cdot}}$$

Continue on with each herd in turn until for each sire there are the following values:

$$C_{\cdot j} \quad , \quad R_{\cdot j} \quad , \quad \sum_{j'} S_{\cdot j'}$$

Then add α to each $C_{\cdot j}$. These values can be used to calculate by iteration the EPD values into one or the other of the last storage locations for each sire or A_j^k and A_j^{k+1}. The procedure to follow is to first calculate

$$A_j^1 = \frac{R_{\cdot j}}{C_{\cdot j}} \ ,$$

for each sire. To obtain the second set of sire values calculate

$$A_j^2 = \frac{R_{\cdot j} - \sum_{j'} S_{\cdot j'} A_{j'}^1}{C_{\cdot j}} \ ,$$

which adjusts the first EPD estimate for the sires compared with each sire. Repeat this process of iteration using the last equation until on comparison of each sire value

$$A_j^{n+1} - A_j^n < \text{some specified value such as } .001$$

Then the values

$$A_j^{n+1}$$

are the EXPECTED PROGENY DIFFERENCES for the set of sires expressed as a difference from the average of all sires. This value is regressed for progeny numbers and accounts for distribution of progeny and the comparisons made with other sires. It also has selection index properties that maximize the probability of a correct ranking of sires.

A reasonable estimate of the prediction error is

$$\frac{\sigma_e^2}{C_{\cdot j}} \quad .$$

This analysis procedure should be reasonably fast and can be programmed on computers with small internal storage capacity if tape or disk storage is available.

The same procedure can be used if the interaction is ignored. Then

$$N_{ij} = n_{ij}$$

and

$$Y_{ij} = y_{ij} \quad .$$

The reason the interaction can be absorbed is that it is considered a random effect. If considered fixed, $\beta = 0$ and $N_{ij} = 0$ since $N_{ij} = n_{ij}\beta/n_{ij} + \beta$. In ordinary least squares where all effects are fixed, absorption of an interaction takes out both main effects as well. To see the usual absorption formula note that

$$\frac{n_{ij}\beta}{n_{ij}+\beta} = n_{ij} - \frac{n_{ij}^2}{n_{ij}+\beta} \quad .$$

The maximum value obtainable for a N_{ij} is β no matter how large n_{ij} becomes. As n_{ij} increases the value of β is approached quite quickly indicating, as expected, that many observations in one cell where interaction is present are not very useful.

Background Statement on Accuracy of Progeny Test Information for Sire Evaluation Committee

The problem is to develop a statistic that can be used easily by the beef industry to access the "ACCURACY" of expected progeny differences generated by national sire evaluation programs. Several terms, especially accuracy, need to be defined critically.

The classical animal breeding definition of accuracy is that ACCURACY is the correlation between the "true" breeding value and an estimate of the breeding value. The accuracy of a selection index is the correlation between the aggregate genotype and the selection index. This correlation is maximized in the process of calculating the index weights. In this context accuracy has to do with the probability of correctly ranking individuals.

In experimental statistics the word ACCURACY when used with estimation indicates unbiasedness or the statistic is an accurate estimator of the parameter if its expected or average value is equal to the parameter. The word PRECISION when used with estimators indicates repeatability or as the number of observations used to estimate the statistic increases the sampling variance is decreased. Precision has to do with the variation encountered when repeated samples are used to compute the statistic. This is the idea involved when the standard deviation of the statistic is used to describe POSSIBLE CHANGE.

The alternative exists in reporting expected progeny differences to stress the probability of correct ranking by using the correlation or ACCURACY or to stress the sampling variation about the difference by using the standard deviation of the statistic or the prediction error or the PRECISION of the estimator. The reporting of the prediction error is the better of the alternatives because of the following:

1. The prediction errors can be obtained exactly from the lead diagonal elements of $(X'X)^{-1}$ times σ_e^2 when the mixed model is used to obtain expected progeny differences. The number of progeny, their distribution over herds, and their comparisons with progeny from other sires are all considered in this measure of PRECISION.

2. The prediction errors can be approximated by using the reciprocal of the lead diagonal from $(X'X)$ times σ_e^2 when the mixed model is used but the expected progeny differences are obtained by iteration instead of inversion. The number of progeny and the number of contemporaries in each herd are considered in this measure of PRECISION.

3. The prediction errors can be approximated from a least squares solution

Although not proved, the analogy of this simple relationship probably holds when herd equations are absorbed into sire equations and the inverse elements are used rather than values of n. It is possible that the accuracy calculated as

$$r_i^* = \sqrt{\frac{\left(n_{.j} - \sum_i \frac{n_{ij}^2}{n_{i.}}\right)}{\left(n_{.j} - \sum_i \frac{n_{ij}^2}{n_{i.}}\right) + \alpha}}$$

or

$$r_i^{**} = \sqrt{\frac{\sigma_s^2}{\sigma_s^2 + \frac{\sigma_e^2}{c^{ii}}}}$$

is much closer to the true accuracy than is r_i which accounts only for number of progeny and assumes that the mean is known without error and sire distribution is perfect over herds or all are compared in one herd.

From these deliberations, ACCURACY and PRECISION are closely related to each other. The first emphasizes ranking and the second possible change when the numbers of progeny are increased. The Simmental and Limousin programs have emphasized the notion of possible change and called it accuracy. Whether we in BIF end up with a term like repeatability as used in dairy predicted difference which is really ACCURACY squared but also has an animal breeding definition, depends on our deliberations. To call the prediction error ACCURACY when σ_s really has to do with PRECISION or repeatability and accuracy is usually a correlation, is possibly a mistake. Whatever we call it, prediction error or the standard error of s_i should be the method used to access the "ACCURACY" of EPD values for the beef industry.

in which the values have been regressed by numbers by multiplying the regression times the least squares prediction error. This measure of PRECISION considers all factors as (1) when $b_i = \sigma_s^2/(\sigma_s^2 + \sigma_e^2/c^{ii})$ and c^{ii} is the element of $(X'X)^{-1}$ on the lead diagonal pertaining to the i^{th} sire.

4. Accuracy as a correlation has reference to a population from which the sires are a random sample. This is not the case for sires being progeny tested because they are already a select sample. The prediction error does a better job of describing what breeders need to know when selecting sires based on their expected progeny differences than does a correlation which is not in the units of measure of the EPD.

The relationship between ACCURACY and PRECISION in the simple situation of sire evaluation where all sires are compared in the same herd is instructive. Suppose we have estimates of $\sigma_s^2 = \sigma_p^2(h/4)$ and $\sigma_e^2 = \sigma_p^2((4-h)/4)$. Then $\alpha = (4-h)/h$. The PRECISION of s_i is

$$\sigma_{s_i} = \sqrt{\frac{\sigma_e^2}{n+\alpha}}$$

and the ACCURACY of s_i is

$$r_i = \sqrt{\frac{n}{n+\alpha}} \quad .$$

As n increases σ_{s_i} decreases and s_i becomes more precise while the accuracy of s_i increases. To obtain σ_{s_i} from r_i, multiply r_i by the least squares standard error of s_i as

$$r_i \cdot \sqrt{\frac{\sigma_e^2}{n}} = \sqrt{\frac{n}{n+\alpha}} \cdot \sqrt{\frac{\sigma_e^2}{n}} = \sqrt{\frac{\sigma_e^2}{n+\alpha}}$$ which is

the basis of (3). To obtain the accuracy from σ_{s_i}, multiply σ_{s_i} by the reciprocal of the least squares standard error of s_i as

$$\sigma_{s_i} \cdot \sqrt{\frac{n}{\sigma_e^2}} = \sqrt{\frac{\sigma_e^2}{n+\alpha}} \cdot \sqrt{\frac{n}{\sigma_e^2}} = \sqrt{\frac{n}{n+\alpha}} \quad .$$

Record Utilization Committee Report & Recommendations

Richard Willham, Chairman

The charge to this committee is to develop utilization of performance records in the beef industry. The following opportunity areas are being worked in to accomplish the charge:

1. Guidelines for performance programs offered to the beef industry by BIF member organizations are developed so that the programs can provide records that can be best utilized by the participants. These guidelines are as follows:

   A. GUIDELINES FOR BREEDING STOCK PERFORMANCE PROGRAMS
   B. GUIDELINES FOR LARGE COMMERCIAL PERFORMANCE PROGRAMS
   C. GUIDELINES FOR FEEDER CALF PERFORMANCE PROGRAMS

   One other set of guidelines needs to be considered and that is for small commercial herds that need an inexpensive near-total performance program.

2. Develop means to promote enrollment and continued participation of cattlemen in performance programs. This is being worked on by the following means:

   A. Publish educational material on performance record use for all segments of the beef industry. Examples of this activity are the pamphlet on the bull selection problem and the section for the new guidelines on estimated breeding values.

   B. Working with BIF member organizations in developing educational material, revision of existing programs to include reproduction data and breeding values, and the development of new programs to service new segments of the beef industry.

   C. Working with the many forms of the news media to promote record utilization throughout the beef industry. This is being done through articles and news stories that appear in the farm news media.

All of these opportunity areas have been worked on by the committee. This report, the fourth for the committee, will deal with developments to date and then consider new developments.

Developments to Date

This is the year to revise the BIF guidelines. Draft copies of the section on RECORD UTILIZATION are ready to be reviewed by the committee. This includes the draft copies of two sets of guidelines, the Breeding Stock and Large Commercial guidelines. The third, feeder calf guidelines, are being developed at this meeting and will be circulated to the committee. A new section for the BIF guidelines on estimated breeding values is in draft form and ready for review. One performance organization in BIF has adapted the computer cow game to its own record forms and is in the process of developing educational programs around the game. Several more BIF

member organizations are now calculating estimated breeding values either on a selection worksheet or on their performance pedigree.

New Developments

The following is a list of new ventures for the record utilization committee to consider and to develop if the need and value can be established:

1. No action was taken on developing material on THE PLACE OF RECORDS OF PERFORMANCE IN THE BEEF INDUSTRY and HOW TO SELECT A PERFORMANCE PROGRAM. The general consensus last year was to get help from the press rather than BIF publications.

2. No action was taken on developing material on A BANKER'S GUIDE TO BEEF PERFORMANCE RECORDS.

   Motion was made and passed to develop material encompassing topics 1 and 2. This should be done by member organizations.

   In the discussion, it was pointed out that the ideas and help of banking people already appreciative of performance records should be enlisted.

   Motion was made and passed that these materials and others developed should then be sent to a central gathering house. Either Dixon Hubbard or Richard Willham might serve as the gathering party.

3. Some guidelines on AIDS IN PLANNING and CATALOGING OF PERFORMANCE RECORDS within herds needs to be developed. This would include herd record calendars and index tabs useful in cataloging records. Suggestions to member organizations could be helpful. No action was taken. Some discussion was made on essential permanent records.

Discussion

The following is a list of topics brought up for discussion at the record utilization committee meeting.

1. The problem of "on-time" record return to breeders needs discussion. No action was taken.

   Discussion: Mail in and out time is long. Can only increase turn around for time "in shop." Perhaps fewer groups could do this - faster.

2. The problem of Performance and the Show Ring deserves consideration. No action was taken.

   Discussion: Mixed ideas on this. Some felt it could be tied together successfully. Others thought we may promote wrong thing. There was discussion of current 4-H performance programs.

3. The idea of requiring performance data for registration should be evaluated by BIF.

   Motion was made and passed that BIF go on record recommending to breed registry associations that they appraise the merit or value of the presence or absence of performance records of the form BIF recommends on all registration certificates.

4. Publication of research results.

   Motion made and passed that BIF guidelines need not necessarily be followed in reporting of research results.

5. New custom designed records? No action taken.

   Discussion: Suggested that organizations take care of individuals at same time examine opportunities for more sophisticated programs.

6. EBV for Guidelines. The copy was presented.

7. Record standardization.

   Calving ease score: 0=no difficulty and 1=difficulty.

8. Central Processing of Records. No action taken.

   Discussion: Keep federal government out. Breed associations do this as an additional business - aids in other aspects of breed promotion.

9. Simple complete performance program was considered.

10. The sub-committee for developing guidelines for feeder calf programs met and will have guidelines ready for inclusion in the revision.

Background Statement on Tentative Guidelines for Record Standardization

The development of uniform reporting of basic information is considered an important objective by the Beef Improvement Federation. A standard set of input forms for weaning and yearling information is in use by five state Beef Cattle Improvement Associations in the southeastern area. They are available to other organizations.

It is recommended that the descriptive aspect of performance records be emphasized rather than the competitive one. The following uniform codes for data reporting are recommended.

I. BREED:

A. System - Suggest the same system as is currently being used by PRI which involves the use of 4 numerals or letters or combinations that will explain 1/2 to 15/16 blood animals and straightbreds. The first

numeral or letter is that of the sire, the second is that of the sire of the dam, the third is the sire of the granddam and the fourth is the sire of the great-granddam. This system assumes purebred sires.

B. Breeds Included and Coding Recommended:

1. Angus	6. Santa Gertrudis
2. Hereford	7. Charolais
3. Shorthorn	8. Brangus
4. Red Angus	9. Polled Hereford
5. Brahman	10. Devon

A. Simmental	J. Jersey	S. Brown Swiss
B. Beef Master	K. Murray Grey	T. Texas Long Horn
C. Highlander	L. Limousin	U. Guernsey
D. South Devon	M. Maine Anjou	V. (open)
E. Red Brangus	N. Charbray	W. (open)
F. Milking Shorthorn	O. (not to be used)	X. Unknown
G. Galloway	P. (open)	Y. (open)
H. Holstein	Q. (last to be used)	Z. Chianina
I. (open)	R. Red Polled	

C. Example of Use:

1222 = 1/2 Angus, 1/2 Hereford 1122 = 3/4 Angus, 1/4 Hereford
1112 = 7/8 Angus, 1/8 Hereford 1111 = 15/16 Angus or Straightbred (purebred)

II. SEX:

A. Single birth (or twins where only 1 is raised on dam)

1. Bull	3. Steer
2. Heifer	4. Heifer born twin to bull

III. CALVING EASE SCORES:

1. Normal
2. Assistance Required
3. Death (either cow or calf or both)

IV. MANAGEMENT CODE:

A. Weaning

1. Dam only
2. Dam and creep feed (6 weeks or longer)
3. Irregulars - for all records not desired in averages. Calves raised under abnormal management such as twin calf raised as twin, nurse cow, foster mother, sick, injured, or deformed calf.

B. Post-weaning (use as 2-digit combinations)

(1) Age at end of test (1st digit)

1. 12 months (365-day weight)
2. 15 months (452-day weight)
3. 18 months (550-day weight)

(2) Feed Levels (2nd digit)

4. Fitted
5. Full Fed
6. Intermediate Feeding
7. Roughage and/or Pasture

Example of Use:

14 = Fitted 12 months animal (365-day weight)
25 = Full Fed 15 months animal (452-day weight)
37 = Pasture Fed 18 months animal (550-day weight)

V. PROPOSED STATE CODE NUMBERS FOR BEEF PERFORMANCE TESTING PROGRAMS: (same as DHIA uses)

State Code Numbers (USDA - DHIA)

11.	Maine	63.	Tennessee		
12.	New Hampshire	64.	Alabama	50.	Delaware
13.	Vermont	65.	Mississippi	51.	Maryland
14.	Massachusetts	71.	Arkansas	52.	Virginia
15.	Rhode Island	72.	Louisiana	54.	West Virginia
16.	Connecticut	73.	Oklahoma	82.	Idaho
21.	New York	74.	Texas	83.	Wyoming
22.	New Jersey	81.	Montana	84.	Colorado
23.	Pennsylvania	34.	Michigan	85.	New Mexico
31.	Ohio	35.	Wisconsin	86.	Arizona
32.	Indiana	41.	Minnesota	87.	Utah
33.	Illinois	42.	Iowa	88.	Nevada
55.	North Carolina	43.	Missouri	91.	Washington
56.	South Carolina	45.	North Dakota	92.	Oregon
57.	Georgia	46.	South Dakota	93.	California
58.	Florida	47.	Nebraska	94.	Puerto Rico
61.	Kentucky	48.	Kansas	95.	Hawaii

VI COUNTY CODES:

Each state designate - Recommend use of USDA-DHIA codes already set up.

VII. HERD CODES:

Each state designate.

COMMENTS CODES

Calf Codes

C0	Twin calf--raised on foster dam	C5	Calf weighed under 160 days of age
C1	Twin calf--raised on own dam as twin	C6	Calf weighed over 250 days of age
C2	Calf sick	C7	Calf died at calving
C3	Calf sold prior to weaning	C8	C8 Calf died due to disease
C4	Not weighed	C9	Calf died for other reason

Dam Codes

D0 Cow died--at calving
D1 Cow died--disease
D2 Cow died--other reason
D3 Cow failed to calve
D4 Cow aborted
D5 Cow sold--for breeding use
D6 Cow sold--because of age
D7 Cow sold--physical defect
D8 Cow sold--poor fertility
D9 Cow sold--inferior calves

Sire Codes

S1 Sire owned by another breeder
S2 Sire unknown
S3 Unfertile bull

Temperament Codes

T1 Satisfactory temperament
T2 Fair temperament
T3 Poor temperament

Background Statement on Tentative Guidelines for Breeding Stock Performance Programs

REPRODUCTION. Calf crops start with the mating decisions a year prior to birth. Breeding stock programs should have breeding forms to record matings and dates. Following a pregnancy exam, the breeding forms can be sent in where they constitute the prelist for birth and weaning data the following year. Such forms record the reproductive performance of the cow herd. Further, they can be used for registration of the calf crop.

SIMPLICITY. Programs should be simple for the breeder or the customer. Worksheets must be prelisted in some useful sequence, previous weights given if applicable, convenient in size for easy writing, of high quality paper, and with enough space to record easily. Performance programs must be developed with the breeder or customer in mind, not the data flow being the primary consideration. Carbon use on the farm needs to be avoided. Hand copying of records by the breeder is obsolete and besides, errors are generated. Copy machines are available. The less desk work required of the customer, the greater will be the participation.

TIMING. The adjusted and analyzed records need to be available to the breeder at the time they can be used in selection and for other decisions. Adjusted weaning weights are of little value after selection. Contemporary groups should be processed immediately. Dam summaries are of value when culling is done. Sire summaries should be available especially for yearling and carcass data before sires are selected to go into the breeding season. The general rule for record processing is "raw data in, processed data out ASAP."

UTILIZATION. The available information on a trait for a particular set of individuals to be compared needs to be utilized. The records on close relatives exist in the data sets for herds and can be used to provide the customer with estimated breeding values. Ranking of individuals on their estimated breeding value using all available information for a trait will increase the accuracy of selection. See section in GUIDELINES on estimated breeding values.

HONESTY. The honesty and accuracy of the breeding in keeping records is the backbone of the system. Our beef industry is built on this. The breeding stock breeder sells breeding values and that is how the calves of his breeding stock perform for the buyer. When his stock does not perform for others, free enterprise solves the problem.

INNOVATION. Performance programs need to adapt quickly to unified sire evaluation programs. Since sire selection is the key to genetic change in the beef industry, this is imperative. Adoption of uniform testing programs for performance of individual bulls and for uniform progeny evaluation should be accomplished.

INVOLVEMENT. All cattle in the herd should be involved in the program.

PARTICIPATION.

1. Development by each performance organization of a clear, concise write-up of procedures to follow in enrolling and continuing to

participate is essential. A calendar for record keeping can help the breeder plan his program. The order involves calving, yearling, breeding, and weaning. Three calf crops are involved in any one calendar year. First, last year's crop must be evaluated as yearlings; second, this year's crop must be born and weaned; and third, cows must be bred for next year's crop. Calving twice a year compounds the problem and calving the year around presents real difficulty. Understanding the programs initially is a big problem.

2. Becoming acquainted with a set of records and how they can be used is a significant aid in interesting new participants in a performance program. While obtaining enough records to be useful, is the time a lot of breeders quite. If they could practice on a simulated set of records they could select and see results as well as become acquainted with the forms and procedures. Such a tool is available in the computer cow game. It has been adapted to use actual forms of a member organization. The opportunities to educate customers using the computer cow game are limitless.

3. Educational material in depth must be developed by the member organizations on just how to use records in selection and in the entire process of beef production. For an organization to serve its customers requires it to challenge all. No breeder today is utilizing his records for selection at near maximum potential.

4. There should be cooperation between all performance programs operating in a state.

Background Statement on Tentative Guidelines for Large Commercial Performance Programs

Large commercial beef producers need performance programs that can be conducted within the costs they can afford. By combining records on performance, quality of product and cost into a management control system, a more modern and scientific approach can be developed for these ranches. The controlled program--production, quality and cost--should measure in some degree the biological processes that are typical in today's beef production. To direct those biological processes, management must have measurements taken periodically which indicate if the processes are operating in a normal manner or are deviating sufficiently to justify corrective action. Then a study should be made to determine the cost of correcting the situation.

What follows are specific guidelines for large commercial performance programs:

THE RANCH -- PRESENT AND FUTURE. Before any rancher embarks upon a continuing record of production and quality characteristics, his first step should document his present production and quality level and set goals for periods of 5 or 10 years in the future. These goals should include record of production characteristics such as number of (and percentage when applicable) cows bred, calves born, calves weaned, average weaning weight, and average cow weight. To document the quality level of young cattle produced on the ranch, there is a need to record such traits as age and weight in the feedlot, the weight, quality and yield grade of the finished cattle.

Goals should reflect what appears to the rancher to be the necessary changes in production and quality to establish the most profitable ranch operation within his own personal preferences.

HERD BULLS. Information on young bulls such as an average 205-day weaning weight and an average weaning weight ratio of all bulls purchased within a given year is necessary. A registered breeder would also be able to furnish yearling weights and ratios if young bulls are purchased after 12 months of age. A few breeders will furnish feedlot and carcass data on half sibs. Performance information on the individual bulls plus feedlot and carcass data on half brothers is ideal. A 205-day weaning weight and a yearling weight is minimum. When feedlot and carcass data is available on half brothers, bulls may be purchased at a younger age based on 205-day weights and ratios. This would reduce the extra cost of feeding the young bulls and reduce the possible loss of breeding ability because of feeding.

COW HERD. A calf cannot be weighed that has not been born and a 600 pound calf weaned from a cow that failed to calve the year before,--- is not very profitable. With present cow prices there is no doubt that the most important record for the cow and calf man has is on the reproductive performance of the breeding herd. Percent calf crop should be calculated every year. It is the number of cows exposed to bulls divided into the number of calves born. Percent calf crop calculated in this manner furnishes information that relates directly to reproduction and leaves out calf losses which may be a problem but would require entirely different actions for solution. Records should establish calving intervals. If large numbers of cows exceed an average of 12 months then corrective action should be taken in management or breeding to give the best chance possible of one calf each 12 months.

WEANING CALVES. Calf and cow weights can indicate many things related to production efficiency. These are not individual weights, but group weights taken at the time calves are weaned. If calves are weaned and sold at one time, calf weights are available. The weight of the cows annually culled from the breeding herd or a random sample of cows is excellent information. This information will have some meaning as annual weight records. The trend of the calf weight and cow weight over a period of years will reflect some changes in nutrition level and possibly some genetic change. These two weights can be expressed as an efficiency ratio using weaning weight as a percentage of mature cow weight. Both calf and cow weights become the basis for many comparisons in subsequent records that help answer questions about overall efficiency and profitability of the ranch operation.

FEEDER CALVES. A record program for a cow and calf operation should record the kind of product that is being marketed. This product can be measured by its performance through a feedlot and the carcass characteristics after the feeding period. Goals of a rancher, as they relate to the quality of product, may vary considerably. In all ranching operations, production efficiency should be of primary consideration. Rate of gain and feed required per 100 pounds gain is a better figure than cost of gain on long term records because of changing feed prices. This information is easy to obtain on large ranches since weaning calves are sold in large groups to one buyer and some large ranchers maintain ownership of their cattle. Rate and efficiency of gain can be measured every 3 or 4 years

on most ranches since breeding programs require at least this much time to change one-third of the genetic make-up of the breeding herd. Some ranches may wish to use a random sample of the steer calves instead of feeding the entire calf crop.

SLAUGHTER CATTLE. Even though cattle are efficient at weaning time and grow efficiently through the feedlot, carcass characteristics have an effect on profit. Yield and quality grades are used to indicate the product's quality. Grading carcasses on yield and quality is done by USDA graders. When the cattle are sold it is necessary to make arrangements to have a federal grader available. A large percentage of cattle on long feeding periods are expected to have yield grades between one and two and be in the low choice grade. A rancher must set his own goal for his market that may require different carcass characteristics. Product quality does not have to be measured on the entire calf crop but can be measured on a reasonable sample of feeder calves every 3 or 4 years.

UNIT COST AND INCOME. To make decisions on ranch management, records should be more detailed than generally shown in total ranch costs and total ranch income. Costs and income per cow along with costs and selling price per 100 pounds of calf weaned give the rancher an opportunity for a different kind of study of total ranch operation. A section should deal with only cost and income per cow showing these figures on the same form. The comparison of these figures serve as an excellent indicator of production efficiency. A section on cost and selling price per 100 pounds of weaned calf would be used to make direct comparisons with costs of production and selling price of each 100 pounds of weaned calf. Differences in these figures is probably the best measure of overall efficiency, other than percent return to total capital investment.

INDIVIDUAL COW RECORDS. Records can be maintained on large ranches without considerable effort provided details of breeding stock programs are omitted. Any individual cow record on large ranches require a number identification on each cow. This is not unusual since other industries individually identify production machinery. This number can be a fire brand, an ear tag, neck chain or neck band. An individual cow record for large ranches does not require calves be identified with their mothers. A record showing only the identification number of each cow that did not calve or produced a "reject" calf is all that is necessary for a useful individual cow record. Cows that calve regularly and produce acceptable calves would be considered normal, and records would be so marked. Pregnancy checks can be used to cull cows before the dry period which is usually the high cost time.

A performance record program for the commercial beef producer must be simple and useful in management decisions. The following program is designed for the commercial beef producer wishing to identify his cows and calves individually so that he can practice cow and heifer selection, evaluate his male germ plasm, and develop a performance reputation for his commercial herd. All or part of the program can be utilized depending on the desires of the producer. The sequence of events in commercial beef production is calving, yearling, breeding, and weaning. The yearling information can be omitted if the latter two objectives are ignored.

To initiate the program sequence a producer sends in, on a weaning summary form, a list of his cows and heifers that are in his cow herd. If previous data are available it may be entered on the same form.

This information is entered in a cow-pocket book containing a tag sequence list of cows and heifers giving their age in years, the number of calves, and the average weaning weight ratio of her calves. Following this printout are columns for calf birth data, breeding information, and weaning data. When the cow-pocket book is completed, it is returned.

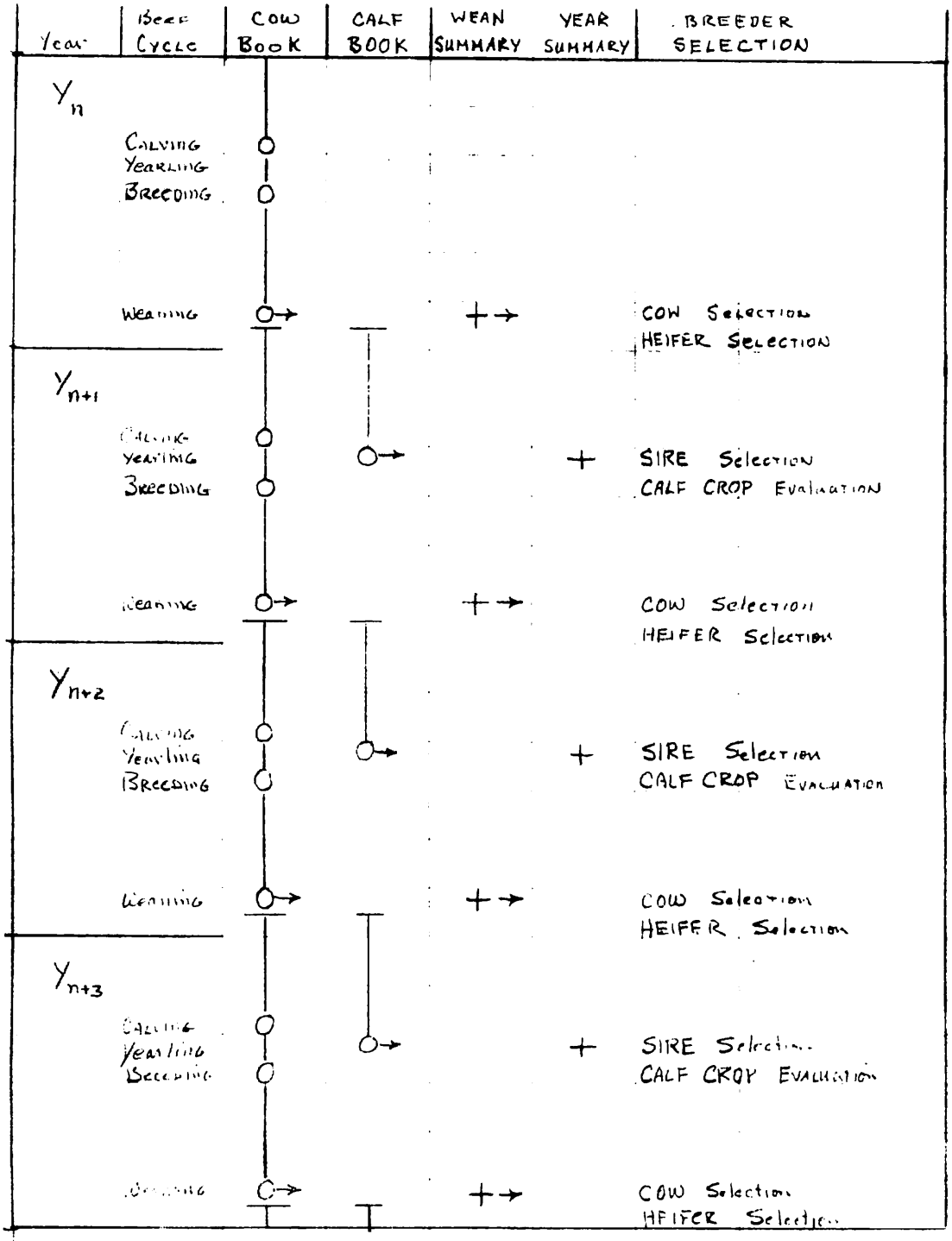
With this new data and previous data a weaning summary is produced which includes a tag order listing of cows, heifers and males, either steers or bulls. This summary includes data on cow reproduction, previous calves, and the present calf. The current calf crop has own performance listed. The last page contains summary information on calf crop percentages by cow ages and average weights of calves by cow ages, sire progeny averages, and other summary figures including those for management groups. The last one-fourth of the weaning summary is perforated and lists all the cows, heifers, and males. This perforated section of the weaning summary has a column for disposition and also coded figures that summarize previous records. The producer marks whether the animal is to be retained or culled and sends in this part of the weaning summary.

From this decision sheet containing the coded figures that summarize previous records, the new cow-pocket book is made up using only the selected cows and heifers. Also a calf-pocket book is made up containing a tag order listing of heifers and males giving their own weaning data and having columns for the recording of yearling and carcass data. Only heifers and males on which further performance data are to be obtained will be listed. Thus, if the calf crop is sold at weaning the producer need not use a calf-pocket book at all.

When the calf-pocket book is completed by the producer, this is sent in and a yearling-carcass summary is prepared and sent back to the producer. This yearling-carcass summary will be the size of the weaning summary after the perforated section has been removed. It will give identification, pedigree, weaning, yearling and carcass data individually, but grouped into sire-sex-management groups and averaged. From this summary, the breeder can evaluate either young bulls or the purchased sires and develop a performance reputation for his herd by knowing how his product offered for sale performs in the feedlot and on the rail. This yearling-carcass summary, which includes weaning information as well, can be retained each year and used by the commercial breeder to evaluate his breeding program over time. The weaning summary by years gives the reproductive values of his herd.

Table 1 gives the sequence of events in the operation of the commercial program. The program is designed such that the producer is required to select his cow herd and include the heifers each year. If the program is not utilized for selection, the producer will not be a participant. The several format designs are included in the remaining table.

TABLE 1.

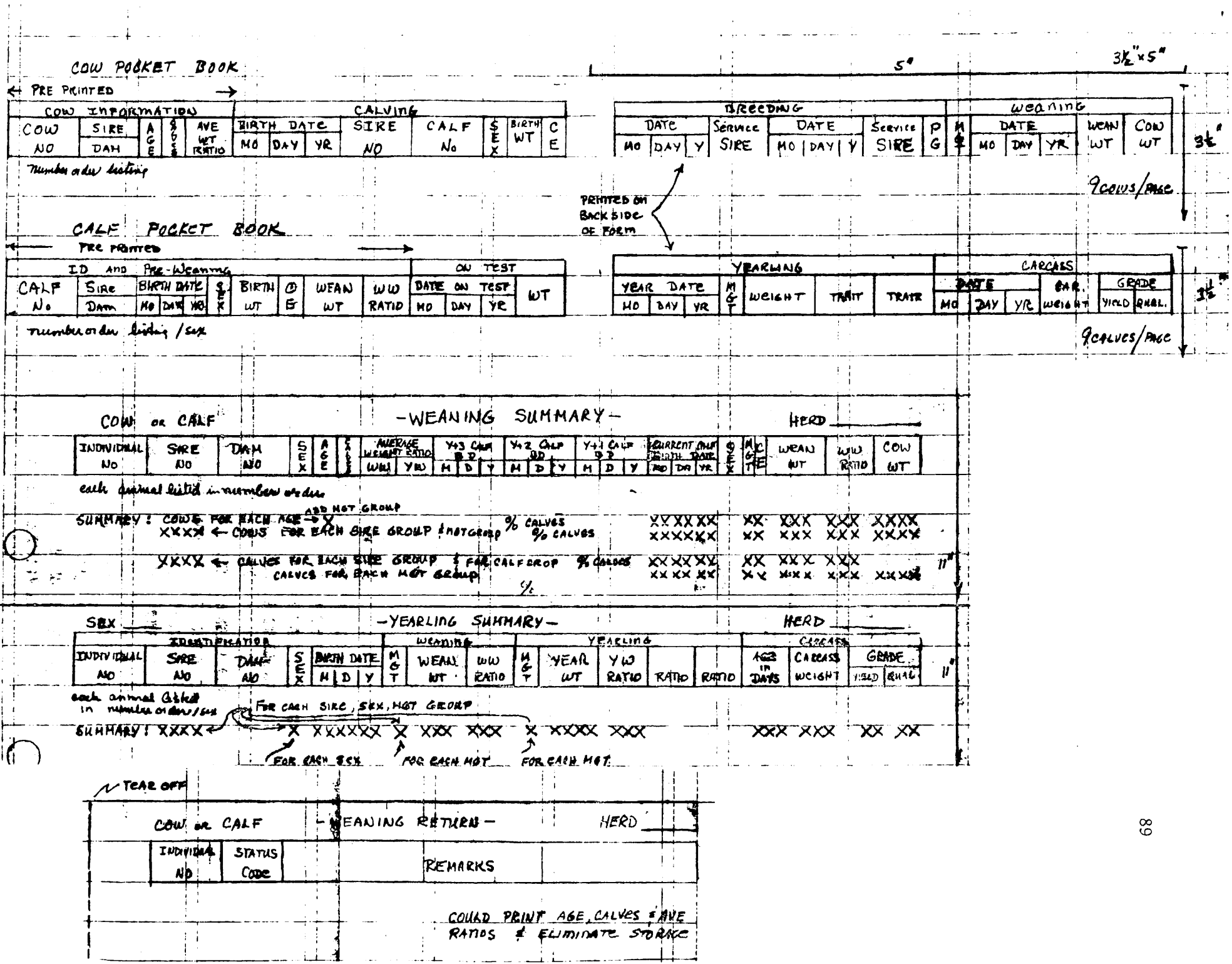


T = raw book

O = data input from breeder

→ = sending in completed book or selection sheet for new cow book

\+ = data summary


COW POCKET BOOK
5"
3½"×5"
← PRE PRINTED →
COW INFORMATION
COW NO
SIRE
DAM
AGE
SEX
AVE WT RATIO
CALVING
BIRTH DATE
MO
DAY
YR
SIRE NO
CALF No
SEX
BIRTH WT
CE
BREEDING
DATE
MO
DAY
Y
Service SIRE
DATE
MO
DAY
Y
Service SIRE
PG
MGT
weaning
DATE
MO
DAY
YR
WEAN WT
COW WT
3½"
Number order listing
9 COWS/PAGE
PRINTED ON BACK SIDE OF FORM
CALF POCKET BOOK
← PRE PRINTED →
ID AND PRE-WEANING
CALF No
SIRE
DAM
BIRTH DATE
MO
DAY
YR
SEX
BIRTH WT
CE
WEAN WT
WW RATIO
ON TEST
DATE ON TEST
MO
DAY
YR
WT
YEARLING
YEAR DATE
MO
DAY
YR
MGT
WEIGHT
TRAIT
TRAIT
CARCASS
DATE
MO
DAY
YR
BAR. WEIGHT
GRADE
YIELD
QUAL.
1½"
Number order listing / sex
9 CALVES/PAGE
COW or CALF
-WEANING SUMMARY-
HERD
INDIVIDUAL NO
SIRE NO
DAM NO
SEX
AGE
SIRE
AVERAGE WEIGHT RATIO
WW
YW
Y+3 CALF D.O.B.
M
D
Y
Y+2 CALF D.O.B.
M
D
Y
Y+1 CALF D.O.B.
M
D
Y
CURRENT CALF BIRTH DATE
MO
DAY
YR
SEX
MGT CODE
WEAN WT
WW RATIO
COW WT
each animal listed in number order
SUMMARY: COWS FOR EACH AGE →
XXXX ← COWS FOR EACH SIRE GROUP
ADD HOT GROUP
HOT GROUP
% CALVES
% CALVES
XXXX ← CALVES FOR EACH SIRE GROUP
CALVES FOR EACH HOT GROUP
FOR CALF CROP
% CALVES
11"
SEX
-YEARLING SUMMARY-
HERD
IDENTIFICATION
INDIVIDUAL NO
SIRE NO
DAM NO
SEX
BIRTH DATE
M
D
Y
WEANING
MGT
WEAN WT
WW RATIO
YEARLING
MGT
YEAR WT
YW RATIO
RATIO
RATIO
CARCASS
AGE IN DAYS
CARCASS WEIGHT
GRADE
YIELD
QUAL.
11"
each animal listed in number order/sex
FOR EACH SIRE, SEX, MGT GROUP
SUMMARY: XXXX
FOR EACH SEX
FOR EACH MGT
FOR EACH MGT
TEAR OFF
COW or CALF
-WEANING RETURN-
HERD
INDIVIDUAL NO
STATUS CODE
REMARKS
COULD PRINT AGE, CALVES & AVE RATIOS & ELIMINATE STORAGE

Performance Pedigree Committee Report & Recommendations

Tom Burch, Chairman

The Performance Pedigree Committee reviewed the material in the BIF Guidelines. The following material is recommended for publication in future Guidelines. The Performance Pedigree should include:

I. Animal's individual record.
   1. 205 day adjusted weaning weight
   2. Weaning weight ratio
   3. Number of contemporaries, weaning
   4. 365, 452 or 550 day adjusted yearling weight
   5. Yearling weight ratio
   6. Number of contemporaries, yearling

   Breeding values may be added to any traits that are considered important.

II. Progeny of each individual in pedigree.
   1. Number of progeny and average weight ratios.

III. Progeny carcass information.
   1. Number of progeny
   2. Age of progeny
   3. Carcass weight
   4. Trimmed retail cuts/day of age
   5. Quality grade

IV. Productivity of a sire's daughters.
   This information will give a producer an idea of how the daughters of different bulls are producing or milking in his herd. The records of the daughters and the number of records.
   Average MPPA (Most Probable Producing Ability) for each sire's daughters as compared to her contemporaries or use average weaning weight ratios for this comparison.

Editorial Comment by BIF Secretary, Frank Baker

At recent BIF meetings there has been considerable discussion concerning the relationship of the "performance pedigree" to the "estimated breeding value" as calculated from performance data on which the "performance pedigree" is based. In one sense the performance pedigree is a simple pictorial presentation of data which constitutes the "estimated breeding value." In order to not become confused in assessing the usefulness of data on a performance pedigree one needs to understand the composition purpose and significance of "estimated breeding value." For this reason the BIF Board requested the preparation of the following discussion on "estimated breeding value." At some future time BIF may consider a recommendation to place more emphasis on "estimated breeding value" and less emphasis on performance pedigrees. Obviously to take such a step, BIF would have to determine that both "performance pedigrees" and "estimated breeding value" are well understood by the breeders and public who use them.

Background Statement and Definition of Estimated Breeding Values

by
R. L. Willham
Iowa State University

The issue in record utilization is SELECTION. The central concept in selection is the notion of BREEDING VALUE. Records can be utilized to ESTIMATE the breeding value of prospective parents. Selecting on estimated breeding value can enhance the effectiveness of selection. The purpose of this section is to consider the estimation of breeding values from performance records available in performance programs and examine their value in beef breeding programs.

Beef performance records are relatively expensive both in terms of money and time required to obtain them. Cattle have a long GENERATION INTERVAL, a low reproductive rate, and are expensive. These latter two problems result in a low INTENSITY of selection especially in cows. If the existing records can be utilized to increase the ACCURACY of selection even a bit without increasing the generation interval or reducing the intensity, this advantage should be used in performance programs serving the beef industry. Precisely this can be done by estimating breeding values based on the available and useful relative and individual performance records.

Selection and breeding values are related since the response to selection per year is

$$\text{Response/Year} = \frac{1/2(\text{Breeding Value of Sires}) + 1/2(\text{Breeding Value of Dams})}{\text{Average of Sire's and Dam's Generation Interval}}$$

where the

Breeding Value = HERITABILITY Times SELECTION DIFFERENTIAL.

This applies to selection based on the individual performance of the parents. Using the same logic the estimated breeding value of a bull for yearling weight based on his own record is the difference between his record and the contemporary average multiplied by heritability. His superiority or inferiority is REGRESSED toward the average by the fraction of the difference expected to be heritable. If heritability is 40% and a bull is 100 pounds superior to his contemporaries in yearling weight, his estimated breeding value is .4 x 100 = 40 pounds. On the average, this bull would be expected to transmit 20 pounds to his progeny.

Progeny, HALF-SIBS, and parents as well as the performance of an individual can be used in breeding value estimation since they all have GENES that are identical by descent from some common ancestor. Table 1 presents the various sources of relative information available in most performance programs. To evaluate the sources, the table gives the accuracy or the CORRELATION between the true breeding value and the estimated breeding value using the particular relative information. Three heritability values are

Table 1. The accuracy of records on relatives for estimating the breeding value of an individual

Relatives	Number	Genetic Relationship	Heritability 20%	40%	60%
Parent	1	1/2	.22	.31	.39
Paternal half-sibs	10	1/4	.30	.36	.40
	40	1/4	.41	.45	.47
Maternal half-sibs	2	1/4	.15	.22	.26
	4	1/4	.21	.28	.33
Individual	1	1	.45	.63	.77
Progeny	10	1/2	.59	.72	.80
	40	1/2	.82	.90	.94

used. The accuracy is higher the more heritable the trait. As the genetic relationship to the individual increases so does the accuracy. When the numbers in the relative groups increase, the accuracy goes up. The rate of increase is faster for high heritability than low, but diminishing returns for increasing numbers sets in more quickly for high compared to low heritability. The accuracy of selection is influenced by heritability, relationship, and number of relatives in the average.

The primary relatives in beef records are the individual himself, his paternal and maternal half-sibs and his progeny. If sibs are available, the parent records add little. The first three sources are available at or before reproductive maturity while the progeny require an increased generation interval to obtain. The use of sib or progeny averages helps in breeding value estimation since the groups are usually unselected and the averaging of several records tends to cancel out the plus and minus environmental differences leaving more nearly a genetic value for the average.

These sources of information can be combined into a single estimate of breeding value for each animal that is the subject of selection. This is done by using the numbers in the averages, the heritability, and the relationships to develop a set of linear equations that when solved give proper weighting factors to the particular information available on the individual for the trait. Then these weights times the records expressed as DEVIATIONS give an estimated breeding value. The value is for the particular trait using the available information. This procedure has some desirable properties for the breeder using the values for selection. First, the correlation between true and estimated breeding value is maximum. Second, the estimate is regressed toward the average depending on the amount of information. This latter feature makes it possible for the breeder to use these values to fairly rank individuals that differ in the amount of information available. The computation of estimated breeding values is done easily by computer but is virtually impossible by hand.

Table 2 gives the percentage attention that is paid to different pieces of information when the amount of information varies. The first two rows of the table illustrate the sort of information available on young animals and the last two rows illustrate the influence of progeny as a means of estimating breeding value.

Table 2. The relative amount of attention that should be paid to various relative groups in estimating the breeding value of an individual

Numbers				Percentage Attention			
IND	PHS	MHS	PROG	IND	PHS	MHS	PROG
1	10	2	0	44	42	14	0
1	20	4	0	33	46	21	0
1	10	2	10	18	17	6	59
1	20	4	20	10	14	6	69

Theory is available to combine information on several traits together into a SELECTION INDEX such that selection could be based on the index. The additional information necessary to compute such an index is the ECONOMIC VALUE of each trait, the GENETIC and PHENOTYPIC CORRELATIONS between the traits, and a specification by the breeder of net merit. Which traits and

how they relate economically are individual breeder problems in his determination of goal and cannot be set for him by his performance record program.

Two logical alternatives exist for the breeder that gets estimated breeding values on his herd for several traits. First, he can weight the estimated breeding values by appropriate economic values and use this as his selection criterion. Second, he can use an independent culling level for each trait. When the values for the first trait are available, he can select a fraction P of the animals, and when the second trait values are available, he can select a fraction Q of the remaining animals. The product P x Q must equal the number of replacements necessary.

There are two ways estimated breeding values can be presented for use by the breeder. The first is in the form of a selection worksheet and the second is in the form of a performance pedigree. The first is useful in making selections in a breeding program and the second has as its purpose promotion of breeding stock.

The selection worksheet is a document that gives the animal identification, the available data for that animal, and an estimated breeding value based on the records on a contemporary group of animals in a herd. The purpose is to use the selection worksheets in conjunction with common sense to select breeding stock. For example, each time a group of calves are weaned the breeder receives selection worksheets that give the estimated breeding values of the male and female calves separately along with the values for the dams and sires. These are current documents having compiled into one number all of the relevant weaning data for each individual that is on record. From this the breeder can make his first selection on the calves and cull his cows in conjunction with a pregnancy test. When yearling selection worksheets are sent, the breeder can select his sire prospects, develop his sale bull offering, and make decisions about his herd bulls all before he lots his sires for breeding. The selection worksheet is a way to really use records in a creative breeding program.

Performance pedigrees are primarily promotional especially if the selection worksheets are being used. Using the information on a performance pedigree to estimate a breeding value for each trait of importance is a much safer procedure than trying to mentally come up with a sound analysis of the pedigree. Human nature is such that the good records get over-evaluated and the poorer ones are sometimes forgotten. The individual performance of the ancestors when expressed relative to their contemporaries provides an excellent means of determining the selection practiced in the herd. As a promotional tool, the breeding value is

an estimate of what that individual is expected to transmit to his or her offspring. This breeding value concept is precisely what a breeding stock breeder is selling. It is what the stock of a breeder does in the herd of the buyer that makes the performance reputation.

What follows are the statistical and computational details of estimating breeding values. This information may be used by BIF organizations to develop programs to estimate these values routinely. The information needed for each individual, if available, is as follows:

1. His own performance as a deviation or a ratio deviation from his contemporary group.
2. The average performance of his paternal half-sibs as the average of the individual deviations or ratio deviations and the number of sibs. The individual's own record should be excluded from the average.
3. The same as 2, except for maternal half-sibs.
4. The average performance of his progeny as the average of the individual deviations or ratio deviations and the number of progeny.

After this information has been collected, the following set of linear equations must be solved for the B values for each individual:

$$1/H \cdot B_1 + 1/4 \cdot B_2 + 1/4 \cdot B_3 + 1/2 \cdot B_4 = 1$$

$$1/4 \cdot B_1 + \frac{4+(N_1-1)H}{4N_1H} \cdot B_2 + 0 \cdot B_3 + 1/8 \cdot B_4 = 1/4$$

$$1/4 \cdot B_1 + 0 \cdot B_2 + \frac{4+(N_2-1)H}{4N_2H} \cdot B_3 + 1/8 \cdot B_4 = 1/4$$

$$1/2 \cdot B_1 + 1/8 \cdot B_2 + 1/8 \cdot B_3 + \frac{4+(N_3-1)H}{4N_3H} \cdot B_4 = 1/2$$

The values that change from one animal to the next are as follows:

N_1 = number of paternal half-sibs excluding the individual

N_2 = number of maternal half-sibs excluding the individual

N_3 = number of progeny

The symbol H is the heritability for the particular trait. Only the lead diagonal coefficients change; all other coefficients are genetic relationships. If an individual has only part of the information, the row and column where no

data is available is eliminated. The solution to these equations can be obtained by matrix inversion as

$$C \cdot B = R$$
$$B = C^{-1} \cdot R$$

where C^{-1} is the inverse of the matrix of coefficients C. After solution a set of weights or regression coefficients are available. These are multiplied by their respective relative average and summed as

$$B_1 \cdot \text{Individual deviation}$$
$$+ B_2 \cdot \text{Paternal half-sib average deviation}$$
$$+ B_3 \cdot \text{Maternal half-sib average deviation}$$
$$+ B_4 \cdot \text{Progeny average deviation.}$$

This sum of products equals the estimated breeding value. The accuracy of the estimated breeding value is

$$\text{Accuracy} = \sqrt{B_1 \cdot 1 + B_2 \cdot 1/4 + B_3 \cdot 1/4 + B_4 \cdot 1/2} \quad .$$

The accuracy is an indication of the confidence to be placed in the estimated breeding value, but the estimate has already been regressed so this value should not be considered again. An approximate standard error of the estimated breeding value is

$$\text{Standard Error} = \sqrt{H \cdot \text{Variance} \cdot (1 - \text{Accuracy}^2)}$$

where Variance is the phenotypic variance of the particular trait. This information on each animal should be listed for use by the breeder and returned to him as soon as possible after the trait has been evaluated.

Central Test Station Committee Report & Recommendations

Bobby J. Rankin, Chairman
T. D. Rich, Secretary

An open meeting was held April 15 from 2:30 p.m. to 5:30 p.m., attended by twenty people including five committee members. Items considered were:

1. Glossary of terms related to central test stations. Rankin will circulate a list among the Committee.

2. Length of feed tests for different types of cattle. The present guidelines permit tests longer than 140 days.

3. Standard for reporting fat thickness. The Committee recommends both actual and per cwt. be published.

4. Adjustment of feed conversion values to a mean weight. A proposal based on weight to the three-fourths power is being considered by the Committee.

5. Lack of compliance with BIF Guidelines. BIF has no regulatory function. To increase knowledge of the Guidelines, the Committee recommends to the Directors that separate brochures on Central Test Guidelines be printed so that greater distribution can be made.

6. Incorrect computation of 365-day weights. The present guideline is adequate for cattle which fit all other requirements; i.e., tested shortly after weaning, on-farm 205-day weights available. The Guidelines revision might include examples which clarify and stress the importance using one standard. Several other alternatives were discussed.

7. Publication of more performance data in sale catalogs. Time is a problem with most tests completed very near sale date. It should be clearly indicated that performance data is available and possibly 112-day data should be published with the pedigrees.

8. Conformation scores. The reference to a particular scoring system will be deleted, leaving as an optional measurement <u>any</u> system of visual appraisal.

9. A draft of revisions will be circulated among the Central Test Committee and a final draft sent to the coordinator.

TABLE FOR CONVERTING AVERAGE WEIGHTS DURING TEST TO (WEIGHT)$^{3/4}$ FOR ADJUSTING FEED EFFICIENCY VALUES FOR DIFFERENCES IN MAINTENANCE REQUIREMENT

Wt.	(Wt.)$^{3/4}$	Wt.	(Wt.)$^{3/4}$	Wt.	(Wt.)$^{3/4}$	Wt.	(Wt.)$^{3/4}$
700	136	850	157	1000	173	1150	197
710	138	860	159	1010	179	1160	199
720	139	870	160	1020	180	1170	200
730	140	880	162	1030	182	1180	201
740	142	890	163	1040	183	1190	203
750	143	900	164	1050	184	1200	204
760	145	910	166	1060	186	1210	205
770	146	920	167	1070	187	1220	206
780	148	930	168	1080	188	1230	208
790	149	940	170	1090	190	1240	209
800	150	950	171	1100	191	1250	210
810	152	960	172	1110	192	1260	211
820	153	970	174	1120	194	1270	213
830	155	980	175	1130	195	1280	214
840	156	990	176	1140	196	1290	215
						1300	216

HOW TO USE THE TABLE:

(1). Compute the mid-weight of each pen of bulls fed together.

$$\left(\frac{\text{Avg. final wt.} - \text{avg. initial wt.}}{2}\right)$$

(2). Compute the test group average of pen mid-weights.

$$\left(\frac{\text{Sum of pen mid-wts}}{\text{Number of pens}}\right)$$

(3). Convert these mid-weights to Weight to the three-fourths power by using the above table.

(4). Compute actual pounds of feed per 100 pounds of gain for each pen.

$$\left(100 \times \frac{\text{total feed consumed}}{\text{total gain}}\right)$$

(5). Compute the adjusted feed efficiency as follows:

$$\frac{(\text{Avg. of all pen mid-wts})^{3/4}}{(\text{pen mid-wt})^{3/4}} \times \text{Actual feed/100 lb. gain}$$

(6). Note: This method adjusts for differences in maintenance requirements of bulls of different sizes. The feed/gain of heavier than average bulls will adjust downward and feed/gain of lighter than average bulls will adjust upward. Maintenance requirement is proportional to (Weight)$^{3/4}$.

Farm and Ranch Pre- & Post-Weaning Testing Programs Committee Report & Recommendations

Ray Meyer, Chairman

The following committee members were present: M. A. Kirkeide, J. Massey, M. Jorgenson, C. Ricketts, H. Fitzhugh, L. Nelson, W. McReynolds, J. Minyard, C. Allen, and G. Butts.

The first item of business was a discussion of the revision of the BIF Guidelines. The secretary distributed a preliminary draft of the revised Farm and Ranch section and committee members were asked to work on further changes and present suggested changes for approval by the committee at the April 16, 1974 meeting.

The following changes in wording are suggested:

Change wording in second paragraph, page 1 (10th and 12th lines), "Heifers" to "calves" on motion by Fitzhugh, second by Massey. Carried.

Foster moved, seconded by Ricketts to drop last sentence of the second paragraph, page 1. Carried. It was moved by Fitzhugh, seconded by Massey that the following be added to the first sentence of Post-Weaning Phase section: "When cattle have been compared on a constant weight or age basis."

Age of dam adjustment factors were discussed. Dr. Fitzhugh pointed out that any standard adjustment factors will not likely fit all cattle and all environments. For example, in Brahman and other high-milking crosses, the adjustment given two-year-olds is probably too much. Recent data suggest adjustments for these high-milking crosses should probably be: 2-yr-olds--108%; 3-yr-olds--106%; and 12's and older--105%.

Nelson moved, Allen seconded, that the following statement be inserted immediately following the suggested age of dam factors:

"These factors were primarily based on data from the British beef breeds. Evidence is available that these factors are not appropriate to all breeds, especially those noted for higher milk production. In this case, weaning weight for calves from younger cows are over-adjusted relative to those from mature cows."

Standard adjustment of all weaning records to a 205 day weight was considered. Alternatives discussed were (1) adjusting to the mean age of a specific group and (2) having computer programmed to break larger herds into logical age groupings. Fitzhugh moved that a more comprehensive description of "equal opportunity groups" and its implication and importance for adequate age adjustment be included in the Guidelines. Second by Massey. Carried.

The committee discussed the matter of "irregular" animals in weaning weight summaries. No action was taken by the committee; feeling seemed to prevail that present provisions appear to be adequate.

After considerable discussion, Fitzhugh moved the committee recommend the use of a cow summary including the following information:

Measures relating to reproductive efficiency

1. Age in months at first calving
2. Age in months when most recent calf was delivered
3. Number calves delivered to date
4. Number calves weaned to date
5. Average age of calves when weaned
6. Average calving interval

Measures relating to productivity

1. Average birth weight
2. Average weaning weight ratio of all calves weaned
3. Average adj. 365 day weight, wt. ratio and number contemporaries
4. MPPA

Motion seconded by Kirkeide. Carried.

Ricketts moved and Massey seconded that the following statement be inserted at the end of the Farm and Ranch section. Carried.

"The BIF recognizes that there is a great deal of variability in the size and composition of beef cattle at any constant age such as weaning time and a year of age. Even though the BIF is not recommending a standardized evaluation* system, it does feel that evaluation is important. The BIF encourages breed associations and State BCIA's to use an evaluation program that is workable in their respective state or breed programs."

The next item of business was a discussion of measures of cow efficiency. A brief presentation was made by Dr. Dinkel (S.D.). Comments were made by Butts and Fitzhugh. After considerable discussion, Butts moved, seconded by Allen, that the Board of Directors be encouraged to direct an in-depth study of cow efficiency measures. Carried.

Butts moved, Allen seconded, that the committee recommend to the Board of Directors that they encourage the collecting and storing of yearling weights and cow weights. Carried.

Moved by Ricketts, seconded by Massey that the committee meeting be adjourned.

*Evaluation defined as either subjective or objective.

Editorial Comment by BIF Secretary

The BIF Board reviewed this report and its previous action concerning objective and subjective evaluation systems. The Board chose to reaffirm its earlier decision to leave evaluation systems particularly subjective visual scoring to the discretion of the individual member organizations without endorsement of the concept pro or con by BIF.

BIF AWARDS' PROGRAM

The Commercial Producer Honor Roll of Excellence

Chan Cooper	Montana	1972
Alfred B. Cobb, Jr.	Montana	1972
Lyle Eivins	Iowa	1972
Broadbent Brothers	Kentucky	1972
Jess Kilgore	Montana	1972
Clifford Ouse	Minnesota	1973
Pat Wilson	Florida	1973
John Glaus	South Dakota	1973
Sig Peterson	North Dakota	1973
Max Kiner	Washington	1973
Donald Schott	Montana	1973
Stephen Garst	Iowa	1973
J. K. Sexton	California	1973
Elmer Maddox	Oklahoma	1973

1974

	Nominated By:
Marshall McGregor, Circle F Cattle Co. Stoutland, Mo. 65567	Missouri BIA
Lloyd Nygard, Route 1, Minot, N.D. 58701	North Dakota BIA
Dave Matti, Matti Ranch, Helmville, Mt. 59843	Am. Simmental Assn.
Eldon Wiese, Pequot Lakes, Mn. 56472	Mn. BCIA
Lloyd DeBruycker, Dutton, Mt. 59433	Mt. Beef Perf. Assn.
Gene Rambo, P. O. Box 113, Shandon, Ca. 93461	Ca. BCIA
Jim Wolf, Wagonhammer Ranches, Albion, Ne. 68620	North American Limousin Found.
Elmer Maddux, Freedom, Ok. 73842	Performance Registry Intl.
Henry Gardiner, Ashland, Ks. 67831	A BIF Director
Johnson Bros., Trail City, S.D. 57657	SD Livestock Production Recds. Assn.

The Seedstock Breeder Honor Roll of Excellence

John Crowe	California	1972
Dale H. Davis	Montana	1972
Elliot Humphrey	Arizona	1972
Jerry Moore	Ohio	1972
James D. Bennett	Virginia	1972
Harold A. Demorest	Ohio	1972
Marshall A. Mohler	Indiana	1972
Billy L. Easley	Kentucky	1972
Messersmith Herefords	Nebraska	1973
Robert Miller	Minnesota	1973
James D. Hemmingsen	Iowa	1973
Clyde Barks	North Dakota	1973
C. Scott Holden	Montana	1973
William F. Borror	California	1973
Raymond Meyer	South Dakota	1973
Heathman Herefords	Washington	1973
Albert West III	Texas	1973
Mrs. R. W. Jones, Jr.	Georgia	1973
Carlton Corbin	Oklahoma	1973

1974

	Nominated By:
Wilfred Dugan, Rt. 3, Montose, Mo. 64770	Mo. BCIA
Bert Sackman, Streeter, N. D. 58483	N.D. BCIA
Dover Sindelar, Rt. 3, Alexander Rd., Billings, Mt. 59101	American Shorthorn Assn.
Jorgensen Bros. (Martin & Donald), Ideal, S. D. 57541	S.D. Livestock Prod. Reeds. Assn.
J. David Nichols, Anita, Ia. 50020	Iowa BIA
Bobby Lawrence, P.O. Box 367, Leesburg, Ga. 31763	American Simmental Assn.
Marvin Bohmont, Bohmont Herefords, Martell, Ne. 68404	Nebraska BCIA
Charles Descheemaeker, Boyd, Mt. 59013	Montana Bf. Perf. Assn.
Bert Crane, 5500 S Bear Creek Drive, Merced, Ca. 95340	California BCIA
Burwell M. Bates, Box 55, Konawa, Ok. 74849	North American Limousin Found.
Carlton Corbin, Fittstown, Ok. 74842	Performance Registry Intl.
Maurice Mitchell, Westbrook, Mn. 56183	Minnesota BCIA

The Pioneer Awards

Jay L. Lush	Iowa State University	Research	1973
John H. Knox	New Mexico State University	Research	1973

1974

Ray Woodward - American Breeders Service - Research

Educated at Montana State University and the University of Minnesota, he was an active research leader at the U.S. Range Livestock Experiment Station from 1945 to 1960. His projects included selection on performance records, linebreeding and crossbreeding. Since 1960 he has been an active leader of sire selection and progeny testing programs for the American Breeders Service.

Fed Willson - Montana State University - Research

Educated at North Dakota State University and Iowa State University, Fred Willson served in Montana as a county agent, superintendent of the North Montana Branch Station and head of the Animal Science Department at Montana State University. He initiated the performance research studies at the North Montana Station and cooperated in the research at Miles City, Montana. He was active in education of ranchers about performance testing. He is a fellow of the American Society of Animal Science.

Charles E. Bell, Jr. - Extension Service, USDA, Washington, DC - Education

Charles Bell was at the University of Georgia for 20 years before joining the Extension staff of USDA, Washington DC. He served both as county agent in Fayette County and as state livestock specialist. At the state level, Bell introduced testing procedures for improvement of cattle herds. As a national Extension specialist, Bell participated in the formation of Performance Registry International. He assisted performance programs by serving as an adviser to PRI and other beef organizations.

Reuben Albaugh - Extension Service, University of California - Education

Reuben "Rube" Albaugh was educated at Oregon State University and served as a member of the Extension service of the University of California for more than 40 years. His service included 22 years as Farm Adviser of Monterey County and more than 20 years as livestock specialist for northern California.

Rube used performance testing type procedures in the Monterey County program during the 40's and at the state level during the 50's and 60's. The California Beef Cattle Improvement Association grew out of Albaugh's efforts. He was also a contributor of ideas to development of programs in several other states and countries.

Paul Pattengale - Extension Service, Colorado State University - Education

Paul Pattengale was educated at the University of California and served as Extension Farm Adviser in San Benito County, Ca. for 10 years. After two years as a ranch manager in the county, Pat moved to Colorado State University as Extension livestock specialist in 1953. He introduced beef testing procedures in San Benito County, California during the 40's and in Colorado during the 50's and 60's.

Commercial Producer of the Year

Chan Cooper	Montana	1972
Pat Wilson	Florida	1973

1974

		Nominated By:
Lloyd Nygard	Minot, N.D.	N.D. BCIA

Lloyd Nygard, outstanding commercial producer, began his career as a vocational agriculture instructor at Velva High School, North Dakota. In his 10 years there, he had one of the most successful chapters in the state, winning both the State and National FFA Chapter Contests.

After leaving Velva, Nygard moved to Burlington where he managed the Harrington Ranch for 20 years. There, he began the first performance tested herd in the state, and conducted performance testing at the ranch every year after. He has also served as both officer and director for the North Dakota Beef Cattle Improvement Association since it was organized.

In the past two years, he has started his own livestock and grain enterprise and has a small purebred herd on which performance records are kept. A 4-H leader for the past 10 years, he remains active in local activities, including school board, township board, and the Ward County Agriculture Improvement Association.

Breeder of the Year

John Crowe	California	1972
Mrs. R. W. Jones	Georgia	1973

1974

		Nominated By:
Carlton Corbin	Fittstown, Ok. 74842	Performance Registry Intl.

The outstanding seedstock producer, Carlton Corbin, of Stoneybroke Ranch is a past president of Performance Registry International. He was cited as one of the nation's foremost authorities on the benefits of performance testing. He was a graduate of Oklahoma State University in 1929.

Corbin is the founder of the Emulous line of Angus cattle. This is a high performing line with an outstanding show ring record and an equally outstanding record on 140-day feed tests. He is also the breeder of the first Certified Meat Sire and a bull that holds the world's record yearling weight.

Organization of the Year

Beef Improvement Committee, Oregon Cattlemen's Association	1972
South Dakota Livestock Production Records Association	1973

1974

American Simmental Association, Inc.

The American Simmental Association, Inc., headquartered in Bozeman, Montana was recognized for its extensive work with performance testing records. The Association offers a data service that prints out performance data on bulls, cows, heifers and progeny.

The Association introduced to the American beef industry the concept of the annual release of a National Sire Summary by a breed association.

Besides making available the National Sire Summary listing traits ratios, expected progeny differences, and accuracy figures for various traits, they also rank Simmental cows on the basis of producing ability. Exceptional cows may be presented with "Excellent," "Superior," or "Elite" awards.

Three years ago, the Simmental Association also began sponsoring awards recognizing carcass merit in Simmental steers, with emphasis on carcass value per day of age.

The American Simmental Association has grown from nine individual commercial and purebred breeders to a membership of 3,800-plus in 34 state associations. Since its beginning, within-herd performance records have been mandatory for registration.

Continuing Service Awards

Clarence Burch	Oklahoma	1972
F. R. Carpenter	Colorado	1973
E. J. Warwick	ARS-USDA, Washington, D.C.	1973
Robert deBaca	Iowa State University	1973

1974

FRANK H. BAKER - Chairman, Animal Science Department at the University of Nebraska-Lincoln. Baker was active in Beef Improvement Programs in Oklahoma and the USDA. He assisted in organizing BIF. He is presently serving as the BIF Secretary. While serving with USDA, he organized and chaired the U.S. Beef Records Committee in 1964-65 which prepared the first publication on Guidelines for Uniform Beef Improvement Program. This Committee was the forerunner of the BIF.

D. D. BENNETT - Manager, Stone Hereford Ranch, Hermiston, Oregon. Past-chairman in Oregon Beef Improvement Programs. Past BIF President, 1971-72. Currently serving as a Director from Western Region and Chairman of the Committee on Reproduction. He was raised on a well-known Shorthorn Ranch. Bennett was educated at Washington State University--BS, 1960, MS, 1965. He served as a faculty member for 2 years. He joined the Stone operation in 1967 as Manager of the registered herd and a partner in the commercial ranch.

RICHARD WILLHAM - Animal Breeding Researcher and Teacher, Iowa State University, Ames, Iowa. Active in Oklahoma and Iowa Beef Improvement Programs. One of the authors of BIF National Sire Evaluation Program. Lecturer on BIF Sire Evaluation Symposium series in 1971-72. Currently, Chairman of BIF Record Utilization Committee and Secretary of BIF Sire Evaluation Committee. Author of BIF brochure on "Sire Selection." Has consulted with several associations on development of sire evaluation programs. BS, Oklahoma State University, Ph.D., Iowa State University. Served on faculty of both OSU and ISU.

Minutes of the Meeting of the Midyear Board of Directors
Beef Improvement Federation
Bozeman, Montana - October 17, 1973

Members present included:

Martin Jorgenson, Ideal, South Dakota
Fred Francis, St. Joseph, Missouri
C. D. Swaffer, Omaha, Nebraska
Don Vaniman, Bozeman, Montana
Frank Baker, Lincoln, Nebraska
Dave Nichols, Anita, Iowa
Ray Meyer, Sorum, South Dakota
Bob Miller, Mabel, Minnesota
Dixon Hubbard, Washington DC - Extension Service Representative
Lou Chesnut, Spokane, Washington
Bob Vantrease, Denver, Colorado
Larry Cundiff, Clay Center, Nebraska - ARS Representative
Doug Bennett, Hermiston, Oregon
Bill Durfey, St. Joseph, Missouri
Craig Ludwig, Kansas City, Missouri

The meeting was called to order by President Dave Nichols and the agenda reviewed and established for the day. The Secretary reviewed the program activities since the annual meeting in the spring. These activities centered on the publication of the Proceedings and the conduct of the Beef Carcass Data Service Program. Board members encouraged the Secretary to try to obtain enough copies of the listing of the federally inspected slaughter plants for distribution to BIF members. The Board was informed that Dr. E. J. Warwick accepted an overseas assignment for two years and was being replaced on the Board by Dr. Larry Cundiff.

The history and operational procedures of the National Sire Evaluation Committee were reviewed because of the resignation of Dr. Warwick as chairman of the committee. It was noted that Dr. Warwick had been originally selected as chairman of the National Sire Evaluation Committee because the organizations operating sire evaluation programs felt that it was better for the chairman of the committee to be a public employee independent of vested interest in any of the ongoing programs. At the end of the discussion, Fred Francis offered a motion that Dr. Cundiff be named as chairman of the National Sire Evaluation Committee. Motion was seconded by Bill Durfey. Motion passed.

With the election of Dr. Cundiff to the chairmanship of the National Sire Evaluation Program the question was raised in regard to the secretaryship of the Farm and Ranch Testing Committee previously held by him. After discussion of the matter Swaffer offered a motion that the secretaryships of the committees be filled by appointment by the committee chairmen with concurrence of the committee coordinatory. Motion was seconded by Bennett. Motion passed.

The new committee assignments were reviewed by Dixon Hubbard, Program Committee Coordinator. It was pointed out that there had been some revision and combining of the committees in order for them to function on the basis that appears to be in the best interest of the total BIF program.

Plans for publication for the 1974 edition of the Guidelines booklet were reviewed by Dixon Hubbard. The Board was asked to consider whether the publication should be continued as a USDA publication and whether or not it should continue as a single publication, or whether it should become a series of leaflets on different phases of the program. After the discussion, Durfey offered a motion that the publication should continue to be a USDA publication and the next edition should be completed and released in the latter part of 1974 after the annual meeting. Swaffer seconded the motion. Motion passed.

Discussion was initiated on the timetable for preparation of material for revision of the Guidelines booklet. After the discussion, Vantrease offered a motion that the final draft of the material be in the hands of the Program Coordinator, Dixon Hubbard, by June 1, 1974 and the major changes in the material to be included in the publication should be approved by the Board at the time of the annual meeting, April 15-17. Motion was seconded by Chesnut. Motion passed.

The program coordinator was instructed to notify committees immediately to prepare revisions of the Guidelines prior to and during the annual meeting. As a service to BIF members, the secretary will try to arrange to produce a preliminary copy of the revised Guidelines for each BIF member in July of 1974. The program coordinator was asked to include a section in the publication on the "glossary of terms." It was suggested that Dr. Robert deBaca could serve as an editor for this section of the Guidelines. Each committee could be asked to prepare the "glossary of terms" covered by that committee's section of the publication. Dr. deBaca could integrate and edit these lists. The Board also felt that it was appropriate that the booklet include a section on estimated breeding value and that this section should be prepared to Dr. Richard Willham and should be circulated to all of the committees and to all of the members of the Board of Directors prior to the annual meeting so they might have an opportunity to offer suggestions and changes.

A discussion was initiated in regard to the districts used for election of BCIA Directors. It was pointed out that the present four districts provided for distribution of the directors in different parts of the country. In at least one district it has been difficult to obtain an active BCIA Director. After the discussion, the motion was offered by Meyer and seconded by Bennett that the following operating policies be in effect and that the secretary notify the members of BIF regarding this operating policy:

"In the future the Mississippi River will serve as a division line for two geographic districts for allocation of BCIA Directors. Two directors will be elected from the states east of the division line and two directors from the states west of the line. Four directors will be elected at large. No more than one BCIA Director can be nominated from a state in any single year. A director who is inactive will be notified to become active or that he will be replaced at the next annual meeting."

A discussion of plans for the 1974 annual meeting was initiated. Cundiff reported on tentative plans for a 1/2 day research symposium. Nichols and Vaniman reported on plans for a 1/2 day symposium on merchandising.

Following approval of the program outline a discussion of allocation of funds to the program for the annual meeting was initiated. After the discussion a budget plan for the annual meeting was approved on the basis of the motion by Chesnut. Seconded by Bennett. The motion stated that up to $1,000 was allocated to the Merchandising Committee and up to $500 to the Research Committee for use in paying expenses of speakers. One-half the funds for this budget was to come from the treasury and 1/2 from the conference registration fees. Committee chairmen will be directed to emphasize the paying of the expenses of speakers where necessary. Honorariums will not be paid unless absolutely necessary. Wherever possible member organizations should sponsor the expenses for speakers from their organizations who appear on the program.

The secretary informed the Board of Directors that the Nationl Livestock Testing Association formed under the leadership of Charles Moore and Dwayne Shaver has requested membership in the Beef Improvement Federation. The secretary has informed Mr. Shaver that an associate membership is immediately available to NLTA, Inc. and that the membership and program of NLTA will be reviewed at the time of the annual meeting of BIF.

The secretary also reviewed other operational items in regard to the program for the benefit of the Board. The financial status of the organization seems to be a little stronger this year than in past years but the problem of meeting the work requirement of the secretaryship still exists.

The meeting adjourned at 3:00 p.m.

Minutes of the Meeting of the Board of Directors
April 15 & 17, 1974

All members were present except C. D. Swaffar (represented by Sherman Berg), Clarence Burch (represented by Tom Burch), William Gray and D. D. Bennett. Newly elected directors were included in the meeting.

The meeting was called to order at 7:15 am, April 15, by President Dave Nichols. The minutes of the midyear meeting were reviewed by the secretary and approved.

In the absence of the treasurer, the secretary reviewed the financial situation and estimated that the year-end financial statement, July 1, would show a balance of approximately $4,500 which is approximately $500 higher than in 1973. The increase in postal rates and other costs will make operating costs higher in 1974-75.

Plans for publication of the 1974 edition of the BIF Guidelines were reviewed by Larry Cundiff, Dixon Hubbard and Frank Baker. A preliminary copy of the Guidelines will be produced about July 1, 1974. The USDA printing will be made about December, 1974.

Larry Cundiff who chaired balloting for the selection of the Continuing Service Awards announced that the 1974 awardees are D. D. Bennett, Richard Willham and Frank Baker.

Officers elected were Ray Meyer, President; Martin Jorgenson, Vice President; Frank Baker, Secretary and C. D. Swaffar, Treasurer.

The meeting recessed until 12:30 pm, April 17.

The date and location for the 1975 BIF meeting was discussed. A motion was made by Jorgenson and seconded by Vaniman that the meeting be May 19, 20 and 21 at Atlanta, Georgia using a motel near the airport with the same general format as the 1974 meeting. Motion passed.

A motion was made by Hammond and seconded by Bennett that the president appoint a director-at-large to fill the unexpired term of William Gray who has not been able to participate. (John R. Whaley, a newly elected director has been designated as an Eastern Regional Director to permit categorizing the vacancy for 1974-75 as a Director-at-large). Motion passed.

The Board authorized publication of leaflets on: (1) central station testing, (2) merchandising and (3) national sire evaluation as recommended by the committees.

The Board discussed the question of whether BIF should direct its attention toward youth activities. Concensus indicated that the need is being met by a national committee of extension personnel and BIF should concentrate its efforts in other areas.

Committee reports were reviewed. The secretary was instructed by a unanimous vote of the Board on a motion by Jorgenson and a second by Vaniman to add an editorial footnote on the Farm and Ranch Testing Committee report in the BIF meeting proceedings indicating that the Board reaffirms its previous action not to take a position encouraging evaluation as defined by the Farm and Ranch Testing Committee.

The Board authorized an editorial committee composed of Dixon Hubbard, Larry Cundiff, Frank Baker, Dwight Stephens and Don Vaniman to edit and finalize the committee recommendations for publication in the BIF Guidelines in June. The committee was instructed to correct the contradictory points between sections of the publication.

Motion by Jorgenson, second by Durfey, expressing appreciation to retiring President, Dave Nichols, for his outstanding leadership to BIF.

Meeting adjourned at 3:00 pm.

Minutes of General Business Meeting
April 16, 1974

The meeting was called to order at 3:45 pm by President Dave Nichols. The Secretary's report was presented by Frank Baker. The financial status of the organization was reviewed by the Secretary in the absence of the Treasurer.

Committee reports were called for and presented as published elsewhere in the proceedings. Committee reports were accepted for review and action by the Board of Directors and Editorial Committee of "BIF Guidelines."

Election results were announced. Directors elected were John R. Whaley, Fred Francis, Louis C. Chesnut, Martin Jorgenson and Tom Burch (replacing Clarence Burch for PRI). Officers elected in the Board meeting were President, Ray Meyer; Vice President, Martin Jorgenson; Secretary, Frank Baker and Treasurer, C. D. Swaffar.

Dixon Hubbard announced that membership of committees would remain the same until the fall of 1974.

Meeting adjourned at 5:15 pm.

1973-74 Secretary's Report

by Frank Baker

The Beef Carcass Data Service has been a focal point for BIF this year. Bob Leverette of AMS-USDA asked me to report that since September 1972, 90,000 tags have been distributed. Carcass reports were returned on 9,103 tags. The number of tags placed in cattle ears and the number of tagged cattle marketed are not known. There are 32 cooperating organizations plus approximately a dozen state BCIA's obtaining tags through BIF in quantities of less than 1,000. The present supply of tags in USDA is estimated to last into 1975.

BIF came into existence through an expressed need of the beef industry in 1965-66-67. BIF's objectives were and are directed to the performance movement with emphasis on uniformity, development, cooperation, education and confidence.

BIF has worked with cattlemen's problems and industry needs in the existing cattle populations. Many of BIF's prime recommendations originated from concepts of the mid 60's.

Next year, 1975 -- future BIF programs must be oriented to the 70's and the 80's. BIF must achieve professional maturity in record keeping.

Uniform procedures may not be applicable to today's cattle populations, today's cattlemen, today's industry needs.

We must develop relevant guidelines for the future if we are to serve the industry in the future. There has been worldwide recognition of BIF. The guidelines are being used in part in several countries.

From a personal viewpoint, working with this organization is exciting because of the challenges, the people and the concepts. It is truly one of my great satisfactions.

President's Address

J. David Nichols

Woodrow Wilson once aptly said, "Opportunity is responsibility". We have experienced in BIF the opportunity to peddle our wares to the beef industry. The combination of the scientist and the technically aware layman has culminated in such programs as National Sire Evaluation, Farm and Ranch Record Standardization and Central Bull Test Procedures to name a few. But with this tremendous opportunity we also must accept the responsibility of telling it like it is. The need for accurate information and research data is real. Whether as breeder or scientist, we must remember that today is merely a shadow of tomorrow, and we must have the technical and research inputs before the seed stock industry can respond. Change is not without its problems. Let's not dwell on the compact and fat animal of the past and try to discern who was at fault for its popularity--rather let's combine our resources so this type of costly error does not occur again.

The breeding and selling of seed stock and the accompanying education of laymen is an intangible area of facts, fiction, prejudice, emotion, superstition, tradition, energy and lethargy. The interplay of all these values in this business of producing germ plasm has an effect which I'm sure few of us understand.

Each of us has a part in this drama of breeding seed stock. Each of us has an opportunity. Each of us has a responsibility to the two- and one-half billion persons on this earth with a net gain of roughly one person per second. Each of us makes our own rules--usually following the traditions of the past--and each is ever so slightly influenced by new and scientific ideas. BIF has been a scientific plowman of the 70's. Much of this information has been available since the 19th century. BIF has made it available for the use or misuse of the seed stock industry. While not inclined to make predictions, I'll predict that the beef industry is in or about to experience one last bust.

However, one can't be pessimistic about the future of beef cattle--the ability of the beast to consume low-quality cellulose and synthetic nitrogen. In the next decade, we may see where overproduction is not a worry.

My friend, George Chiga, from Oklahoma once said, "Few, if any individuals or organizations are self-transforming without a sense of overriding need." As I see it, we do have an overriding need. We can no longer rely on simply identifying superior germ plasm and introducing it into our programs.

The seed stock industry has been beating the bushes to find breeders and cattle that had the foresight to breed performance cattle. The Carlton Corbin's, the Les Holden's, the Jim Lingle's and the Travers Smith's have given us the opportunities to make genetic short cuts in

breeding cattle. However, now we are going to have to breed cattle to improve the one's we already have. I suspect much of the performance germ plasm has been discovered. We must develop a sound sense of goals and use new measures of efficiency. A mad scramble for 1,000 pound, 205 day weights and 2,000 pound yearlings may be as ill-advised as the Baby Beef of yesteryear. Some breed associations have assumed positions of leadership in developing within breed programs of identifying superior cattle. I think they are to be commended for their efforts particularly in National Sire Evaluation. I'm sure these new innovative measures will not be relegated to "just another tool", but will move to the forefront in breed selection and promotion. Breeds and breeders must define their place in the commercial cross-breed production of beef. I'm sure no breeder or breed has a corner on all the good traits necessary for efficient beef production. I suspect those breeds or breeders that try are going to progress rather slowly.

The accomplishments of BIF this past year are not a reflection of my leadership; but rather, on the training and dedication of all the people involved. We must recognize that this knowledge can only be of value to the consuming public if it goes beyond the laboratory. The research symposiums we hold each year do this very thing. Current advances do not signal the end of the technical road; but rather, the great opportunities and responsibilities ahead. Being President of this organization has been a maturing, rewarding and personal experience for me. The opportunity to work with the Board and great leaders such as Clarence Burch and Frank Baker has had an impact on me that is not describable. I'll close with a feeble attempt at Farmer's poetry.

At the end of a pleasant journey,
The trail of this year ends
The days and ways made easier
With the help of loyal friends.

ELECTION OF BOARD OF DIRECTORS AND OFFICERS

Vacancies of the Board of Directors were filled by election in accordance with the by-laws i.e. representatives of breed associations caucus and elect members to represent them; state BCIA representatives elect regional directors in regional caucuses and at-large directors in a caucus of all BCIA's.

Director	Address	Representing	Term Expiration
Breed Associations			
Fred Francis	3201 Frederick Blvd. St. Joseph, Mo. 64506	Am. Angus Assn.	1977
Craig Ludwig	Hereford Drive Kansas City, Mo. 64105	Am. Heref. Assn.	1975
Raymond Meyer (President)	Sorum, S.D. 57654	Red Angus Assn. of Am.	1976
C. D. Swaffar (Treasurer)	8288 Hascall St. Omaha, Nebr. 68124	Am. Shorthorn Assn.	1975
Don Vaniman	Box 24 Bozeman, Mt. 59715	Am. Simmental Assn.	1975
Robert Vantrease	309 Livestock Ex. Bldg. Denver, Colo. 80216	No. Am. Limousin Foundation	1976
State BCIA's & PRI			
James Bennett	Red House, Va. 23963	BCIA Eastern Region	1976
John R. Whaley	The Wye Plantation Queenstown, Md. 21658	BCIA Eastern Region	1977
D. D. Bennett	Box 352 Hermiston, Or. 97838	BCIA Western Region	1975
Louis Chesnut	4314 Scott Spokane, Wash. 99200	BCIA Western Region	1977
Jim Wolf	Box 548 Albion, Nebr. 68620	BCIA-At-Large	1975
J. David Nichols	Anita, Ia. 50020	BCIA-At-Large	1976
Robert Miller	View Lawn Farm Mabel, Minn. 55954	BCIA-At-Large	1976
Martin Jorgenson (Vice President)	Ideal, S.D. 57541	BCIA-At-Large	1977
Tom Burch	Mill Creek, Ok. 74856	PRT	Continuing
Other Organizations			
John Airy	Pioneer Beef Johnston, Ia. 50131	Am. Natl. Cattlemens Assn.	Continuing
William Durfey	512 Cherry St. Columbia, Mo. 65201	Natl. Assn. of An. Brdrs.	Continuing
Ex Officio			
Frank H. Baker (Sec.)	Ani. Sci. Dept., Univ. of Nebr., Lincoln, Nebr. 68503		
L.V. Cundiff	USMARC, Clay Center, Nebr. 68933		
Dixon Hubbard	Extension Service, USDA, Washington, D.C. 20250		
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